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# THE ANNALS

AND

# MAGAZINE OF NATURAL HISTORY,

INCLUDING

## ZOOLOGY, BOTANY, AND GEOLOGY.

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

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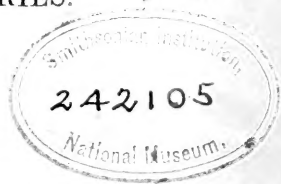
ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,

WILLIAM CARRUTHERS, F.R.S., F.L.S., F.G.S.,

AND

WILLIAM FRANCIS, JUN., F.L.S.

VOL. VII.—SEVENTH SERIES.



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

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

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

J. TAYLOR, *Norwich*, 1818.













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# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

---

“..... per litora spargite muscum,  
Naiades, et 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 mucosis e rupibus, et mihi conchas  
Ferte, Deæ pelagi, et pingui conchylia succo.  
N. Parthenii Giannettusi, Ecl.

---

No. 37. JANUARY 1901.

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I.—*Diagnoses of new Fishes discovered by Mr. J. E. S. Moore in Lakes Tanganyika and Kivu.* By G. A. BOULENGER, F.R.S.

### II. Cichlidæ, Mastacembelidæ.

*Paratilapia vittata.*

D. XV–XVI 8–9. A. III 8–9. Sq. 33–35  $\frac{4}{11-12}$ .

L. lat. 20–21/10–13.

Depth of body  $3\frac{1}{3}$  to  $3\frac{1}{2}$  times in total length, length of head  $2\frac{2}{3}$  to 3 times. Diameter of eye 4 to  $4\frac{3}{4}$  times in length of head; maxillary extending to below anterior border of eye; 3 or 4 series of teeth; 3 or 4 series of scales on the cheek. 10–12 gill-rakers on lower part of anterior arch. Pectoral much shorter than the head. Caudal feebly notched. Two blackish stripes along each side of the body.

Total length 120 millim.

Several specimens from Kivu.

*Paratilapia aurita.*D. XV-XVII 9-10. A. III 8. Sq. 35-36  $\frac{3-4}{9-10}$ .

L. lat. 22-25/14-18.

Depth of body 3 to  $3\frac{1}{4}$  times in total length, length of head  $3\frac{1}{4}$  to  $3\frac{1}{2}$ . Diameter of eye  $3\frac{1}{4}$  to  $3\frac{3}{4}$  times in length of head; maxillary extending to below anterior fourth or anterior third of eye; 2 or 3 series of teeth; 4 or 5 series of scales on the cheek. 10 or 11 gill-rakers on lower part of anterior arch. Pectoral as long as head. Caudal feebly notched. A very distinct blue-black opercular spot.

Total length 130 millim.

Several specimens from Msambu, Tanganyika.

*Paratilapia calliura.*D. XVI-XVII 10. A. III. 7-8. Sq. 37-40  $\frac{2-3}{9-10}$ .

L. lat. 25-29/13-17.

Depth of body 4 to  $4\frac{1}{2}$  times in total length, length of head 3 to  $3\frac{1}{3}$ . Snout pointed; diameter of eye 3 to  $3\frac{1}{3}$  times in length of head; maxillary extending to below anterior fourth of eye; 2 series of teeth; 2 or 3 series of scales on the cheek. 15 gill-rakers on lower part of anterior arch. Pectoral a little shorter than the head. Caudal feebly notched. Dorsal and anal edged with black; 4 or 5 black bars across the caudal.

Total length 110 millim.

Several specimens from Kalambo, Tanganyika.

*Paratilapia stenosoma.*D. XV 13. A. III 12-13. Sq. 60-68  $\frac{6}{16}$ .

L. lat. 54-58/31-34.

Body very strongly compressed, its depth nearly equal to length of head and  $2\frac{3}{4}$  to 3 times in total length. Diameter of eye  $3\frac{1}{3}$  to  $3\frac{1}{2}$  in length of head; maxillary not extending to below anterior border of eye; 2 or 3 series of teeth; 2 series of scales on the cheek. 19-23 gill-rakers on lower part of anterior area. Pectoral a little shorter than the head. Caudal deeply notched. Dorsal fin blackish at the edge.

Total length 220 millim.

Three specimens from the south end of Lake Tanganyika and from Maswa, south of Ujiji.

*Paratilapia nigripinnis.*D. XV-XVII 11. A. III 8-9. Sq. 39-40  $\frac{3}{11}$ .

L. lat. 29-30/13-16.

General proportions and essential characters as in *P. leptosoma*, Blgr., but easily distinguished by the number of spines and soft rays in the dorsal and of soft rays in the anal. Dark brown, lighter beneath; fins blackish, caudal edged with white.

Total length 80 millim.

Two specimens from Msambu, Tanganyika.

*Bathybates fasciatus.*D. XVI 16. A. III 17. Sq. 140  $\frac{11}{25}$ . L. lat. 75/45.

Depth of body  $4\frac{1}{3}$  times in total length, length of head  $3\frac{1}{2}$ . Diameter of eye twice in length of snout, 5 times in length of head,  $1\frac{1}{2}$  times in interocular width. 18 gill-rakers on lower part of anterior arch. A series of large round blackish blotches above the upper lateral line, alternating with vertical blotches or cross-bars below.

Total length 340 millim.

A single specimen from the west coast of Lake Tanganyika.

*Xenotilapia ornatipinnis.*D. XIII-XV 12-13. A. III 7-8. Sq. 34-37  $\frac{3}{10}$ .

L. lat. 28-32/13-18/4-12.

Body less elongate than in *X. sima*, Blgr., its depth nearly equal to length of head and  $3\frac{1}{3}$  to  $3\frac{1}{2}$  times in total length. Large blackish spots or oblique bars on the dorsal; upper lobe of caudal with a blackish edge; a blackish chevron-shaped band lower down on the caudal.

Total length 110 millim.

Several specimens from Kibwesi, Tanganyika.

*Trematocara unimaculatum.*D. X-XII 9-11. A. III 7-8. Sq. 30-32  $\frac{3}{7}$ . L. lat. 5-11.

17 gill-rakers on lower part of anterior arch. Dorsal spines longer than in *T. marginatum*. A large round black spot on the posterior third of the spinous dorsal.

Total length 120 millim.

Several specimens from Usambura, Tanganyika.

## GEPHYROCHROMIS, gen. nov.

A band of very small tricuspid teeth in both jaws and an outer series of larger conical teeth. Anal spines 3.

Differs from *Paratilapia* as *Telmatochromis* from *Lamprologus*.

*Gephyrochromis Moorii*.

D. XVII 8. A. III 7. Sq.  $30 \frac{3}{11}$ . L. lat. 22/13.

Depth of body equal to length of head, 3 times in total length. Diameter of eye  $3 \frac{1}{3}$  times in length of head; 3 series of scales on the cheek. 13 gill-rakers on lower part of anterior arch. Caudal rounded.

Total length 120 millim.

A single specimen from the north end of Lake Tanganyika.

*Tilapia pleurotaenia*.

D. XV-XVIII 11-12. A. III 8-10. Sq. 32-35  $\frac{4}{11-12}$ .  
L. lat. 22-24/10-15.

Depth of body  $2 \frac{1}{2}$  to 3 times in total length, length of head 3 to  $3 \frac{1}{2}$ . Diameter of eye 3 to  $3 \frac{1}{2}$  times in length of head; mouth extending to below nostril or between nostril and eye; 3 series of teeth; 3 or 4 series of scales on the cheek. 10-12 gill-rakers on lower part of anterior arch. Pectoral a little shorter than head. Caudal deeply notched. A blackish lateral stripe.

Total length 110 millim.

Several specimens from the north end of Lake Tanganyika and from the Usisi River.

*Tilapia trematocephala*.

D. XVI 11. A. III 9. Sq.  $40 \frac{3}{10}$ . L. lat. 28/?.

Depth of body equal to length of head,  $3 \frac{1}{4}$  times in total length. Sensory organs on the head with very wide openings; diameter of eye 3 times in length of head; mouth extending to between nostril and eye; 2 series of teeth; 3 series of scales on the cheek. 13 gill-rakers on lower part of anterior arch. Pectoral  $\frac{3}{4}$  length of head. Caudal deeply notched. Ventral and anal black, latter edged with white.

Total length 90 millim.

A single specimen from the north end of Lake Tanganyika.

*Tilapia boops.*D. XII-XIII 14. A. III 8-9. Sq. 39-40  $\frac{5}{14-15}$ .

L. lat. 34-35/15-19.

Depth of body equal to length of head,  $3\frac{1}{4}$  to  $3\frac{1}{3}$  times in total length. Diameter of eye  $2\frac{1}{2}$  in length of head; mouth not extending quite to below anterior border of eye; 3 series of teeth; 2 or 3 series of scales on the cheek. 13 gill-rakers on lower part of anterior arch. Pectoral as long as head. Caudal deeply notched.

Total length 90 millim.

Two specimens from Msambu, Tanganyika.

## ASPROTILAPIA, gen. nov.

Teeth small, tricuspid, closely set, in two series. Mouth inferior, transverse. Body elongate, much attenuate in the caudal region. Scales ctenoid; two lateral lines. Anal with 3 spines.

Allied to *Tilapia*.*Asprotilapia leptura.*D. XIV 12. A. III 8. Sq. 38  $\frac{2}{11}$ . L. lat. 27/20.

Body rather feebly compressed, its depth 5 times in total length. Snout subconical, projecting strongly beyond the mouth; diameter of eye  $2\frac{3}{5}$  times in length of head; 3 series of scales on the cheek. Caudal deeply notched. Caudal peduncle 3 times as long as deep.

Total length 95 millim.

A single specimen from Msambu, Tanganyika.

*Mastacembelus frenatus.*

D. XVII 85. A. II 90.

Vent equally distant from the end of the snout and from the caudal; length of head  $3\frac{2}{3}$  times in its distance from vent. Mouth extending to below anterior border of eye; no præ-opercular spines. Body with dark brown marblings; a dark streak on each side of the head, passing through the eye; two brown bars across the caudal.

Total length 250 millim.

A single specimen from the north end of Lake Tanganyika.

*Mastacembelus tenuiatus.*

D. XXXIII 85. A. II 85.

Vent nearer caudal fin than end of snout; length of head 3 times in its distance from vent. Mouth extending to below anterior border of eye; no præopercular spines. A brown lateral stripe from the end of the snout to the tail, passing through the eye.

Total length 105 millim.

A single specimen from the north end of Lake Tanganyika.

II.—*Rhynchotal Notes*.—VIII. Heteroptera: *Fam. Coreidæ*.  
By W. L. DISTANT.

THESE notes and descriptions refer to the subfamilies Acanthocephalinæ, Homœocerina, Cloresminæ, and Colpurinæ, with a few further references to the family Pentatomidæ. Most of Walker's descriptions in these groups are reviewed, but some two or three still await further consideration. It is also probable that some species Walker described in subsequent locations may, when those groups are reached, be found to belong to the above subfamilies.

*ACANTHOCEPHALINÆ.*

## Genus ACANTHOCEPHALA.

*Acanthocephala latipes.*

*Cimex latipes*, Drury, Ins. iii. p. 63, pl. xlv. fig. 3 (1782).

*Metapodius sericeicollis*, Walk. Cat. Het. iv. p. 49. n. 7 (1871).

*Acanthocephala angustipes.*

*Metapodius angustipes*, Westw. in Hope Cat. ii. p. 15 (1842).

*Metapodius constrictus*, Walk. Cat. Het. iv. p. 47. n. 4 (1871).

*Acanthocephala unicolor.*

*Metapodius unicolor*, Westw. in Hope Cat. ii. p. 15 (1842).

*Metapodius distinctus*, Walk. Cat. Het. iv. p. 50. n. 21 (1871)



## Genus LAMINICEPS.

*Laminiceps megæra*.

*Paryphes megæra*, Burm. Handb. ii. p. 336. n. 3 (1835).

*Laminiceps megæra*, Stål, En. Hem. i. p. 156. n. 1 (1870), cum synon.

This species has been omitted in the Catalogue of Lethierry and Severin (cf. t. ii. p. 34, *Laminiceps*).

*Laminiceps festivus*, sp. n.

Head bluish green, eyes ochraceous, antennæ fuscous; pronotum ochraceous, with two large discal, subquadrate, indigo-blue spots, which do not reach the posterior or lateral margins and are more remote from the anterior margin; scutellum indigo-blue, with a central longitudinal ochraceous fascia, which is broadest at base and apex; corium dark bluish black, crossed at base of membrane by a transverse ochraceous fascia; membrane black. Head and body beneath ochraceous; rostrum, a spot beneath bases of antennæ, a spot near intermediate and posterior coxæ, and the legs bluish green; bases of anterior and intermediate femora, base and under surface of posterior femora ochraceous, the last with the femoral spines blackish.

The pronotum has the dark spots thickly and coarsely punctate, the remaining area more sparingly punctate excepting the anterior margin, which is almost impunctate; lateral margins obscurely crenulate; scutellum transversely rugulose and coarsely punctate, corium thickly and finely punctate.

♂. Posterior femora incrassate, curved, and with a series of spines beneath which gradually increase in size from near base to apex.

Long., ♂, 18 millim.

*Hab.* Amazons (Brit. Mus.).

Allied to *L. fasciatus*, Dall., and *L. cardinalis*, Stål; from the first it is at once separated by the different markings and colour of the femora, from the second by the markings of the pronotum and scutellum, different colour of the legs, &c.

*Laminiceps sumptuosus*, sp. n.

Above dark bluish green; basal and lateral margins of head, anterior area, lateral margins of pronotum (narrowly), and a central longitudinal fascia to pronotum, scutellum, bases of corium and clavus, apex of clavus connected with a broad transverse fascia to corium, body beneath and legs

reddish ochraceous; antennæ, base and apex of rostrum, three large spots on each side of sternum near coxæ, bases of third and fourth abdominal segments, tibiæ (excluding bases), and the tarsi dark bluish green.

Pronotum with the dark areas very coarsely punctate and rugulose, remaining area more sparingly punctate, anterior margin impunctate, lateral margins finely and obscurely crenulate, the lateral angles prominent; scutellum subrugulose; corium thickly and finely punctate.

♂. Posterior femora strongly incrassate and curved, with several longitudinal series of obscure spines or tubercles, and a much more distinct series beneath, which is duplex near apex; posterior tibiæ inwardly strongly spined.

Long., ♂, 19 millim.

*Hab.* Amazons, Rio Magdalena (*Dr. O. Thieme*, Coll. Dist.).

Allied to *L. ducalis*, Stål, from which it may be separated by the unicolorous scutellum, different colour of the legs, &c.

### HOMŒOCERINÆ.

#### Genus HOMŒOCERUS.

##### *Homæocerus angulatus.*

*Homæocerus angulatus*, Westw. in Hope Cat. ii. p. 22 (1842).

*Homæocerus clarus*, Walk. Cat. Het. iv. p. 94. n. 12 (1871).

*Homæocerus mundus*, Walk. loc. cit. p. 99. n. 28.

*Homæocerus parallelus*, Walk. loc. cit. p. 100. n. 31.

##### *Homæocerus signatus.*

*Homæocerus signatus*, Walk. Cat. Het. iv. p. 97. n. 19 (1871); Kirby, Journ. Linn. Soc., Zool. xxiv. p. 91 (1891).

*Homæocerus biplagiatus*, Stål, En. Hem. iii. p. 59. n. 14 (1873).

Mr. Kirby had correctly placed these two species as synonymic (*supra*), but as Lethierry and Severin have since placed them as distinct in their Catalogue (t. ii. pp. 35 and 37), it is as well to draw attention to the correction.

##### *Homæocerus subjectus.*

*Homæocerus subjectus*, Walk. Cat. Het. iv. p. 97. n. 20 (1871).

The type is unique and represented by a specimen in bad condition. Probably only a colour-variety of *H. abbreviatus*, Fabr.

*Homæocerus serrifer.**Coreus serrifer*, Westw. in Hope Cat. ii. p. 24 (1842).*Homæocerus parvulus*, Walk. Cat. Het. iv. p. 101. n. 32 (1871).*Homæocerus unipunctatus*, Dall. (nec Thunb.), List Hem. ii. p. 447. n. 11 (1852).*Homæocerus unipunctatus.**Cimex unipunctatus*, Thunb. N. Ins. Sp. ii. p. 38, t. ii. fig. 52 (1783).*Homæocerus chinensis*, Dall. List Hem. ii. p. 447. n. 12 (1852).*Homæocerus prominulus.**Ceratopachys prominulus*, Dall. List Hem. ii. p. 501. n. 3 (1852).*Ceratopachys vicinus*, Dall. *loc. cit.* n. 4.*Homæocerus graminis.**Lygæus graminis*, Fabr. Syst. Rhyng. p. 216. n. 55 (1803).*Homæocerus turbidus*, Walk. Cat. Het. iv. p. 95. n. 15 (1871).*Homæocerus abbreviatus.**Lygæus abbreviatus*, Fabr. Ent. Syst. iv. p. 150. n. 51 (1794).*Homæocerus umbratus*, Walk. Cat. Het. iv. p. 95. n. 17 (1871), excl. syn.*Homæocerus variabilis.**Ceratopachys variabilis*, Dall. List Hem. ii. p. 502. n. 5 (1852).*Homæocerus anticus*, Walk. Cat. Het. iv. p. 98. n. 25 (1871).*Homæocerus annulatus.**Alydus annulatus*, Thunb. Hem. rostr. Cap. iii. p. 4 (1822).*Ceratopachys subsparsus*, Walk. Cat. Het. iv. p. 105. n. 5 (1871).*Homæocerus borneensis*, sp. n.

Brownish ochraceous, coarsely and darkly punctate; antennæ piceous, base of apical joint pale luteous; pronotum with an indistinct pale central levigate line, and the lateral margins narrowly piceous; corium with the margins and venation palely levigate, the submarginal area piceous; scutellum with the margins and apex palely levigate; membrane with the internal area black; abdomen above dark brownish, a broad central fascia and the connexivum ochraceous, apical segment with its margins black. Body beneath and legs ochraceous; sternum unspotted.

Antennæ with the first and second joints longest and subequal in length, third and fourth joints shorter, third a little

longer than fourth; lateral angles of pronotum slightly prominent and subangulate; rostrum with the second joint slightly longer than the third.

Long., ♂, 18 millim.; exp. pronot. angl.  $4\frac{1}{2}$  millim.

*Hab.* S.E. Borneo (Atkinson Coll., Brit. Mus.).

The striking colour of the abdomen above will render this species easily recognized, especially with the unspotted corium and sternum.

*Homæocerus malayensis*, sp. n.

Brownish ochraceous, veins and apical area of the corium ochraceous, the last preceded by an irregular transverse black fascia. Antennæ with the basal joint brown, the second and third joints piceous (apical joint mutilated); lateral margins and angles of pronotum narrowly piceous; basal margin of pronotum, margins and apex of scutellum, and margins and venation of corium palely levigate; membrane pale brownish, with its basal area black; body beneath and legs ochraceous, a small black spot on each side of meso- and metasternum.

Antennæ with the first and third joints subequal in length, second a little shorter; body above very coarsely punctate, the punctures somewhat darker; lateral angles of the pronotum prominent, subacute, and slightly directed backward; rostrum with the second joint much longer than the third.

Long. 16–18 millim.; exp. pronot. angl.  $4\frac{1}{2}$ –5 millim.

*Hab.* Malay Peninsula; Singapore, ♂ (Saunders Coll., Brit. Mus.); Perak, ♀ (*Doherty*, Coll. Dist.).

In the Perak specimen the abdominal stigmata are black.

Somewhat allied to *H. Walkerianus*, Leth. & Sev. (*plagiatus*, Walk.).

*Homæocerus Atkinsoni*, sp. n.

Ochraceous, thickly and coarsely punctate, the punctures black on the corium and scutellum, and forming a more or less distinct transverse fascia between the lateral angles, and three somewhat indistinct discal longitudinal lines, also distinct on the extreme lateral margins of the pronotum. Body beneath and legs ochraceous; a lineate series of small spots to the sternum and abdomen, mostly double on the abdomen, and the stigmata black. Antennæ black, apical joint fuscous, with its apex ochraceous. Abdomen above dark purplish, the segmental margins (narrowly) and the connexivum ochraceous.

Antennæ with the second joint slightly longer than the

third; lateral angles of the pronotum prominent and subacute; abdomen distinctly dilated on each side at apical half; lateral margins and apex of scutellum, margins and venation of corium levigate; internal angle of membrane fuscous; rostrum with the third and fourth joints subequal in length.

Long., ♂, 13-14 millim.; exp. pronot. angl.  $4\frac{1}{2}$ -5 millim.

*Hab.* Assam (Atkinson Coll., Brit. Mus.); Naga Hills (Doherty, Coll. Dist.).

A species allied to *H. tinctus*, Dist., from which it differs by the pronotal angles, colour of antennæ, &c.

*Homæocerus abdominalis*, sp. n.

Ochraceous, coarsely punctate; antennæ, lateral margins of pronotum, membrane, and a lateral series of five large segmental spots to body beneath, black; clavus and marginal area of corium punctured with black.

Antennæ with the base of first joint ochraceous; first and second and third and fourth joints almost subequal in length, third and fourth shortest; pronotal angles subprominent; rostrum with the second joint longer than the third; first, second, and fourth joints almost subequal in length.

Long., ♂, 14 millim.; exp. pronot. angl.  $4\frac{1}{2}$  millim.

*Hab.* Malay Peninsula; Perak (Doherty, Coll. Dist.).

A species easily recognized by the colour of the antennæ and the large abdominal spots.

*Homæocerus montanus*, sp. n.

Ochraceous; apical joint of antennæ (excluding extreme base) roseate; apical area of corium more or less infuscated; abdomen above ochraceous, with a double series of subquadrate sanguineous spots.

Antennæ with the first and fourth joints incrassated, second joint longest, third slightly shorter than fourth, which is subequal in length to first joint; body above coarsely punctate; pronotal angles not produced; rostrum with the second joint slightly longer than the third.

*Var.*—Posterior margin of the pronotum, clavus, and internal area of corium infuscated.

Long., ♂ ♀, 14-17 millim.

*Hab.* British India, Nilgiri Hills (Sir G. Hampson, Coll. Dist.).

*Homæocerus smecticus*, sp. n.

Ochraceous, thickly, coarsely, and darkly punctate; antennæ fuscous, the apical joint luteous; pronotum with a

central pale levigate line, the extreme lateral margins and angles piceous; abdomen black, the connexivum, apical margin, and two transverse spots on disk ochraceous; body beneath and legs ochraceous; abdomen with a series of black stigmatal spots.

Antennæ with the first and fourth joints moderately incrossated; first, second, and third joints almost subequal in length, fourth shortest; lateral angles of the pronotum produced into very small obtuse spines; rostrum with the second joint longer than the third.

Long., ♂, 13 millim.; exp. pronot. angl. 4 millim.

Hab. Burma; Ruby Mines (*Doherty*, Coll. Dist.).

Somewhat allied to *H. nigradorsum*, Horv., from which it may be at once separated by the more slender and elongate antennæ, the produced lateral angles of the pronotum, the different markings of the upper surface of the abdomen, the unspotted sternum, relative lengths of the joints of antennæ, &c.

*Homæocerus Yerburyi*, sp. n.

Fuscous brown, thickly and coarsely punctate; antennæ with the first and fourth joints piceous, second and third joints ochraceous, with their apical thirds piceous; head with a lateral piceous fascia behind the eyes; corium with the veins and an irregularly angulated patch on apical margin ochraceous; membrane brassy brown; body beneath and legs reddish brown; two oblong spots on mesosternum between the anterior and intermediate coxæ, extreme apex of rostrum, apical thirds of femora, apices of tibiæ, tarsi, and marginal spots to abdomen piceous; abdomen above reddish ochraceous, connexivum broadly spotted with piceous; scutellum with extreme lateral levigate margins and the apex ochraceous.

Antennæ with the first and third joints subequal in length, second longest, fourth short and cylindrical; basal joint stout, second and third joints moderately thickened at apices; pronotal angles strongly developed, directed upwards, their apices acute; rostrum with the first and second joints short, thickest, and subequal in length; third and fourth slender, third a little longer than fourth.

Long., ♂ 15 millim., ♀ 18 millim.; exp. pronot. angl. 5½-7 millim.

Hab. Aden (*Col. Yerbury*, Brit. Mus.).

*Homæocerus trimaculatus*, sp. n.

Ochraceous, coarsely and darkly punctate; pronotum with

the lateral spines and a transverse discal series of three conspicuous spots black; a somewhat obsolete central line to pronotum and the apex and basal angles of the scutellum palely levigate; antennæ, body beneath, and legs brownish ochraceous; an oblique spot on prosternum and oblique fascia and two spots on mesosternum, a somewhat bent lineate fascia on metasternum, and the apex of the rostrum black; abdomen above brownish ochraceous, with a double discal series of blackish spots with small ochraceous centres.

First and fourth joints of the antennæ moderately incrasated, second joint longest, first and third subequal in length, fourth a little shorter than third; pronotum with the lateral angles very prominent, directed upwards and somewhat forwards, apices slightly reflexed; rostrum with the joints almost subequal in length.

Long., ♂  $16\frac{1}{2}$  millim., ♀ 18 millim.; exp. pronot. angl., ♂ 5 millim., ♀ 7 millim.

*Hab.* British East Africa, Maragya Fundi (*C. S. Betton*, Brit. Mus.).

A species to be placed near *H. magnicornis*, Burm., and *H. auriculatus*, Stål.

#### CLORESMINÆ.

#### Genus NOTOBITUS.

#### *Notobitus abdominalis*, sp. n.

♂. Head, antennæ, pronotum, scutellum, abdomen above, body beneath, and legs obscure dark olivaceous; eyes, apex of scutellum, connexivum, central macular fascia to abdomen above (neither reaching base nor apex), lateral margins of abdomen beneath, and posterior margins of third, fourth, and fifth abdominal segments ochraceous; corium, anterior and intermediate tibiæ, and tarsi brownish ochraceous; membrane dull ochraceous, its basal margin paler; apical joint of antennæ pale fuscous, its extreme base olivaceous.

Antennæ with the first, second, and third joints pilose and almost subequal in length; head, pronotum, and scutellum thickly and coarsely punctate; posterior femora (♂) with a series of irregular spines beneath, of which the largest and most prominent is situate about one third from apex.

Long. 23 millim.

*Hab.* East India (*sic*) (Brit. Mus.); Assam (*Chennell*, Coll. Dist.).

The abdominal markings will alone render this species quite distinct.

## Genus CLORESMUS.

*Cloresmus modestus*, sp. n.

♂. Body above brownish ochraceous, sometimes tinged with purplish; antennæ, rostrum, a central fascia to head beneath, and mesosternum, anterior and intermediate legs, posterior trochanters and tarsi ochraceous; posterior legs and abdomen beneath reddish brown; abdomen above purplish, sometimes pale castaneous, with three pale central ochraceous spots—one on second segment and the others at junction of third and fourth and fourth and fifth segments; connexivum above and beneath ochraceous, spotted with black or castaneous at the incisures; membrane pale fuscous; scutellum with the apex and basal angles narrowly ochraceous.

♂. With a very distinct spine on outer edge of posterior coxæ; rostrum extending about halfway across mesosternum; antennæ very hirsute, first and third and second and fourth joints almost subequal in length; posterior femora armed with a long spine beneath a little beyond centre.

Long., ♂ 18 millim., ♀ 16 millim.

*Hab.* ♂ ♀, British India, North Khasia Hills (*Chennell*, Coll. Dist.); ♀, Singapore (*H. N. Ridley*, Brit. Mus.).

The Singapore specimen is somewhat paler beneath than in the Khasia examples.

The species is allied to *N. nepalensis*, Westw., from which it differs by its larger size, longer antennæ, different colour of the abdomen, &c.

*Cloresmus khasianus*, sp. n.

Above pale shining olivaceous or brownish ochraceous, with the head and anterior margin of pronotum olivaceous; antennæ with the first, second, and third joints brownish ochraceous, with their extreme apices olivaceous, fourth joint ochraceous, its base and an apical annulation fuscous; abdomen above sanguineous, with two small ochraceous linear spots at bases of fourth and fifth segments; connexivum ochraceous, with large fuscous spots at the incisures; prosternum, anterior and intermediate legs, and posterior tarsi ochraceous; meso- and metasternum, abdomen beneath, and posterior legs castaneous; lateral margins of abdomen ochraceous, minutely spotted with fuscous at the incisures; head beneath and anterior margin of prosternum shining pale olivaceous.

♂. Antennæ hirsute, the first and third and second and



fourth joints subequal in length ; rostrum short, scarcely extending beyond the anterior coxæ ; posterior coxæ somewhat obscurely spined ; posterior femora moderately incrassated, obscurely spinous beneath, and with an elongate spine a little beyond centre.

Long., ♂ ♀, 21 millim.

*Hab.* British India, Mungphu (Atkinson Coll., Brit. Mus.) ; Khasia Hills (*Chennell*, Coll. Dist.).

Allied to the preceding species, from which it differs by the larger size, shorter rostrum, longer and more attenuated posterior femora, different colour and markings of antennæ and upper surface of abdomen, &c.

### COLPURINÆ.

#### Genus SCIOPHYRUS.

##### *Sciophyrus anticus.*

*Cletus anticus*, Walk. Cat. Het. iv. p. 196. n. 43 (1871).

##### *Sciophyrus crassus.*

*Cletus crassus*, Walk. Cat. Het. iv. p. 197. n. 46 (1871).

#### Genus COLPURA.

*Lybas*, Dull. List Hem. ii. pp. 450 & 463 (1852), nom. præocc.

*Colpura*, Bergr. (n. nom.) Rev. Ent. France, xiii. p. 154 (1894).

*Lybastes*, Kirkaldy (n. nom.), Entomologist, xxxiii. p. 240 (1900).

##### *Colpura afflicta.*

*Lybas afflictus*, Walk. Cat. Het. iv. p. 151. n. 8 (1871).

Anterior angles of the pronotum rounded, unarmed ; membrane not quite reaching the apex of the abdomen, pale brown, with the veins fuscous and very distinct.

Walker's type was unlocalized ; I, however, possess a specimen from Bantam, Java, in my own collection.

##### *Colpura lugubris.*

*Lybas lugubris*, Walk. Cat. Het. iv. p. 151. n. 7 (1871), part. (type a, Singapore).

*Colpura speculatrix*, Bredd. Abh. Senckenb. Ges. xxv. p. 152, t. ix. fig. 6 (1900).

Walker's type from Singapore possesses the black anterior area to the membrane ; in my own collection is a specimen from Sumatra.

*Colpura funebris*, sp. n.

Piceous, finely ochraceously pubescent; apical joint of antennæ (excluding base), apex of scutellum, lineate marginal spots to abdomen above and beneath, trochanters, tarsi, and posterior margins of fourth and fifth abdominal segments ochraceous; membrane dark cupreous, with its inner area brownish ochraceous; corium with a large dull piceous spot near claval apex; body beneath piceous; abdomen with four basal spots (sometimes obsolete), the stigmata and a sublateral series of spots, of which the last three are the largest and most distinct, shining black; sternal spots (sometimes obsolete) shining black; posterior and intermediate femora more or less suffused with ochraceous above.

Antennæ with the basal joint stoutest and curved, second and third joints slender, second much longer than third, fourth cylindrical and shortest, not much more than half the length of third; pronotum with the anterior angles rounded and unarmed; abdomen moderately dilated and recurved, projecting beyond the corium for about half its length; rostrum about reaching the centre of the third abdominal segment; abdomen prominently sulcated for about half its length.

Long. 15 millim.; exp. pronot. angl.  $4\frac{1}{2}$  millim.

*Hab.* Sikkim (Atkinson Coll., Brit. Mus.).

By the markings of the corium allied to *C. planiceps*, Bredd.

*Colpura javanensis*, sp. n.

Head, pronotum, scutellum, body beneath, and legs piceous; corium, antennæ, connexivum, and tibiæ pale castaneous; bases and apices of first, second, and third joints of antennæ (very narrowly), fourth joint (excluding base), two spots on corium (the first and smaller at about one third from base, the second and larger near posterior margin), marginal spots to abdomen both above and beneath, rostrum, trochanters, tarsi, and posterior margins of fourth and fifth abdominal segments ochraceous; abdomen beneath with four black spots near base and a rounded sublateral black spot on fourth, fifth, and sixth abdominal segments; membrane cupreous.

Head long, about as long as the pronotum; basal joint of the antennæ moderately thickened and curved, second joint longest, fourth cylindrical, a little shorter than third; pronotum with the anterior and posterior angles rounded, not prominent; rostrum very long, almost reaching the apex of fourth abdominal segment; abdomen strongly sulcated from

base to apex of penultimate segment; membrane not extending to apex of abdomen.

Long. 10 millim.; exp. pronot. angl.  $2\frac{1}{2}$  millim.

*Hab.* Java (Horsfield Coll., Brit. Mus.).

*Colpura modesta*, sp. n.

Obscure brownish, finely ochraceously pilose, coarsely punctate; membrane cupreous; body beneath and legs piceous; rostrum, trochanters, extreme bases of femora, tarsi, apical joint of antennæ (excluding base), marginal spots to abdomen both above and beneath, and posterior margins of fourth and fifth abdominal segments ochraceous; abdomen above bluish black, the two basal segments reddish; abdomen beneath with four black spots near base and a rounded sub-lateral spot on the fourth, fifth, and sixth abdominal segments.

Antennæ with the basal joint thickened and curved, second and third joints slender, second longest, fourth cylindrical and a little shorter than third; head with a somewhat prominent tubercle directed outwards on each side behind the eyes; pronotum with the anterior and posterior angles rounded, the lateral margins somewhat sinuate; rostrum about reaching the centre of the third abdominal segment; abdomen broadly but obscurely sulcated for about half its length from base.

Long. 9-10 millim.; exp. pronot. angl.  $3\frac{1}{2}$  millim.

*Hab.* Java (Horsfield Coll., Brit. Mus.); S.E. Borneo (*Doherty*, Coll. Dist.).

*Colpura labecula*, sp. n.

Piceous, greyishly pilose; apical joint of antennæ (excluding base) luteous; rostrum, coxæ, trochanters, extreme bases of femora, posterior margins of fourth and fifth abdominal segments, spots to connexivum, and marginal spots to abdomen beneath ochraceous; membrane black, with a large central ovate ochraceous spot.

Antennæ with the basal joint thickened and curved; second and third joints slender, second longest, fourth joint cylindrical, shorter than third; head with two foveate impressions in front of the ocelli and another on anterior portion of disk; pronotum deflexed anteriorly, lateral margins nearly straight, lateral angles rounded, not prominent; scutellum with the apex narrowly ochraceous; rostrum reaching the apex of the third abdominal segment; abdomen beneath with three sub-marginal black spots on the fourth, fifth, and sixth abdominal segments, and broadly centrally sulcated for about half its length from base.

Long. 9-10 millim.; exp. pronot. angl. 3-3½ millim.

*Hab.* Malay Peninsula; Singapore (*H. N. Ridley*, Brit. Mus.); Perak (*Doherty*, Coll. Dist.).

The Perak specimen is minus the lateral ochraceous and black spots to the abdomen beneath.

*Colpura erebus*, sp. n.

Very dark castaneous; apical joint of antennæ (excluding base), eyes, apex of scutellum, a small discal spot on corium near posterior margin, lineate lateral spots to abdomen above and beneath, posterior margins of fourth and fifth abdominal segments, and the coxæ ochraceous; femora much suffused with ochraceous.

Antennæ with the first joint thickened and slightly curved, second and third joints slender, second longest, fourth cylindrical, shorter than third; pronotum with the anterior angles moderately and distinctly prominent, anterior margin concavely sinuate, lateral margins nearly straight, anterior area bilobately impressed; abdomen broader than corium and projecting from about half its length to apex; connexivum recurved, membrane not quite reaching apex of abdomen; abdomen beneath broadly and distinctly sulcated; rostrum reaching the apex of the third abdominal segment.

Long. 11-15 millim.; exp. pronot. angl. 3½-4½ millim.

*Hab.* India, Mungphu (Atkinson Coll., Brit. Mus.); Naga Hills (*Doherty*, Coll. Dist.).

This species is allied to *Colpura afflictus*, Walk., and both species have a resemblance to the genus *Pachycephalus*, from which the length of the rostrum and the sulcated abdomen separate them. From *C. afflicta* the present species differs by the much more developed anterior pronotal angles.

*Colpura noctua*, sp. n.

Piceous; apical joint of antennæ (excluding base), coxæ, extreme bases of femora, rostrum, posterior margins of fourth and fifth abdominal segments, spots to lateral margins of abdomen above and beneath ochraceous; tibiæ and tarsi obscure brownish ochraceous.

Rostrum reaching the centre of the third abdominal segment; antennæ with the basal joint thickened and curved, second and third joints longest and slender, second longer than third, fourth cylindrical and shortest; pronotum with the anterior angles distinctly spined, lateral margins straight, not sinuate, posterior margin moderately sinuate at base of

scutellum, a distinct subfoveate, subbasal, transverse impression, and the lateral angles subprominent and rounded. Fourth, fifth, and sixth abdominal segments with a very distinct rounded black spot near the lateral margins; body somewhat coarsely punctate; abdomen above purplish.

Long. 11–12 millim.; exp. pronot. angl.  $3\frac{1}{2}$ –4 millim.

*Hab.* Java (Horsfield Coll., Brit. Mus.); Burma and Upper Assam (Coll. Dist.).

### *Lybas turpis.*

*Lybas turpis*, Walk. Cat. Het. iv. p. 150. n. 5 (1871); Kirby, Journ. Linn. Soc., Zool. xxiv. p. 93 (1894).

The type of this species is not to be found. In its place was a mutilated specimen of the American species *Leptoglossus zonatus*; this probably misled Kirby into including *L. turpis* in his enumeration of the Ceylonese species and writing "very like a species of *Homæocerus* in appearance."

## Genus PACHYCEPHALUS.

### *Pachycephalus Touchei*, sp. n.

Piceous brown, coarsely punctate; connexivum above and beneath with lineate spots at incisures, some irregular spots to femora, and subbasal and subapical annulations to tibiæ ochraceous; apical joint of antennæ (excluding base) luteous.

Rostrum not reaching base of second abdominal segment.

Allied to *P. opacus*, Uhler, from which it differs by its darker colour, annulated tibiæ, spotted connexivum, &c.

Long. 11 millim.; exp. pronot. angl. 3 millim.

*Hab.* China; Kualun, N.W. Fokien (*J. de la Touche*, Brit. Mus.).

## *Summarized Disposition of Walker's Genera and Species.*

### Acanthocephalinæ, Homæocerinæ, Cloresminæ, and Colpurinæ.

#### *Species considered valid and described under correct Genera.*

*Homæocerus signatus*, Walk. Cat. Het. iv. p. 97. n. 19 (1871).

— *subjectus*, Walk. loc. cit. n. 20.—*H. abbreviatus*, Fabr., var. ?

— *concisus*, Walk. loc. cit. n. 21.

— *sinicus*, Walk. loc. cit. p. 98. n. 24.

— *lucidus*, Walk. loc. cit. p. 100. n. 29.

— *simplex*, Walk. loc. cit. n. 30.

*Species considered valid, but requiring generic revision.*

- Metapodius affinis*, Walk. Cat. Het. iv. p. 51. n. 22 (1871), belongs to gen. *Acanthocephala*.  
*Lybas penicillatus*, Walk. loc. cit. p. 150. n. 6, belongs to gen. *Colpura*, n. nom.  
 — *lugubris*, Walk. loc. cit. p. 151. n. 7, belongs to gen. *Colpura*, n. nom.  
 — *afflictus*, Walk. loc. cit. n. 8, belongs to gen. *Colpura*, n. nom.  
 — *mæstus*, Walk. loc. cit. p. 152. n. 9, belongs to gen. *Colpura*, n. nom.  
 — *fascipes*, Walk. loc. cit. n. 10, belongs to gen. *Colpura*, n. nom.  
*Cletus anticus*, Walk. loc. cit. p. 196. n. 43, belongs to gen. *Sciophyrus*.  
 — *fasciatus*, Walk. loc. cit. n. 44, belongs to gen. *Acanthotyla*.  
 — *crassus*, Walk. loc. cit. p. 197. n. 46, belongs to gen. *Sciophyrus*.

*Species treated as synonymic.*

- Metapodius constrictus*, Walk. Cat. Het. iv. p. 47. n. 4 (1871), = *Acanthocephalus angustipes*, Westw.  
 — *sericeicollis*, Walk. loc. cit. p. 49. n. 7, = *Acanthocephala latipes*, Dru.  
 — *distinctus*, Walk. loc. cit. p. 50. n. 21, = *Acanthocephala unicolor*, Westw.  
*Homæocerus plagiatu*s, Walk. loc. cit. p. 93. n. 11 (nom. præocc.), = *Homæocerus Walkerianus*, Leth. & Sev.  
 — *clarus*, Walk. loc. cit. p. 94. n. 12, = *Homæocerus angulatus*, Westw.  
 — *fascifer*, var., Walk. loc. cit. n. 13 (part.), = *Homæocerus Walkeri*, Kirby.  
 — *turbidus*, Walk. loc. cit. p. 95. n. 15, = *Homæocerus graminis*, Fabr.  
 — *umbratus*, Walk. loc. cit. p. 95. n. 17, = *Homæocerus abbreviatus*, Fabr.  
 — *anticus*, Walk. loc. cit. p. 98. n. 25, = *Homæocerus variabilis*, Dall.  
 — *mundus*, Walk. loc. cit. p. 99. n. 28, = *Homæocerus angulatus*, Westw.  
 — *parallelus*, Walk. loc. cit. p. 100. n. 31, = *Homæocerus angulatus*, Westw.  
 — *parvulus*, Walk. loc. cit. p. 101. n. 32, = *Homæocerus serrifer*, Westw.  
*Ceratopachys subsparus*, Walk. loc. cit. p. 105. n. 5, = *Homæocerus annulatus*, Thunb.

*To be treated as non-existent.*

*Species the types of which are not now to be found in the British Museum.*

- Homæocerus lineatus*, Walk. Cat. Het. iv. p. 97. n. 22 (1871).  
*Lybas turpis*, Walk. loc. cit. p. 150. n. 5.

## Pentatomidæ still to be located.

## CYDNINÆ.

## Genus MENTISA.

*Mentisa*, Walker, Cat. Het. iii. p. 537 (1868).

*Mentisa smaragdina*.

*Mentisa smaragdina*, Walk. *loc. cit.* n. 1.

Walker's type and unique specimen in the British Museum is strongly carded, and thus afforded no opportunity for examination of the ventral segments. This, in conjunction with its distinct coloration, made me strongly doubt it belonging to the Cydninæ at all; but Dr. Bergroth now informs me that he has received the species from Central Brazil and that the arrangement and number of ventral segments prove it to belong to that subfamily. I therefore gladly locate it in that position on his authority. Walker described the antennæ as four-jointed, but his specimen is mutilated in that respect, and Dr. Bergroth informs me that in normal specimens the number of the antennal joints is five.

## PENTATOMINÆ.

## CROLLIUS, gen. nov.

Body very much depressed, subovate. Antennæ four-jointed; basal joint shortest and stoutest, slightly passing the apex of the head, second joint longest; head about as long as broad between the inner margins of eyes, the lateral lobes sublaminar and reflexed, longer than the central lobe and meeting beyond it, their apices rounded but separated; antenniferous tubercles outwardly and prominently spined. Pronotum with the anterior and posterior margins concavely sinuate, the lateral margins slightly reflexed and sinuate, the anterior angles with a small tubercle or spine, the posterior angles slightly notched or angulated. Scutellum broad, about as long as the corium, its lateral margins sinuate, its apex angularly rounded. Membrane short, reaching the apex of the abdomen, longitudinally veined. Rostrum about reaching the anterior coxæ, fourth joint almost equal in length to that of third joint. Prosternum strongly sulcated; mesosternum with a slight central ridge.

I have placed this genus near *Platycoris*, Guér., with which it has many affinities.

*Crollius conspersus*.

*Podops conspersus*, Walk. Cat. Het. i. p. 71. n. 9 (1867)

*Hab.* Natal (*Gueinzus*, Brit. Mus.); British East Africa (*C. S. Betton*, Brit. Mus.).

Walker describes the head as unarmed, a statement contradicted by the spinous antenniferous tubercles.

*Podops conspersus*, Walk. Cat. Het. i. p. 71. n. 9 (1867), belongs to gen. *Crollius*, gen. nov.

*Strachia frontalis*, Walk. loc. cit. ii. p. 338. n. 80 (1867), belongs to gen. *Asopus*.

— *reciproca*, Walk. loc. cit. p. 340. n. 84, belongs to gen. *Asopus*.

— *megaspila*, Walk. loc. cit. p. 341. n. 85, = *Asopus reciprocus*, Walk.

— *hamata*, Walk. loc. cit. p. 342. n. 86, belongs to gen. *Asopus*.

— *saturata*, Walk. loc. cit. n. 87, = *Asopus hamatus*, Walk.

*Duadicus telifer*, Walk. loc. cit. p. 376. n. 377, belongs to gen. *Andriscus*.

*Stauralia crassicornis*, Walk. loc. cit. p. 377. n. 2 (rightly placed).

— *terminalis*, Walk. loc. cit. p. 378. n. 3 (rightly placed).

*Microdeuterus equalis*, Walk. loc. cit. p. 390. n. 2 (rightly placed).

*Brachystethus piceohus*, Walk. loc. cit. p. 456. n. 10 (rightly placed).

III.—*An Account of a Collection of Butterflies made by the Rev. K. St. Aubyn Rogers between Mombasa and the Forests of Taveta.* By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., &c., Senior Assistant-Keeper, Zoological Department, British Museum (Nat. Hist.).

IN a letter sent from Mombasa, July 13th, 1900, Mr. Rogers writes:—"I have been collecting butterflies here for some time, and have been recommended by Mr. R. Crawshay to send you some specimens in case any of them may be of interest to you. I do not suppose you will find them of any great value, as the greater part of them have been taken so near the coast, the few from up-country being either from Taveta or on the road there. I regret there are so few, but I have already sent the greater part of my collections there to the Royal Institution of Cornwall.

"Most of the species I send you are common generally, but I append a few notes as to those which I have not taken so commonly." Then follow notes upon many of the species.

In spite of Mr. Rogers's modest opinion of this collection, I have found it of considerable interest; it consists of ninety-seven species, some poorly represented in the Museum collection, others quite new to us. One local form I have had to name, its differences from its southern representative being clearly quite constant.

The species from Taveta seem all to be referable to dry or intermediate phases, those from Mombasa chiefly, if not altogether, to the wet phase.



## Nymphalidæ.

1. *Amauris ochlea*, Boisd.

♀, Mombasa, 30th December, 1899.

2. *Amauris dominicanus*, Trimen.

♂♂, Taveta, 11th November, 2nd and 5th December, 1899; Mombasa, 2nd May, 1900.

3. *Limnas chrysippus*, var. *dorippus*, Klug.

♂, Mombasa, 7th May, 1900.

4. *Samanta perspicua*, Trimen.

♂♂, Taveta, 4th and 22nd August, 28th November, 1899; locality illegible, 28th April, 1900.

The examples obtained at Taveta are all of the dry-season phase (but not yellow above as in *S. Simonsi*); the April example is of the wet phase.

5. *Monotrichtis sufizza*, Hewits.

♂, Mombasa, 12th July, 1900.

A curious variety with five ocelli on under surface of primaries, the first, third, and fourth small, the second only slightly larger, the fifth as large as usual.

6. *Neocænura duplex*, Butler.

♂, Taveta, 11th December, 1899.

"Common between Voi and Taveta" (*St. A. Rogers*).

7. *Physcænura leda*, Gerst.

♂♀, Chaengombe, 23rd April, 1900.

"Common at Rabai, but not at Mombasa" (*St. A. R.*).

8. *Ypthima granulosa*, Butler.

♂, Mombasa, 22nd February, 1900.

9. *Charaxes brutus*, Cramer.

♀, Taveta, 4th September, 1899.

"Fairly common at Taveta, but difficult to get in good condition" (*St. A. R.*).

10. *Charaxes rosæ*, Butler.

♂, Taveta, 7th September, 1899.

The same note applies to this as to the preceding species; we should be glad to get more females of this species; they can at once be distinguished by the broad white belt across both front and hind wings and the distinct white spots on the former; the males of this and *C. manica* are much alike and liable to be confounded; *C. rosæ*, however, has distinctly broader and less falcate primaries.

11. *Charaxes neanthes*, Hewits.

♂, Taveta, 9th September, 1899.

“Occurs fairly frequently beyond Voi” (*St. A. R.*).

12. *Charaxes varanes*, Cramer.

♂, Mombasa, 20th June, 1900.

13. *Precis cloantha*, Cramer.

♀, Rabai, 6th June, 1900.

“This occurs widely, but I have never found it common” (*St. A. R.*).

14. *Precis elgiva*, Hewits.

Taveta, 15th July and 5th August, 1899.

15. *Precis cebrene*, Trimen.

♂, Taveta, 17th July; ♀, 7th October, 1899; ♂♂♀, Mombasa, 7th May, 11th June; ♀, Inn Town, 2nd June, 1900.

16. *Precis clelia*, Cramer.

♀, Taveta, 22nd August, 1899; ♂♀, 4th and 16th January, 1900.

17. *Precis boopis*, Trimen.

♂♂♀♀, Mombasa, 6th to 8th May, 1900.

18. *Protogoniomorpha nebulosa*, Trimen.

♂, Mombasa, 20th June, 1900.

19. *Pyrameis cardui*, Linn.

♂, Mombasa, 8th May, 1900.

20. *Panopea expansa*, Butler.

(? Frere) town, 30th June, 1900.

"I have only met with this twice, both in bad condition : mimics *Amauris ochlea*" (K. St. A. R.).

21. *Euralia deceptor*, Trimen.

♀, Mombasa, 23rd June, 1900.

"This is not common and is very like *Amauris ochlea*. I wish I could send you a better specimen" (K. St. A. R.).

22. *Euralia Wahlbergi*, Wallgr.

♀ ♀, Rabai, 6th and 8th June, 1900.

"This also seems rare ; it is a very close mimic of *A. dominicanus*" (K. St. A. R.).

23. *Hypolimnas misippus*, Linn.

♀, Mombasa, 20th April, 1900.

24. *Hamanumida dædalus*, Fabr.

♂, Chaengombe, 23rd April, 1900.

"Does not seem common near coast, but much more so up-country" (K. St. A. R.).

25. *Euphædra violacea*, Butler.

♂ ♂, Taveta, 11th November and 5th December, 1899.

26. *Euphædra neophron*, Hopff.

♀, Chaengombe, 23rd April ; ♂, Mombasa, 19th May ; ♂, Rabai, 8th June, 1900.

It is quite evident that this and *E. violacea* never occur together ; it seems likely that the blue of freshly-caught *E. neophron* undergoes a chemical change with age and becomes green ; the colour of *E. violacea*, however, appears to be permanent.

27. *Euryphene senegalensis*, Herr.-Sch.

♂ ♂ ♀ ♀, Rabai, 6th and 8th June, 1900.

"Quite common at Rabai" (K. St. A. R.).

28. *Neptis agatha*, Cramer.

♂ ♀, Rabai, 7th and 11th June ; ♂, Mombasa, 16th June, 1900.

29. *Eurytela dryope*, Fabr.

♀, Mombasa, 27th June, 1900.

30. *Hypanis ilithyia*, Drury.

♂, Mombasa, 7th January; ♀, 30th June, 1900.

31. *Acræa Jacksoni*, E. M. Sharpe.

♂, Taveta, 11th November, 1899.

“This I have also taken commonly beyond Voi”  
(*K. St. A. R.*).

32. *Acræa serena*, Fabr. (var. *perrupta*, Butler).

♀ ♀, “Frere Town?” 2nd June; Rabai, 6th June;  
Mombasa, 7th July, 1900.

“This is very common, but seems to vary a great deal”  
(*K. St. A. R.*).

Strangely enough Mr. Rogers has sent us six females of  
this abundant species, all differing, but not one male.

33. *Acræa lycia*, Fabr.

♂ (typical form), Taveta, 7th October, 1899.

♂ (var. *daira*), Taveta, 9th September, 1899; ♀, Mombasa, 11th March, 1900.

34. *Acræa oerata*, Trimen.

♂, Taveta, 22nd August, 1899; ♂ ♀, Mombasa, 22nd  
June, “Frere? Town,” 12th May, 1900.

The male from Taveta is small, deep-coloured, and has the  
spotted black body of the ordinary female, yet the spots on  
the under surface do not differ; it is probably the dry phase  
of the species. Mr. Rogers says of it—“I have not seen  
this near the coast, but it is abundant the other side of Voi”;  
of the typical form he says—“Fairly common at Mombasa.”

35. *Acræa natalica*, Boisdu.

♂ ♂, Mombasa, 8th May; Rabai, 9th June, 1900.

36. *Acræa anemosa*, Hewits.

♀, Mombasa, 1st February; ♂, 4th July; ♂, Rabai,  
9th June, 1900.

37. *Acræa neobule*, Doubl.

♀, Mombasa, 15th February; ♂, "Frere?" Town, 17th February, 1900.

38. *Acræa insignis*, Dist.

♀, Mombasa, 27th April, 1900.

"This is the first specimen I have met with" (*K. St. A. R.*).

39. *Acræa satis*, Ward.

♂, Rabai, 8th June; ♀, Mombasa, 20th June, 1900.

Of the female Mr. Rogers says:—"I have not found this really common." The female is numbered 78, but the male 37, so that their specific identity seems not to have been recognized.

40. *Acræa mombasæ*, H. G. Smith.

♀, Rabai, 9th June, 1900.

"This is fairly common at Rabai, and occurs sometimes at Mombasa" (*K. St. A. R.*).

Unfortunately Mr. Rogers only sent us one example; it is a species not too well represented in the Museum series.

41. *Pardopsis punctatissima*, Boisd.

"Frere?" Town, 28th April, 1900.

**Lycænidæ.**

42. *Tingra amenaïda*, var. *mombasæ*, H. G. Smith.

♂, Rabai, 8th June, 1900.

"This flies quite slowly; quite unlike a Blue" (*K. St. A. R.*).

43. *Lachnocnema bibulus*, Fabr.

♂, Taveta, 8th December, 1899; ♀, Rabai, 8th June, 1900.

Of the male Mr. Rogers writes:—"This curious Blue is quite common in a district of Taveta called Mbondeni, where it flies rapidly backward and forward, and frequently settles." Of the female he mentions having taken "a single specimen."

44. *Axiocerses harpax*, Fabr.

♂, Rabai, 11th June; ♀, Mombasa, 4th July, 1900.

Var. *tjoane*, Wallgr.

♂ ♂, Chaengombe, 23rd April; Rabai, 6th and 7th June; Mombasa, 23rd June.

Two examples of the variety are numbered (8), like the typical form, and two (180). *A. harpax* appears to be an extremely variable species, the fiery mahogany colouring of the primaries being somewhat reduced in var. *perion*, more so in var. *tjoane*, and wanting or nearly so in var. *punicea*. Similar variations occur in the males of *A. amanga*, examples from Abyssinia having the belt on the primaries narrowed and interrupted, whilst in British Central Africa it is usually cone-shaped, with a separate spot for the apex of the cone, and does not extend above the second median branch; nevertheless we have one normal male from Nyasaland.

Another example is also numbered (180), and is doubtless a form of var. *cræsus* with the basal area of the primaries very black, so that the central reddish area represents a narrow and irregular tapering band, divided externally below the first median branch by a transversely oblique black bar; this specimen was caught at Rabai on the 8th June.

45. *Axiocerses amanga*, Westw.

♂ ♂, "Frere?" Town, 12th May; Rabai, 8th June, 1900.

Mr. Rogers numbers this (159), and remarks as follows:—"I am afraid there is some confusion amongst these; (8) is common, (159) is not common, but occurs both at Rabai and here; (180), if distinct?, I think only occurs at Rabai."

Considering the variability of the primaries in both *A. harpax* and *A. amanga*, it is not surprising that confusion should have arisen. I strongly suspect that *A. mendeche* from Mombasa is only an example of *A. amanga* in which the belt on the primaries is bounded by vein 4, which I should imagine is the vein indicated in the description; as a rule when this is the case the band is converted into a conical patch, but this appears not to be the case in the type of *A. mendeche*.

46. *Argiolaus lalos*, var., H. H. Druce.

♀, Chaengombe, 23rd April, 1900.

The white patches on the upper surface are rather smaller, the red more vivid and rather more restricted on the secondaries: below, the red markings are deeper, the anal patch extending further inwards; the black markings stronger and only extending to the second median branch. I think this will prove to be only a well-nourished example of *A. lalos*.

Mr. Rogers says that it "does not seem really common." We do not possess the male, and should be very glad to get more females.

47. *Stugeta Bowkeri*, Trimen, local form *mombasæ*.

♂ ♂, Mombasa, 7th and 10th February; ♀, 19th May, 1900.

These examples are larger and bluer than those from Natal; the black on the primaries is also expanded, reducing the size of the white markings. On the under surface the ground-colour is chalky white, with hardly any grey suffusion, the dark markings are of a more rufescent brown varied with orange. As a local form I think this insect requires a distinctive name.

48. *Hypolycæna philippus*, Fabr.

♂, Mombasa, 3rd January, 1900.

I am not sure that the African species are typical *Hypolycæna*.

49. *Hypolycæna pachalica*, Butler.

♂, Mombasa, 28th December, 1899.

50. *Virachola antalus*, Hopff.

♀ ♀, Taveta, 28th October, 1899; Rabai, 9th June, 1900.

51. *Virachola dariaves*, Hewits.

♂, Chaengombe, 23rd April, 1900.

Numbered (166) by Mr. Rogers, who, however, sends no note respecting it; it is rare in collections here, and we should be glad to get more specimens; we do not possess the female.

52. *Spindasis victoriæ*, Butler.

♂, Rabai, 11th June, 1900.

"This is not uncommon at Rabai; occurs here, but seems to be replaced further inland by (138)" (*K. St. A. R.*).

This is the first male example I have seen; on the upper surface it is intermediate between *S. natalensis* and *S. nyassæ*: on the under surface the primaries resemble those of *S. nyassæ*, but on the secondaries the central band is united at an angle with that running from the abdominal margin; the subapical transverse band is abruptly widened on first subcostal branch, and runs nearly parallel to the central band, and the outer

submarginal band is much abbreviated and confined to the apical area : these are all characters to be found in the female also. Although it has been questioned whether the three forms *S. natalensis*, *nyassæ*, and *victoriæ* can be distinguished as species, I find that, so far as specimens hitherto received show, the differences are constant to locality.

53. *Lycænesthes amarah*, Lefebv.

♀ ♀, Mombasa, 7th February and 3rd July; ♂, 4th July, 1900.

54. *Lycænesthes Lasti*, H. G. Smith.

♂, Chaengombe, 23rd April; ♀, 11th June, 1900.

This species (no. 163) is new to the Museum collection; the female bears the number (55).

55. *Lycænesthes Kersteni*, Gerst.

♂ ♂ ♀ ♀, Taveta, 14th October, 25th November, and 4th and 8th December, 1899.

The males are numbered (148) and the females (122).

56. *Cacyreus lingeus*, Cramer.

♀ ♀, Mombasa, 14th and 27th June, 1900.

57. *Castalius melæna*, Trimen.

♂ ♀, Taveta, 12th August and 17th October, 1899.

"I think I have only found this at Taveta, where it is common" (*K. St. A. R.*).

We should be glad of more specimens of this species.

58. *Tarucus telicanus*, Lang.

♂, Taveta, 18th August, 1899; ♀ ♀, Mombasa, 14th June and 20th July, 1900.

59. *Azanus jesous*, Guérin.

♂, Mombasa, 20th June, 1900.

60. *Catochrysops peculiaris*, Rogenh.

♀, Mombasa, 12th July, 1900.

A singularly white form of the female, belonging to the intermediate phase. Mr. Rogers observes that "the female is much larger than the male, which is also duller and bluish



grey." The male of this phase is quite unknown to me; it would seem to resemble typical *C. peculiaris* ♂ in size and *C. hypoleucus* ♂ in colour. It is an interesting fact (if I am correct in associating *C. hypoleucus* = *gigantea* with *C. peculiaris*) that the wet phase is tailed, but the intermediate and dry phases are without tails; yet in *Chrysophanus thersamon* we have a tailed form—*C. omphale*—and in a small *Everes* obtained by the late Capt. E. Y. Watson in the Chin Hills the presence or absence of tails appeared to be quite unimportant, so that it seems to me quite likely that the tailed form of the wet season might easily be modified in this respect and the species lose its tails with the reduction in the size of its wings.

61. *Catochrysops asopus*, Hopff.

♀, Mombasa, 23rd June, 1900.

This example bore no collector's number; it may, perhaps, have been confounded with the female of the next species.

62. *Catochrysops osiris*, Hopff.

♂ ♂ ♀ ♀, Mombasa, 30th December, 1899; 16th January and 17th February, 1900.

63. *Chilades trochilus*, Freyer.

♂ ♀, Mombasa, 8th March, 1900.

64. *Cupidopsis jobates*, Hopff.

♀, Taveta, 14th July; ♂ ♂ ♀ ♀, Mombasa, 28th and 30th December, 1899, and 3rd January, 1900.

65. *Nacaduba sichela*, Wallgr.

♀ ♀, Mombasa, 16th and 20th June, 1900.

"I do not think this is common here" (*K. St. A. R.*).

66. *Zizera knysna*, Trimen.

♂ ♂, Mombasa, 16th June and 4th July, 1900.

Numbered respectively (15) and (85), but they are only small and large examples.

Papilionidæ.

67. *Mylothris agathina*, Cramer.

♂ ♀, Mombasa, 12th May; ♀, 7th July, 1900.

68. *Terias brenda*, Doubl.

♂, Taveta, 4th December, 1899.

69. *Teracolus calais*, Cramer.

♀, Mombasa, 27th June, 1900.

70. *Teracolus Rothschildi*, E. M. Sharpe.

♂ ♂, Mombasa, 23rd June and 7th July, 1900.

"I have only found this quite close to the sea, generally quite on the shore, where it is often common" (*K. St. A. R.*).  
It is new to the Museum collection.

71. *Teracolus imperator*, Butler.

♀, Mombasa, 30th January; ♂, 12th July, 1900.  
The male is numbered (10) and the female (80).

72. *Teracolus evarne*, Klug.

♀, Mombasa, 20th June; ♂, 12th July, 1900.  
The male is numbered (4) and the female (61).

73. *Teracolus isaura*, Lucas.

♂, Mombasa, 30th December, 1899.

This is a more southern habitat than I should have expected for *T. isaura*, which is a true northern form, found in Egypt, the White Nile, and Abyssinia.

74. *Teracolus gavis*a, Wallgr.

♀, Rabai, 9th June, 1900.

Mr. Rogers says that this was obtained at Rabai only.

75. *Teracolus callidia*, H. G. Smith.

Ochreous type.—♀, Taveta, 12th August; ♂, 29th November, 1899.

Crimson type.—♀, Mombasa, 28th December, 1900.

Said to be "common beyond Voi, not at Mombasa."

The specimens from Taveta are of the intermediate phase, that from Mombasa of the wet phase; the male is numbered (119), the females (2) and (2 var.).

76. *Teracolus leo*, Butler.

Intermediate phase.—♀, Taveta, 28th July, 1899.

Dry phase.—♂, 4th August; ♀, 28th October, 1899.

"Beyond Voi" (*K. St. A. R.*).

The more specimens of this species we receive the more convincingly is it proved that all the characters which distinguish it from the Arabian *T. halimede* are constant and absolutely reliable.

77. *Teracolus aurigineus*, Butler.

♂ ♂, Taveta, 19th August, 1899.

"Common beyond Voi, not at Taveta" (*K. St. A. R.*).

78. *Teracolus catachrysops*, Butler.

♂, Mombasa, 14th June, 1900.

The males of this well-marked species have come to hand tolerably frequently of late years; but the females seem to be rarer, more especially the white variety. Mr. Rogers numbers this insect (183), but makes no remark about it, from which fact I should judge that it cannot be rare at Mombasa. I should be very glad to get more examples, especially females.

79. *Catopsilia florella*, Fabr.

♀, Mombasa, 11th June; ♂, 7th July, 1900.

80. *Glutophrissa contracta*, Butler.

♀, Chaengombe, 23rd April; ♂, Mombasa, 16th June, 1900.

The male is numbered (97), the female (100).

81. *Herpænia eriphia*, Godart.

♀, Taveta, 26th July, 1900.

"This is fairly common here, but much more so further up country" (*K. St. A. R.*).

82. *Eronia dilatata*, Butler.

♂, Mombasa, 23rd February, 1900.

83. *Papilio corinneus*, Bertol.

♀, Mombasa, 19th May, 1900.

84. *Papilio similis*, Cramer.

♂, Chaengombe, 23rd April, 1900.

85. *Papilio philonoe*, Ward.

♂, Mombasa, 27th June, 1900.

We are badly in want of good examples of this species.

86. *Papilio constantinus*, Ward.

♂, Chaengombe, 23rd April, 1900.

"I have never found this common, though widely distributed" (*K. St. A. R.*).

87. *Papilio nireus*, Linn.

♂, Rabai, 7th June, 1900.

88. *Papilio merope*, Cramer.

♂, Rabai, 8th June, 1900.

"Difficult to get in good condition" (*K. St. A. R.*).

**Hesperiidæ.**

89. *Tagiades fesus*, Fabr.

♂, Mombasa, 16th June, 1900.

90. *Pyrgus dromus*, Plötz.

Rabai, 7th June; Mombasa, 7th July.

91. *Parosmodes icteria*, Mab.

Rabai, 6th June, 1900.

"Only seen at Rabai" (*K. St. A. R.*).

92. *Acleros placidus*, Plötz.

Rabai, 8th June, 1900.

This is very nearly related to *A. Mackenii*; indeed it would not surprise me to find that with a good series it would be impossible to separate them.

93. *Andronymus philander*, Hopff.

Rabai, 9th June, 1900.

94. *Kedestes Wallengrenii*, Trimen.

Rabai, 6th and 9th June, 1900.

"Only seen at Rabai" (*K. St. A. R.*).

95. *Baoris lugens*, Hopff.

Mombasa, 20th June and 4th July, 1900.

96. *Parnara mathias*, Fabr.

♂ ♀, "Frere?" Town, 2nd and 30th June, 1900.

The male is numbered (182), the female (170).

97. *Ceratrichia? stellata*, Mab.

♂, Rabai, 7th June, 1900.

It has been suggested by Dr. Holland that my *C. punctulata* may be a variety of this species; but I think, if he could compare the two, he would alter this, I will not say *opinion*—for he does not speak with decision,—but perhaps *view* would be the word to use. *C. punctulata* is a more robust species, without chequered but with spotted fringes, and with no ochreous colouring below; the spots on the under surface are chalky white without dark borders and the veins are whitish.

## IV.—A Contribution to the History of Plagyodus (Steller).

By Dr. A. GÜNTHER, F.R.S.

IN the March number of this Journal for 1867 I showed that the remarkable oceanic fish which Lowe described in 1833 under the name of *Alepisaurus* had already been known to Steller (ca. 1745), who named it *Plagyodus*. Steller gave a perfectly recognizable description of it, which was published by Pallas in vol. iii. of the 'Zoographia Rosso-Asiatica' (1811)\*.

However, even Steller was not the first observer who has obtained and taken notice of this interesting type. William Funnell, who served as mate on Captain Dampier's Expedition into the South Seas in the years 1703-4, gives a description and figure of it in his account of that enterprise ('A Voyage round the World': London, 1707. 8°). He says on page 6:—"On October the 22d (being in the Latitude of 6 d. 36 m. N. and Longitude from London W. about 19 d. 57 m.) we caught four fish; a Shark, a Dolphin, a Jelly-fish and an Old-wife." He then proceeds to describe these fishes, the passage referring to the Jelly-fish (p. 8) running as follows:—"The *Jelly-fish* (see fig. III.) was about fourteen inches long, and about 2 inches deep; with a

\* Messrs. Jordan and Evermann (Fish. N. & M. Amer. i. p. 594) call it "a brief description"; it occupies a page of this journal, and, what is more, it is very much to the point. I have no desire to discuss the question whether *Plagyodus*, which in due form was introduced into zoological literature by Pallas, should supersede *Alepisaurus*, or whether it should be discarded, because (as is pretended) names formed by Steller are to be estimated as "monomial designations" rather than generic terms!

very sharp set of teeth, a very curious sparkling eye, a long extended mouth, a monstrous high Fin on its back, being of a slimy substance, only the Ribs which stretched it out (being thirty-two in number) were firm and stiff. He had one small fin under his jaw, of the same slimy substance. That part of him which is without small spots, is a perfect green *Jelly*, whence he was called by us a *Jelly-fish*. The rest of him was firm, of a Silver colour, with small spots, and streaks or partings, as is express in the Figure."

The figure itself, rude as it is, as might be expected from a mariner of that time, leaves no doubt as to the nature of the fish. Whether it was drawn from the specimen at the time of its capture, or at a later period from recollection, is matter of conjecture. It is evident that Funnell, when the Dutch authorities at Amboyna took possession of all the private effects of the ship's company, found means to preserve the notes which he had made during the voyage, and without which he would not have been able to write the account published after his return to England. They probably included a sketch of the fish, but it seems to me that the description was drawn up at a later period, from the sketch and from memory. Both figure and description are much too inaccurate to draw from them any conclusion as to the species to which Funnell's specimen belonged. This, however, is immaterial; Goode and Bean (*Ocean. Ichth.* p. 117) express themselves as not thoroughly satisfied that more than one species has been found in the Atlantic.

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V.—*Notes on Bats of the Genus Nyctinomus found in Africa, &c.* By W. E. DE WINTON.

THE working out of the species of *Nyctinomus* in connexion with Dr. Anderson's 'Fauna of Egypt' has necessitated looking through the whole of the specimens of this genus contained in the collection of the British Museum. In several instances the determination arrived at by Dobson in his 'Catalogue of the Chiroptera' has been found to require amendment, and the examination of the skulls has brought out additional facts of importance. This communication is confined only to those species, found principally on the continent of Africa and the island of Madagascar, which have the ears joined or rising close together from the centre line of the face, and does not deal with that section of the genus with

smaller and more widely-separated ears which form the sub-genus *Mormopterus*.

## SECTION I.—With incomplete premaxillæ.

*Nyctinomus africanus*, Dobs.

Colour reddish brown, lighter and brighter beneath. Ears and wing-membranes and muzzle brown. Ears distinctly separated on the forehead. Tragus large.

Type in B.M.

Forearm 66 millim.

Skull very large and exceptionally broad, slightly arched on the forehead. The preorbital processes very much expanded. Premaxillæ separated, the opening perfectly circular. Incisors nearly parallel, or their points very slightly divergent. First upper premolar very small, blunt, the cusp barely longer than the cingulum. Lower incisors 4, of equal size. Lower canines almost touching at their bases.

Transvaal.

A rather smaller, white-bellied and light-winged form from Betsileo, Madagascar.

*Nyctinomus teniotis*, Raf.

Colour mouse-grey, very slightly, if at all, paler beneath. Ears and wing-membranes and muzzle black. Ears only united at extreme bases of their inner margins. Tragus large.

Forearm 59–62 millim.

Skull light and rather narrow, but very flat; forehead depressed. Premaxillæ widely separated. Incisors convergent. First upper premolar of fair size, say larger than one of the cusps of the molars. Lower incisors 6; the second pair largest; outer pair smallest and barely notched. Lower canines widely separated at their bases.

Portugal, Italy, Greece, Persia.

*Nyctinomus ægyptiacus*, Geoff.?

The examples in the Museum seem to agree so thoroughly with Geoffroy's description of this species, that, until typical specimens from Egypt are forthcoming to prove the contrary, I shall use this name for this S. African form.

Colour in spirit-specimens as nearly as possible uniform all over: some black, some brown. Closely resembling *N. teniotis* in all respects, but the ears are smaller and less broad; the lips, too, not so pendent. Tragus large.

Forearm 47–50 millim.

The skull resembles that of *N. teniotis* in shape, but is very much smaller and more papery. The premaxillæ are very imperfect, the vacant space being actually larger than in the skull of *N. teniotis*. The first upper premolar is small, not in any way crowded and right in the centre of the tooth-row. Lower incisors 4.

Basutoland, Grahamstown.

*Nyctinomus lobatus*, Thos.

Colour above sooty brown, also chin and sides of body from shoulders nearly to groin. The chest, belly, and genital region white. The lower side of the wings between the humerus and femur covered with soft white fur. Ears transparent and pale; wing-membrane still paler. Ears united at bases of inner margin and almost reaching to end of snout.

Type in B.M.

Forearm 63 millim.

Skull very like that of *N. teniotis*. Preorbital processes rather more prominent and also quite evident postorbital projections. The space between the premaxillæ is rather deeper than in *N. teniotis*, the premolar smaller. In the lower jaw there are but 4 incisors and the canines are rather close together.

Suk Country.

*Nyctinomus brachypterus*, Pet. ?

A specimen in the Museum appearing to agree with Peters's description.

Colour above dark sooty brown; beneath, except chin and sides, whitish. Ears, wing-membranes, &c. black. Wings and interfemoral membrane from ankles. The ears are moderate, joined on the forehead by a low band, which is erect, haired in front, and at all times continuous with the ears and forehead; lobe of inner cartilage of ear-border very prominent. Tragus small.

Forearm 37 millim.

Skull somewhat raised on forehead and accentuated by a low median crest rising at constriction. Premaxillæ separate, but incisors rather close together and parallel. First premolar small, rather crowded, but in direct tooth-row. Lower incisors 4, bowed well in front of canines, which are a moderate distance apart.

Sierra Leone.

A specimen (227 a) from Fernando Po with brown undersides was referred by Dobson to *N. pumilus*.



## SECTION II.—With completely ossified premaxillæ.

*Nyctinomus limbatus*, Pet.

Ears connected by a deep band. Tragus small.

Colour above dark reddish brown; the underside, except chin, throat, and sides of the body, white. Long crest of erect hairs behind the connecting membrane of ears in the males. Wing-membranes canary-yellow, covered with white fur from the middle of the humerus to the heel. Inter-femoral membrane palish brown. Wings from ankles. A ♂, 82.2.6.15, Zanzibar, is very dark-coloured above and below, with no white on the belly, but with whitish fur on the wing-membranes; the wings themselves are not quite so brightly coloured as usual.

Forearm 36–38 millim.

♀, 93.12.2.8., Tana R. Slightly larger, wing 38 millim.; wholly brown, with the exception of fur on the wing-membranes, which are very brightly coloured, and a narrow white streak on lower belly including genitals.

Skull very flat, with low crest from constriction; upper incisors close together; premaxillæ completely ossified; first upper premolar a little pinched on to the outer side of the tooth-row. Lower incisors with high inner cusp.

East Africa. Madagascar.

*Nyctinomus gambianus*, sp. n.

Much resembling *N. limbatus* in size and general appearance, but differing in having the lower parts uniform brown. The skull also closely resembles that of the East African species; but in this new bat the first upper premolar is only vestigial, so small, indeed, that it is not possible to see it without the aid of a strong lens. This minute tooth is placed close against the canine, in the outer angle formed by the actual meeting of the canine and second premolar. The first lower premolar is also smaller in this species.

Forearm 37–38 millim. (type).

The males are not furnished with the crest of long hair on the back of the membrane connecting the ears, which is such a characteristic feature in *N. limbatus* from E. Africa.

Gambia, Lagos, Nigeria.

Type, ♂, B.M. No. 89.10.7.3. Gambia. Collected by Dr. Percy Rendall.

A specimen referable to this species formed the basis of Dobson's description of *N. pumilus*.

*Nyctinomus pumilus*, Cretschm.

Above brown mouse-colour, beneath rather paler. Wings brown and paler. Wings and interfemoral membrane from ankles. Ears united by a broad band forming a distinct frontal cushion with a median furrow, much like that of *N. angolensis*. Tragus rising from rounded eminence, quadrate, rather small.

Forearm 38 millim.

Premaxillæ complete, joined. Upper incisors parallel, not very close together. Premolar small, rather crowded on to the outer side of the tooth-row. Lower incisors 4, the two inner ones bilobed, the outer pair simple and small.

Dried skin, 77 a, South Africa (Dobs. Cat.), is possibly a true *N. pumilus*, and this is the only specimen mentioned in the Catalogue which belongs to this species.

Massowa.

*Nyctinomus major*, Trouess.

Ears united by a deep band, which in the dry skin forms a distinct lobe, probably as in *N. pumilus*.

Brown above and beneath, with the exception of the pale whitish fur on the wing-membranes and the centre of the breast and belly, which is also whitish. The wing-membranes are pale.

Forearm 43 millim.

The skull is that of a very aged individual, the teeth being worn very low; the upper incisors are rather close together; the canines cut away on the inner side and not evenly bowed; the first upper premolar is small, almost in the centre line of the tooth-row, not in any way crowded. Premaxillæ entirely ossified.

The closest ally of this species is the new form from Mosambiro next described.

Type in B.M.

First Cataract of the Nile.

It is impossible to give a fuller account of this specimen, a dried skin, which still remains unique.

*Nyctinomus Emini*, sp. n.

Ears united by a broad band, probably as in *N. pumilus*.

Size rather larger than *N. pumilus* and *N. limbatus*. General colour dark sooty brown, the centre line of the belly grey or pure white; a tuft of snow-white hair is also found at the base of the humerus, and these white hairs continue

down the side to the groin. The ears, face, and entire wing-membranes are black.

Forearm 43 millim.

Type B.M. No. 90.6.8.15, ♂. Mosambiro. Collected by Dr. Emin.

It is impossible to give a detailed satisfactory description of bats from dried skins.

Skull broader than that of *N. limbatus*, but not so broad as that of *N. major*, and distinguished from both by its prominent preorbital processes. The premaxillæ are joined, but are less perfectly ossified than in the allied species. The upper incisors are close together and parallel; the upper premolar is not in any way crowded, directly in the tooth-row. Lower incisors not markedly bifurcate.

#### *Nyctinomus angolensis*, Pet.

Colour above russet-brown, frosted with pale buff; underside paler, shading to pale buff on the middle line of belly. Ears united by a broad straight band, which folds backwards, forming a distinct naked cushion on the forehead, with thick dark hair behind. Tragus very small. Wing-membranes palish; more or less yellow on the antibrachial membrane, the elbow, and towards the body. Wing-membranes from middle of tibia; interfemoral membrane hugging leg to opposite the same place.

Forearm 48-52 millim.

Premaxillæ completely joined, very small palatal foramina. Skull with very high crest rising from frontal constriction. Teeth rather powerful. Upper incisors very close together. Upper premolar minute, only just showing through gum on the outer side of row. Lower incisors 4, small, barely protruding in front of canines, which are close together though not touching.

Quanza R., Lagos, Benin, Bagamoio, and Tamatave.

#### *Nyctinomus midas*, Sund.

Colour reddish brown. Underside probably lighter, belly whitish grey? Wing-membranes &c. brown. Ears? probably with bases of inner margins in close proximity. Tragus?

Forearm? ♂ juv.

Co-type in B.M. in bad condition, with imperfect bones in the forearms.

Skull exceedingly powerful but very narrow. Preorbital processes not expanded. Very high keel-like sagittal crest

raised above the forehead from between the eyes. Teeth extraordinarily heavy, really enormous! Premaxillæ entire; mesial suture not complete in this young specimen, but completely ossified, enclosing two palatal foramina. First upper premolar very small, triangular, with sharp cusp inclined inwards, rather crushed between canines and second premolar. Upper incisors parallel. Lower incisors 4. Lower canines close together at their bases.

Senaar.

It seems unaccountable how Dobson could have referred this actual specimen to the Southern European form, but such is the fact.

The following species I have not seen:—

*Dysopes ventralis*, Heuglin = *Nyctinomus Cestonii*, Dobs. (partim).

(This is probably *N. midas*, Sundev.)

*Dysopes bivittatus*, Heugl. = *N. bivittatus*, Dobs. Cat. B. M. p. 426.

(From Heuglin's description this form would appear to be very nearly allied to *N. angolensis*, as are also *D. hepaticus*, Heugl., and *D. talpinus*, Heugl.)

*Nyctinomus Bemmeleni*, Jentink, Notes Leyd. Mus. i. 1879, p. 121.

*Nyctinomus Anchietae* and *brunneus*, Seabra, Journ. Sci. Math. 2 ser. t. vi. no. xxii.

(May possibly be the same as the S. African bat referred above to *N. ægyptiacus*.)

*Nyctinomus Bocagei*, Seabra, loc. cit.

VI.—On an undescribed Species of Hedgehog from Southern Arabia. By Dr. JOHN ANDERSON, F.R.S., and W. E. DE WINTON.

*Erinaceus dorsalis*, sp. n.

Hair soft and silky. Spines with from twenty-five to twenty-eight longitudinal ridges with well-marked nodosities.

Bare area on the centre of the head well developed, beginning slightly anterior to the front border of the ears and prolonged backwards to the nape, tapered gradually from its base to its apex. The spines do not extend in advance of the anterior border of the ears.

Head rather short and broad. Ears very large and rounded, their height from lower border of external meatus to tip equalling in adults the length from the external meatus to the snout.

In some individuals not quite adult the ears are somewhat shorter. Limbs strong and moderately long; fore feet broad, hind feet narrower, claws strong. The palmar surface of the fore feet with a single broad pad, occasionally divided in two or nearly so, and when so divided the outer division is the larger. Two much smaller, nearly equal-sized plantar pads on the hind feet placed side by side, and in some specimens more or less obliquely, with granular eminences between them and the digital pads.

The spines in a broad area along the back have their tips nearly black, and in some individuals the tips of these spines are wholly black, whereas, in all, the spines on the sides have broad white tips; so that this hedgehog is distinguished by a broad black dorsal stripe with white sides.

The whole of the face to beyond the eyes, the front of the forehead, and a stripe behind the angle of the mouth to below the ears, the chin, the back of the ears, a broad area of the internal borders, more especially the lower half of the inner border, black or blackish brown. Sides of the body below the spines, the limbs, tail, and around the genitalia likewise blackish brown. The throat, chest, and upper part of belly mixed white and brown in blotches. The insides of the ears, the sides of the neck below the ears, and the area between the ears and the eyes white.

The above description is taken from an adult male in alcohol from the Hadramaut, collected by the Bent Expedition, which is taken as the type of the species, and from which the skull has not yet been extracted.

In some individuals black prevails over all the parts, only a few greyish hairs being present on the forehead and front of the ears, below the ears and on the throat, but the white centre of the ears is present in all. In others, only the face, the fore limb from the elbow downwards, the hind limb, genitalia and the area around them, and the tail are black, the other parts being pure white, while in some brown hairs appear here and there on the white of the underparts.

Out of the ten specimens, only three may be said to be black throughout, but even in them a little white may be detected in places; two are males, but the sex of the other is unknown. In all the others a great deal of white is present on the neck, chest, and upper abdomen.

From the foregoing it will be seen that while the majority of specimens of this hedgehog are little darker in the fur than their near ally *E. aethiopicus*, some individuals in the almost uniform blackness of the furred parts resemble the widely distinct species from the neighbouring country, *E. macrocanthus*. The dark dorsal area on the spines with light sides will, however, always serve as a distinguishing mark of this new species without consulting the skull.

The skull of *E. dorsalis* in its general form resembles that of *E. aethiopicus*, having, like that species, the enormously inflated bullæ and pterygoids, but differs from it in having a much broader snout, this part of the skull of *E. aethiopicus* being finely pointed; first upper premolar with two roots, second very small, lying on the outside of the tooth-row and often absent altogether.

In a Tunisian hedgehog (*E. deserti*, Loche) the snout is not quite so narrowly pointed as in Eastern Soudan individuals; but this observation rests on a single specimen which in its other characters is inseparable from the hedgehogs of the Egyptian Soudan, which externally are the same as the Tunisian animals referable to *E. aethiopicus*.

In one skull (no. 201, ♂) the frontal sends forward a well-defined process which articulates with the premaxilla, the posterior extremity of which is pointed. In another skull (125, ♂) a similar process from the frontal exists but of a more slender character. On the *right side* it touches the premaxilla, but not on the *left*. In another (199, ♀) the posterior extremities of the premaxillæ are rather truncated and separated from the frontal by a considerable interval.

The postpalatine foramina of this species are remarkably long and wide as compared with the considerably smaller imperfections of ossification found in *E. aethiopicus*, in which each opening is sometimes, and apparently not infrequently, resolved into two openings by the presence of a transverse ridge of bone.

Measurements taken from specimens in alcohol :—

	♂ (type). mm.	♀. mm.
Snout to vent .....	172	158
Vent to tip of tail .....	26	26
Snout to eye (internal canthus).....	25	24.5
Auditory meatus to snout .....	47	46
Height of ear .....	45	45
Breadth of ear, greatest .....	31	29
Elbow to tip of middle digit .....	69	67
Length of hind foot .....	33	29.5
Pollex (including claw), under surface of web .....	4.5	4
Hallux .....	2.5	2.3

*Note.*—The above joint notice was written previous to the lamented death of Dr. Anderson, with whom I was associated in his work on the Mammals of Egypt, and is now published almost as it was left.—W. E. DE W.

#### VII.—On a new Species of Bat from the Soudan.

By W. E. DE WINTON.

AMONG the mammals collected in the Soudan by Mr. H. F. Witherby in the spring of this year and acquired by the late Dr. John Anderson is a small bat which appears to be new to science. The specimen, preserved as a skin, was obtained at Wad Mariun about 12 miles from Khartoum on the White Nile on May 12th, and will be taken as the type of the species. A second specimen, which has just been put into my hands by the kindness of Mr. O. Thomas of the British Museum, is preserved in alcohol; it was collected by Capt. S. S. Flower, Director of the Zoological Gardens at Cairo, on March 14th, at Abu Zeit on the White Nile some 200 miles south of Khartoum, during his recent trip with the party sent to inspect the Sud-cutting operations.

Although the front of the head is much damaged by shot, this "spirit specimen" is valuable in enabling a fuller description of the animal to be given than would have been possible if the dried skin alone had been available.

I have great pleasure in associating the name of so keen a worker in zoology, who also collected the first specimen, with this fine new species.

Dobson made a subgenus for the African bats allied to the Australian genus *Chalinobus*, but I think it will be much more convenient to look upon these two geographically separated groups as distinct genera; the species from the two

regions being so distinct from one another in general appearance, and have, besides the characters given by Dobson, the very important difference in the incisor teeth.

The first upper incisor in *Glauconycteris* is bifid, having an outer or rear cusp.

*Glauconycteris Floweri*, sp. n.

Colour above pale fawn, the bases of the fur greyish; the lower side cream-colour, yellower on the throat, paler on the belly. The fur on the forehead ends in a point barely in advance of the eyes, and the furred area is limited in extent in all directions, barely encroaching on to the upper arms, and leaving the tail and legs entirely bare. The skin of the face and ears is nearly black and naked, with the exception of a few short hairs more conspicuous round the lips. The wing-membrane is pale and transparent, with the veins and lines showing slightly darker; the posterior portion in front of the tibiæ and the distal portion of the interfemoral membrane is yellowish white. The upperside of the forearms, legs, and tail, and all the proximal portion of the wings and interfemoral membrane, are thickly studded with dark warty papillæ.

The measurements of the type taken by the collector from the animal in the flesh, an adult male, are:—Head and body 47 millim., tail 34, hind foot 5·5, ear 12, forearm 35.

The specimen in spirit gives the following measurements:—Head and body 42, tail 34, hind foot 5·8, ear 12, forearm 36·5.

In size and general colour this bat somewhat resembles *Scotophilus Schlieffeni*: the body-colour is, however, paler above and brighter on the lower parts, and the furred area is less extensive; but the paler wing-membrane, the dark face, and the extraordinary shagreening on the forearms, tail, and surrounding membranes distinguish this new species at a glance.

The skull is readily distinguished from that of *Scotophilus* by its rounded form and short facial portion; the lower jaw is likewise more rounded or blunter.

VIII.—*Contributions from the New Mexico Biological Station.*

—IX. *On certain Genera of Bees.* By T. D. A. and WILMATTE P. COCKERELL.

(1) *ANTHOPHORINÆ.*

In Trans. Amer. Ent. Soc. xxvi. 1899, pp. 58–64, Mr. W. H. Ashmead has given tables for the separation of the genera of



this group; but we find these unsatisfactory on account of the stress laid upon minor differences of venation, while certain radical differences in the mouth-parts of the genera are overlooked. This defect was perhaps unavoidable in a synopsis of the genera of the whole world, many of which could not at the time be examined for mouth-characters; but it may be useful here to indicate the lines on which a better classification may be framed.

### Tribes.

- Paraglossæ very long, hairy . . . . . *Eucerini* (*Euceræ*, Patton, Bull. U.S. Geol. Surv. v. 471).
- Paraglossæ not or hardly exceeding first joint of labial palpi . . . . . *Anthophorini* (*Anthophoræ*, Patton, tom. cit. 475).
- Paraglossæ very short; form robust, hind legs of ♀ with a copious scopa: neotropical types . . . . . *Centrini*.

### CENTRINI.

- Maxillary palpi 4-jointed . . . . . *Centris*, Fabr.
- Maxillary palpi 6-jointed; paraglossæ very short, broad, thin, scale-like . . . . . 1.
1. First three joints of maxillary palpi twice as thick as, or at least noticeably thicker than, the last three; joint 4 about as long as 3 . . . *Exomalopsis*, Spin.
- All joints of maxillary palpi of about equal thickness and slender; joint 4 longer than 3; 1 not over half length of 4; clypeus yellow in male . . . . . *Anthophorula*, Ckll. (*Diadasiella*, Ashm.).

We find also certain differences between species of these genera, which may be found to indicate subgenera.

### CENTRIS.

- Last joint of maxillary palpi short, not half length of penultimate joint; penultimate (third) joint less than half length of second: flight slow . . . . . *C. pallida*, Fox.
- Last joint of maxillary palpi longer, over half length of penultimate joint; penultimate two thirds length of second: flight very rapid . . . . . *C. rhodopus*, Ckll.; *C. Hoffmannseggiae*, Ckll.

The measurements of the last three joints of the maxillary palpi here given are in  $\mu$ :—

<i>C. pallida</i>	. . .	(2) 430, (3) 189, (4) 84.
<i>C. rhodopus</i>	. . .	(2) 300, (3) 235, (4) 138.

The *C. pallida* studied is a cotype kindly sent by Mr. Fox.

## EXOMALOPSIS.

- Third joint of labial palpus conspicuously stouter than 4 ..... *E. Solani*, Ckll.  
 Third and fourth joints of labial palpus long and slender, of equal thickness..... *E. penelope*, Ckll.

## ANTHOPHORINI.

- Maxillary palpi 4-jointed, labial palpi 2-jointed.. *Saropoda*, Latr.  
 Maxillary palpi 5-jointed ..... 1.  
 Maxillary palpi 6-jointed ..... 2.  
 1. Blade of maxilla greatly elongated, whip-like; tongue extremely long ..... *Entechnia*, Patton.  
 Not so ..... *Anthophoroides*, g. n.  
 2. Third joint of labial palpi attached to tip of second; first two joints with long hair... *Meliturga*, Latr.  
 Third joint of labial palpi attached to side of second ..... 3.  
 3. Blade of maxilla broad at base, suddenly narrowing to the slender apical portion .. *Diadasia*, Patton.  
 Blade of maxilla broad, gradually narrowing to the more or less blunt tip ..... 4.  
 4. Second joint of maxillary palpi very much longer than first ..... *Anthophora*, Latr.  
 Second joint of maxillary palpi not much longer than first ..... *Emphoropsis*, Ashm.

The last three genera are separated also by good characters of the venation, for which see the tables of Ashmead and Cresson. Ashmead cites no type for his new genus *Emphoropsis*, but in a letter he informs me that it is *Habropoda floridana*, Smith. The known species of *Emphoropsis* are *E. floridanus* (*Habropoda floridana*, Sm.), *E. miserabilis* (*H. miserabilis*, Cress.), *E. Morrisoni* (*H. Morrisoni*, Cress.), and *E. salviarum* (*H. salviarum*, Ckll.).

*Emphoropsis* differs from *Habropoda* by the relatively long first joint of maxillary palpi and the second not so long as 4 to 6 united; there are also other important differences, duly indicated by Ashmead.

## ANTHOPHOROIDES, gen. nov.

Type *A. vallorum* (*Podulirius vallorum*, Ckll.). Maxillary palpi 5-jointed, the second joint long, the last very small. The superficially similar *Anthophora Lesquerellæ*, Ckll., is a true *Anthophora*.

## AMEGILLA, Friese.

*Anthophora cleomis*, Ckll., and *A. cardui*, Ckll., belong to

this group, which Ashmead treats as a genus. The mouth-parts agree with *Anthophora*, and we think *Amegilla* at best of subgeneric rank.

### MELITURGOPSIS, Ashm.

Ashmead cites no type, but has kindly sent us the type species, an undescribed form from San Francisco Co., Calif., collected in October. It is superficially just like *Anthophora Portere*, Ckll., but differs in venation and other particulars, and is certainly not congeneric. In Cresson's tables it runs to *Habropoda*, but Cresson's "*Habropoda*" is *Emphoropsis*. The second submarginal cell along the cubitus is shorter than the first or third, whereas in *E. salviarum* and *floridanus* it is about equal to the third. The male *Meliturgopsis* has the scape all black, clypeus white except sides and anterior edge, lateral face-marks V-shaped; hair of thorax greyish white mixed with black; abdomen without bands, first segment densely covered with greyish-white hair.

*Meliturgopsis* seems practically identical with *Emphoropsis*, the latter having priority of place.

### EUCERINI.

Maxillary palpi 4-jointed .....	1.
Maxillary palpi 5-jointed .....	2.
1. Scopa of ♀ with plumose hairs ....	<i>Melissodes</i> , Latr.
Scopa of ♀ with simple hairs ....	<i>Anthedon</i> , Rob.
2. Two submarginal cells.....	<i>Eucera</i> , Scop.
Three submarginal cells .....	<i>Xenoglossa</i> , Smith; <i>Xenoglossodes</i> , Ashm.; <i>Florilegus</i> , Rob.; &c.

MACROGLOSSAPIS, Ckll. = *Macroglossa*, Rads. (not Ochs.).

This genus is omitted by Ashmead. It differs from other genera of Anthophorinæ by its 3-jointed maxillary palpi; the tongue is as long as the body; antennæ filiform, as long as the thorax.

### (2) ANTHIDIINÆ.

Second joint of labial palpi about or nearly twice as long as first .....	1.
Second joint of labial palpi not, or not much, longer than first.....	2.
1. Maxillary palpi 3-jointed.....	<i>Paranthidium</i> , nov.
Maxillary palpi 2-jointed.....	<i>Dianthidium</i> , Ckll.
2. Maxillary palpi 3-jointed.....	<i>Protanthidium</i> , nov.
Maxillary palpi 2-jointed.....	<i>Anthidium</i> , Fabr.

### PROTANTHIDIUM, gen. nov.

Type *P. steloides* (*Megachile steloides*, Bingham), of which  
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we have a male from the Khasia Hills, India, sent by Mr. Sladen. The face is yellow below the antennæ; scutellum prominent and bilobate; abdomen marked on apical segments with yellow. This has the mouth-parts nearly as in *Megachile*, but the ornaments of an *Anthidium*. It appears to be the most primitive of the Anthidiinæ.

#### ANTHIDIUM, Fabr.

Here falls *A. manicatum* and such American species as *A. Portere* and *A. maculosum*.

#### DIANTHIDIUM, Ckll.

This was described as a subgenus, but it should probably be regarded as a genus. Its type is *D. curvatum* (*Anthidium curvatum*, Smith), and *D. parvum* (*Anthidium parvum*, Cress.) is quite congeneric.

The little group of *D. gilense* (Ckll.), *D. Ehrhorni* (Ckll.), *D. notatum* (Latr.), *D. perplexum* (Smith), and *D. strigatum* (Panz) \*, all described under *Anthidium*, is possibly of subgeneric value, and in respect to its labial palpi falls more or less between *Anthidium* and *Dianthidium*. *D. gilense*, in particular, falls with *Anthidium* if its mouth alone is regarded, and so far presents an argument against the generic status of *Dianthidium*.

The following measurements of the first two joints of the labial palpi are in  $\mu$  :—

<i>D. strigatum</i> . . .	(1) 650, (2) 870.
<i>D. gilense</i> . . .	(1) 720, (2) 760.
<i>D. parvum</i> . . .	(1) 720, (2) 1220.
<i>D. perpictum</i> . . .	(1) 650, (2) 1200.
<i>A. manicatum</i> . . .	(1) 1300, (2) 1320.
<i>A. Portere</i> . . .	(1) 1200, (2) 1000.

The nesting-habits of *Dianthidium* and *Anthidium* seem not to be the same; compare *D. consimile* (Ent. News, 1896, p. 25) with *Anthidium manicatum* and *A. paroselæ*.

#### PARANTHIDIUM, subgen. nov.

Type *Dianthidium perpictum* (*Anthidium perpictum*, Ckll.). This has the primitive character of 3-jointed maxillary palpi, but the venation of *Dianthidium*.

East Las Vegas, New Mexico, U.S.A.,  
October 29, 1900.

\* We have this species from Marseilles, France, sent by M. Ernest André. It seems that, according to the law of priority, it ought to be called *D. minus* (*Apis maculata*, var. *minor*, Rossi, 1790).

IX.—A Revision of the Genera of the ARANEÆ or Spiders with reference to their Type Species. By F. O. PICKARD  
CAMBRIDGE, B.A.

IT might have been supposed that with Thorell's work on the genera of European Spiders, in which the types have been selected, written in 1869-70, and with Simon's splendid volumes on the genera of the world, with the types also selected, appearing at intervals from 1892 onwards, that any revision would be unnecessary, and would simply mean doing over again work already admirably accomplished.

In the first place, it must be pointed out, however, that neither of these two authors was apparently aware that the types of twenty-nine genera had been definitely selected by Latreille in 1810. They are selected at the end of his work 'Consid. gén. Nat. Ord. Crust., Arachn. et Insectes,' in the "Table des genres avec l'indication de l'espèce qui leur sert de type." It is true that the types are selected under the French form of the generic name, but since both the Latin and French forms are given in the earlier systematic part of the same work, there cannot be the slightest doubt as to what is the signification of the names and what particular group the selected type represents.

Thorell, too, allowed himself sometimes to be influenced by what authors themselves would have wished with regard to their published names and species, forgetting that when a name has once been published it becomes public property and the author has no further rights over it. He, for instance, in the case of *Micromata*, Latreille, says that a certain species, *accentuata*, "got in by mistake" and must therefore be ignored. On those principles there is nothing to prevent any author making the same assertion of any species or any number of them originally referred to any genus. Thorell, moreover, has in some cases been content with deciding that such and such genera are synonyms of others, and has therefore refrained from selecting the *types*. Since, however, genera dropped in haste are apt to be later on restored at leisure, it is very important to know what are the type species which represent them, whether they are eventually to stand or not.

He does not, however, come to any conclusion without giving his reasons very fully, and thus it becomes much easier to revise his work and bring it up to date.

The same remarks apply also to some extent to Simon's work. He, too, set out apparently with some definite principles,

but his courage seems occasionally to have failed him, for he has not always applied those principles consistently throughout. Curiously enough, too, he ignores his own selections of types made in many cases in 'Les Arachnides de France.'

On page 799 of his *Hist. Nat. Ar. ii.* 1895, he admits that Latreille limited the genus *Araneus* (*Aranea*) to three species, and also his right to do so by quoting Article 35 of the International Congress of Zoology in 1889 (Paris) and 1892 (Moscow) to that effect; but he promptly selects as the type of *Araneus* a species which was not included in this limitation, namely *angulatus*, Clerck. So, too, in the case of the genus *Lycosa*, he takes as the type a species, *tarentula*, Rossi, which was not originally included in the genus under this or any other name.

Simon, moreover, very rarely gives reasons for his selections of types; so that one is forced either to accept his decisions as it were *ex cathedra* or to ignore them altogether. But the days of the authority whose *ipse dixit* is final and above question or criticism have passed away; and since the work cannot be altogether ignored, the whole of the ground must be reinvestigated to prove whether his selections are sound or otherwise.

These criticisms are offered in no way with a view of underrating the splendid efforts of both Thorell and Simon to introduce something like order into the chaos of nomenclature, but simply as a justification for this work of revision.

It must be made quite clear that, as with a group of species, so with the name attached to that group and published, no one, not even the original author himself, has a right to make any alteration in it. It cannot matter, for scientific purposes, whether a name be spelt, for instance, *Micromata* or *Micrommata*, any more than it matters to students in the future whether the spider usually known as *Anyphana accentuata* be known as *Micromata accentuata*, as it must be, since it happens to be the type of the genus *Micromata*.

If an arbitrary method be followed, and every method must be arbitrary at some point, at least let it be applied consistently. Any other attempts, involving philosophical considerations as to what this or that author would have preferred, simply open up further possibilities of confusion, no two men agreeing as to how far this sympathy should be extended, leading on to endless disputation over minor details. Whereas if it be agreed to show no sympathy at

all, then the disputation is at least confined to the interpretation of the strict letter of the law of priority.

The *original spelling*, therefore, of each name is given in every case in this revision; for although it is true that *Micromata* may offend the classical eye, just as the associations also gathered round certain names are swept away and feelings wounded by any alteration in the nomenclature, still something must be sacrificed for the sake of uniformity, and it is better to sacrifice feelings, which are transient, than to tamper with printed facts, which will, at any rate, outlive authors, sentiments, and associations.

The object held in view, then, is to ascertain what is the type species of every group which has ever received a name, and briefly to give the reasons why such a species must be regarded as the type.

No attempt is here made to determine whether this or that generic group ought to be maintained or not, but simply to settle what, if a genus is maintained, must be the type species representing that genus, exclusive of any other species.

This attitude naturally involves the following of some definite system, which shall be consistently applied throughout and no deviation from it admitted on any consideration whatever.

#### *The Principles of Elimination.*

The system followed in the determination of types where no type has been definitely selected is known as that of "*Elimination*," by which the last species left in, of those originally included in the genus when first published, becomes the type, supposing the group to be broken up into other genera by the author himself or by subsequent authors.

If, however, the author himself or another author has definitely selected a *type* for the genus, either from all those originally included or from the two or more species left in, the species thus selected is regarded as the type, whether it be the oldest species or not. On no account can a species not originally included in the group become the type of the genus, even though added subsequently by the author himself or definitely selected by that author as the type.

Species are often eliminated by "*implication*" in other genera. For instance, supposing three species were originally referred to a certain generic name and an author subsequently founds a genus upon another species not originally included but afterwards found to be *congeneric* with one of the original: this original species is then regarded as removed from

the original generic group to that to which it belongs by implication.

On no account must all the species be removed from the title originally given to them; one at least must be left in, which in that case becomes the type.

Where a generic name has been preoccupied, the loss of the name does not lessen the value of the group selected, so that a type may be selected for that group and another name given to it.

These are the main features of the process, and I here give an instance to show more clearly how it works out in practice.

For instance, the name *Bombastes* is given to a group of three species A, B, and C, which are the only ones originally included under that name by the author of it. The question is, which species must we regard as the type?

There are two processes by which the type can be determined, either (i) by *definite selection* or (ii) by *elimination*.

And both processes may be utilized in a selection. Under the first process (a) the author himself may select A, B, or C as the type; or (b) another author may select A, B, or C as the type; and the species so selected must be regarded as the type and no other. No author, of course, not even the originator of the genus himself, can definitely select as the type a species already removed either definitely or by implication under another generic name. If he has done so, his selection becomes null and void, because he had no power or right to make such a selection.

Under the second process, where no type has been definitely selected, one or two, but not *all*, of these species may be removed and placed under another generic name by any other author, thus "breaking up" the original genus and "limiting" the generic name to one, or two, species; the last species left in being the type.

If B and C are removed, A is left in and must be regarded as the type; if A and C are removed, B remains as the type; if A and B are removed, C is left as the type. If A be removed alone, then B or C can become the type either by definite selection or by a further removal of one of them. If B or C be removed, then the same remark applies to A, C or A, B respectively. The species left in are sometimes termed the "*residual species*."

It will be evident that the settlement is comparatively easy when any definite selection of the type has been made soon after the founding of the genus; but the matter becomes much more complicated when the genus, perhaps involving



twenty or thirty species originally, has been split up and subdivided again and again by consecutive authors. A further element of difficulty of course appears when the authors breaking up an original genus have not correctly identified the species withdrawn.

### Literature.

In preparing this revision of the genera of the Araneæ all the pre-Latreillean literature, from Clerck in 1757 and onwards, has been carefully examined, in case any genera may have been established which might have escaped the researches of Dr. T. Thorell and others.

C. Clerck was the first to apply the Linnean binomial system systematically in Arachnology; and although his work 'Aranei Suecici' was published the year before Linnæus's 10th edition of the 'Systema,' it is generally regarded as valid, since he was well acquainted with Linnæus, attended his lectures, and adopted his system. This author, however, made use of only one generic name, *Araneus*, and all his species are included under this title.

Neither Linnæus, Fabricius, Geoffroy, De Geer, nor Meyer made any alteration in this respect; and it was not until 1802 that Latreille, in his Hist. Nat. des Fourmis, p. 345, quoted two genera, *Mygale* and *Aranea*. The original genus *Araneus*, however, was not broken up by Latreille until 1804, in Nouv. Dict. d'Hist. Nat. xxiv.; and it is with this work that the whole question of generic names and the selection of types must naturally begin.

Walckenaer published his 'Faune Parisienne, Insectes,' tom. ii., Paris, in 1802, but includes all his species under *Aranea*.

This first instalment of revisional notes includes, with the exception of *Araneus*, only the generic names published from 1802-1804. In 1810 Latreille definitely selected types for a great many of his own genera and for some of Walckenaer's; and it will be useful to give a brief notice of the works published by both Latreille and Walckenaer between those dates, which might have any possible weight in the settlement of the question of names and types.

1802. P. A. LATREILLE.—Hist. Nat. des Fourmis: p. 345, G. i. *Mygale*, including *A. avicularia*, *cæmentaria*, and *Sauvagesii*; p. 347, G. ii. *Aranea*, followed by a number of species, but without in any way limiting the genus as he afterwards does in 1804.

1802. C. A. WALCKENAER. — Faune Parisienne, Insectes, tom. ii. (Paris).

The generic name *Aranea* is accepted throughout for all species not referred to *Mygale*, but names (*Tubiformes* &c.) are given to various groups.

1804. P. A. LATREILLE.—Hist. des Insectes, vol. vii.; An. Rev. xii.

The author characterizes the genus *Mygale* and the various families of spiders, which are all referred to under the generic name *Aranea*.

1804. P. A. LATREILLE.—Nouv. Dict. d'Hist. Nat. xxiv.

In this work the genus *Araneus* is first limited to three species, and other genera are founded upon the residue, many of the generic groups coinciding with Walckenaer's divisions in the Faun. Par.

1805. C. A. WALCKENAER.—Tableau des Aranéides.

The author here limits some of Latreille's genera and finds others of his own. The genera are characterized, but there is no definite selection of any type, except indirectly where only a single species is quoted.

1806. C. A. WALCKENAER.—Hist. Nat. des Aranéides.

Contains a description of various species with coloured illustrations, but the genera are not designedly limited nor are any types selected. The generic names are those used in the 'Tableau.'

1806. P. A. LATREILLE.—Genera Crust. et Insectorum, iconibus exemplisque plurimis explicata.

*Gnaphosa* is made a synonym of *Drassus* (p. 86), but the author does not select any types and the species are merely given as examples without intention of definitely limiting the genera.

1810. P. A. LATREILLE.—Considérations générales sur Nat. Ordre Crust., Arach. et Insectes, p. 423: "Table des genres avec l'indication de l'espèce qui leur sert de type."

In this work Latreille selects types for twenty-nine genera. In his work on European spiders Thorell must have overlooked this selection of types. The genera are characterized under Latinized names, and at the end of the work the types selected under the same names in a French form.

MYGALE, Latreille, 1802, Hist. Nat. des Fourmis, p. 345 (nom. præocc. Cuvier, 1799).

Three species were originally included in this genus—(1) *A. avicularia*, (2) *cæmentaria*, (3) *Sauvagesii*.

The first was selected as the type of the genus in 1810 by Latreille.

The name *Mygale* had, however, been preoccupied by Cuvier in the table opposite page 496 of his 'Anatomie Comparée,' in the same form *Mygale*, not *Myogale*.

Thorell evidently overlooked the limitation of this genus by Latreille in 1802, for on page 163 of his Europ. Spid. he ascribes the genus to Walckenaer, Faun. Par. 1802.

Type, *Mygale avicularia* (Linn.), 1758.

ATYPUS, Latreille, 1804, Nouv. Dict. Hist. Nat. xxiv. p. 133.

Only one species is included originally, *A. subterranea*, Roemer, Gen. Ins. tab. xxx. fig. 2, which Latreille identified by mistake as belonging to this genus.

Type, *Atypus Sultzeri*, Latreille, 1804.

ERIODON, Latreille, 1804, Nouv. Dict. xxiv. p. 134.

The only species mentioned originally has no name assigned to it:—"Araignée inédite de la Nouvelle-Holl."

In 1806 Latreille, Gen. Crust. Ins. p. 85, quotes *Missulena*, Wlk., as a synonym of *Eriodon*, and gives a single species—"Species i. *occatorius*." In 1810 he definitely selects *Misulena occatoria*, Walck., as the type of the genus.

Type, *Eriodon occatorium* (Walckenaer), 1805.

DYSDERA, Latreille, 1804, Nouv. Dict. p. 134, col. 1, line 11.

Three species are quoted originally under this genus, referred to by Latreille as "Les Claustraliformes" of Walckenaer, who further quotes the species *Aranea punctoria*, Villers.

The three species are:—1. *A. erythryna*, Walck.; 2. *A. Hombergii*, Scop. Ent. Carn. p. 403; 3. *A. punctoria*, Villers.

On page 47 of the 'Tableau' Walckenaer limits *Dysdera* to one species, *D. erythryna*, Walck., which was also definitely selected by Latreille as the type in 1810.

Further, also, *A. punctoria*, Villers, Caroli Linnei Entomologia, t. iv. p. 128, pl. xi. fig. 9, is a *Chiracanthium*, as Simon states in his Ar. Fr. tom. iv. p. 247, and was removed to that genus by implication in 1837 by C. L. Koch. *A. Hombergii*, Scop., was referred to the genus *Harpactes* by Templeton in 1834.

Type, *Dysdera erythryna* (Walck.), 1802.

SEGESTRIA, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 1, line 16.

The spiders which Latreille refers to this genus are those mentioned by Walckenaer, Faun. Par. 1802, p. 222, under "Les Tubiformes."

(1) *Aranea senoculata*, Fabr., (2) *A. perfida*, Walck. (*florentina*, Rossi, Fauna Etrusca, pl. xix. fig. 3).

The same two species are mentioned under *Segestria* by Walck. Tableau, 1805, p. 48, and *A. florentina*, Rossi, was

selected by Latreille in 1810 as the type of the genus (Consid. gén. Nat. Ord. p. 423).

The name *florentina* has priority over *perfidia*.

Type, *Segestria florentina* (Rossi), 1790.

ARGYRONETA, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 1, line 22.

A single species only is quoted under this name, included in Walckenaer's "Nayades," Faun. Par. p. 233.

Type, *Argyroneta aquatica* (Clerck), 1757.

GNAPHOSA, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 1, line 31.

Four species were originally included, being those comprised in Walckenaer's "Celluliformes," Faun. Par. p. 220, 1802:—(1) *A. nocturna*, Linn.; (2) *A. lucifuga*, Walck., Sch. Icon. pl. 101. fig. 7; (3) *A. lapidosa*, Walck.; (4) *A. fulgens*.

The genus was first split up by Walckenaer himself in 1805, who withdrew *A. nocturna*, Linn., *A. lucifuga*, Walck., and *A. fulgens*, Walck., under *Drassus*, Tableau, p. 45, leaving *A. lapidosa*, Walck. This being the last left in becomes the type. It is not possible under these circumstances to regard *Drassus*, Walck., as a synonym of *Gnaphosa*, Latr., as Simon does (Hist. Nat. Ar. 2, i. p. 383, 1893), nor can the type of the latter be *lucifuga*, as there selected.

Type, *Gnaphosa lapidosa* (Walck.), 1802.

CLUBIONA, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 1, line 39.

Seven species were originally included, being those referred by Walckenaer to the "Cameriformes," Faun. Par. p. 217 (1802):—(1) *Aranea atrox*, De Geer; (2) *A. amarantia*; (3) *A. aloma*, Albin, pl. x. fig. 48; (4) *A. erratica*, Albin, pl. xvii. fig. 82, p. 26; (5) *A. epimelas*; (6) *A. holosericea*, De Geer, vii. p. 266, pl. xv. fig. 13; (7) *A. nutrix*.

Walckenaer does not remove any of these species in the 'Tableau,' and the genus was first broken up by C. L. Koch in 1837, who withdrew *A. atrox*, De Geer, as the type of *Amaurobius*, and, in 1839, *A. nutrix*, Walck. = *punctorium*, Villers; and *erratica*, Walck., under *Chiracanthium*, the last by implication.

In 1810 Latreille selected *A. holosericea*, Linn., as the type, a species which he obviously concluded to be identical

with the *holosericea*, De Geer, quoted by Walckenaer, for De Geer gives *holosericea*, Linn., as a synonym of the species figured by himself.

So that Latreille's action is in reality a selection of species (6) as the type, with a correctional reference to the earliest author of the name *holosericea*.

Both Thorell and Simon, however, have come to the conclusion that the species figured by De Geer is not *holosericea*, Linn., but that De Geer's species = *phragmitis*, C. Koch, and Linnæus's = *pallidula*, Clerck.

This conclusion, however, cannot affect Latreille's selection; it merely settles that *phragmitis*, C. Koch, is the type, and not *pallidula*, Clerck, as selected by Simon (Hist. Nat. Ar. ii. 2, p. 85, 1897).

Type, *Clubiona holosericea*, De Geer = *phragmitis*, C. L. Koch.

TEGENARIA, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 1, line 49.

Five species were originally included, namely "Les Tapi-formes," Walck. Faun. Par. p. 215:—

(1) *Aranea domestica*, Fabr. p. 412. 21; Clerck, p. 76, pl. ii. fig. 9; (2) *A. civilis*; (3) *A. agrestis*, Albin; (4) *A. murina*; (5) *A. labyrinthica*, Fabr. p. 417. 34; Sch. Icon. pl. xix. fig. 8; Albin, pl. xvii. fig. 83.

*A. labyrinthica* was taken out under *Agelena*, Walck. Tableau, p. 51 (1805). *Araneus domesticus*, Clerck, was selected by C. Koch in 1837 in the 'Uebersicht,' p. 13, as the type of his new genus *Philoica*.

Latreille did not in 1810 select any species as the type of *Tegenaria*, but he selected *Aranea domestica*, Fabr. = *domestica*, Clerck, as the type of *Aranea*, in 1810, without effect, however, for he had previously limited the genus *Aranea* to one species—*Araneus diadematus*, Clerck.

In 1837, however, a little further down p. 13 of the 'Uebersicht,' C. Koch selected *A. domesticus*, Linn., as the type of *Tegenaria*.

These are definite selections; and if *A. domesticus*, Linn. = *A. domesticus*, Clerck, then *Philoica* is simply synonymous with *Tegenaria*, and can have no separate species as the type.

But under *domesticus*, Clerck, two species are undoubtedly involved—(1) = *ferruginea*, Panzer, (2) = *Derhami*, Scop. The first is obviously represented in the full figure in Clerck's work on pl. ii. fig. 9. The second is represented by the *palpus of the male* figured on the same plate.

Now Thorell (Recen. Crit. Aran. Suec. Clerck, p. 36) retained the name *domesticus* for the full figure in Clerck's work, and his selection, in spite of what might be considered more convenient (*cf.* Simon, Ar. Fr. ii. p. 67, note), must hold good.

Therefore *domesticus*, Clerck, with the signification attached to it by Thorell, is the type of *Philoica*, C. K., 1837, and = *ferruginea*, Panzer.

*A. domesticus*, Linn., however, was also selected, a little further down on the same page, as the type of *Tegenaria* by C. Koch himself. Now *domesticus*, Linn., according to Simon (Ar. Fr. ii. p. 73), and also according to Thorell, is the species whose palpus is depicted on pl. ii. fig. 9 in Clerck's work, and is identical with *Derhami*, Scop. 1763, and with *civilis*, Walck. 1802.

Therefore number (2) of the species originally referred to *Tegenaria* is the type of the genus, and its earliest appellation is *Derhami*, Scop. It is true that later on C. Koch himself reversed the signification of the two generic names and referred *domesticus*, Clerck, to *Tegenaria*, and *civilis*, Walck., to *Philoica*. But this, of course, he had no power to do.

Type, *Tegenaria Derhami* (Scopoli), 1763.

SCYTODES, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 2, line 19.

Latreille includes under this genus two sections:—A. 2 eyes, "Les Filiformes"; B. 6 eyes, *Aranea thoracica*. Now "Les Filiformes," Walckenaer, Faun. Par. p. 212, contain two species: *A. phalangioides*; Scop. (*A. Pluchii*), Ent. Car. 404, 1120. Whether these two names refer to the same species makes no difference, for they are at any rate both congeneric.

*A. phalangioides* was selected by Walckenaer as the representative of his genus *Pholcus* in 1805 (Tableau, p. 80).

*A. thoracica* is therefore the last species left in, and was further selected by Latreille in 1810 as the type of the genus (Consid. gén. Nat. Ord. p. 423).

Type, *Scytodes thoracica*, Latr., 1804.

LINYPHIA, Latreille, 1804, Nouv. Dict. xxiv. p. 134, col. 2, line 50.

Two species only are included under this genus, called by Walckenaer "Les Napiformes," Faun. Par. p. 213:—(1) *A. triangularis*, Clerck, De Geer, t. vii. pl. xiv. figs. 13, 14, 15, 16; Clerck, pl. iii. fig. 2; (2) *A. montana*, Clerck,

De Geer, t. vii. p. 251; Clerck, pl. iii. fig. 1; Lister, t. xix. fig. 19.

Both these species are congeneric, but in 1810 Latreille selected as the type of the genus "Araignée renversée sauvage," De Geer, which is identical with *A. triangularis*, Clerck.

Type, *Linyphia triangularis* (Clerck), 1757.

TETRAGNATHA, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 1, line 5.

One species only was included under "Les Spiraliiformes" by Walckenaer, Faun. Par. p. 203, namely *Aranea extensa*, Fabr. p. 407. 1.

Type, *Tetragnatha extensa* (Linn.), 1758.

ARANEUS, Clerck, Svenska Spindlar, 1757, p. 22, &c.

This genus includes sixty-seven species, which were first split up by Latreille in 1804, Nouv. Dict. p. 135, col. 1, line 8.

Under *Aranea* Latreille places three species only, thus limiting the genus to (1) *A. clavipes*, Fabr., (2) *A. diademata*, Clerck, (3) *A. spinosa*, Fabr.

Neither the first nor the third species, however, nor any species congeneric with them, was originally included in the genus by Clerck, and therefore *A. diadematus*, Clerck, alone can be the type.

Latreille had no power or right to select *A. domestica*, Fabr., as the type of the genus Araignée, *Aranea*, or *A. diadema*, Linn., the type of *Epeira*, Walck., as he does in his selections of 1810, having already himself, in 1804, limited the genus to one species only, *A. diadematus*, Clerck.

Type, *Araneus diadematus*, Clerck, 1757.

HETEROPODA, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 1, line 36.

Under this genus are included "Les Cordiformes" of Walckenaer, Faun. Par. tom. ii. p. 227 (1802), with *Aranea venatoria*, Linn., in addition, and another species bearing no name.

"Les Cordiformes" include twenty species:—*Aranea oblonga*, *argentata*, *rhomboica*, *pigra*, *bilineata*, *aureola*, *cespitem*, *tigrina*, *truncata*, *emarginata*, *rotundata*, *floricola*, *violacea*, *citrea*, *calycina*, *cristata*, *fucata*, *dauci*, *diana*, and *delicatula*.

The genus was first broken up by Walckenaer in the

Tableau, p. 28 *et seq.*, 1805, when he withdrew under *Thomisus* all these species except *emarginata* and *venatoria*, Linn.

*Aranea emarginata* was, however, withdrawn by Walckenaer subsequently, in Faun. Française, p. 74 (1820), under *Thomisus*, thus leaving *Aranea venatoria*, Linn., as the type of the genus.

Type, *Heteropoda venatoria* (Linn.), 1766.

MISUMENA, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 2, line 2.

One species alone is included by Latreille—*Aranea citrea*, De Geer, which is *Araneus vatius*, Clerck, 1757; the latter name having priority.

Type, *Misumena citrea* = *vatia* (Clerck), 1757.

MICROMATA, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 2, line 6.

Four species were originally included, namely those under "Les Grottiformes," by Walckenaer, Faun. Par. p. 225:—(1) *A. accentuata*, Walck.; (2) *A. smaragdula*, Fabr.; (3) *A. ornata*, (4) *A. rosea*, Clerck.

Out of these Walckenaer (Tableau, 1805, p. 39) selected *A. smaragdula*, *A. ornata*, and *A. rosea*, and refers them to his new genus *Sparassus*; and later, in the same work p. 41, he refers *A. accentuata* to *Clubiona*.

This Walckenaer, however, had no right to do, and *accentuata* being the last species left in, naturally becomes the type of the genus *Micromata*.

In 1810 Latreille himself selects *A. smaragdula* as the type of the genus, but this he had no power to do. He had to be content with the species Walckenaer left in.

Thorell says in this connection, 'Europ. Spid.' p. 176, that "*Micrommata* includes 'Les Grottiformes,' Walck., and *A. accentuata*, which is placed there by mistake." For Latreille afterwards obviously wished *Micrommata* to apply to the three species referred by Walckenaer to *Sparassus*, since he quotes his own previous generic name as a synonym of Walckenaer's genus.

One might equally well insist that all the three species originally limited by Latreille to *Aranea* were placed there by mistake (as two of them undoubtedly were), for later on Latreille definitely selects *Araneus domesticus*, Fabr., as the type of *Aranea*, a species not included in his own previous limitation of the genus.



If, however, in the original diagnosis of *Micromata*, Latreille had included any character which would have definitely excluded *A. accentuata*, then it might be possible to act on this fact.

But Latreille's original diagnosis of "*Les Grottiformes*," Walck., is "Mâchoires droites, quatrième paire de pattes la plus longue" (Nouv. Dict. p. 135, 1804); characters which apply equally well to the well-known European *A. accentuata*. It is perfectly clear that Latreille and Walckenaer both wished *accentuata* to be dissociated from the other three "grottiformes," and neither of them cared what became of the original name *Micromata*; the author sunk it as a synonym, while Walckenaer swamped it under his new name *Sparassus*.

It is, however, the duty of science to restore *Micromata* as a generic name, and it is impossible to enter into the question of the wishes and sentiments of authors. This would simply end in a labyrinth of inconsistencies and endless disagreement and disputation. For, if we are to consider the wishes of either of these authors in connection with the signification of *Micromata*, why ignore their conjoint wishes in regard to the name itself?

If we take this line, why are we not also to accept the names substituted by Walckenaer in those cases where he considered them more suitable than others previously given to the same genus or species by other authors? Thorell and Simon both select *virescens*, Clerck, as the type.

Type, *Micromata accentuata* (Walck.), 1802.

OXYOPES, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 2, line 12.

A single species only included—*Aranea heterophthalma*.

Type, *Oxyopes heterophthalmus*, Latr., 1804.

DOLOMEDES, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 2, line 32.

Two species were originally included, namely those mentioned under "*Les Coureuses*" by Walckenaer, Faun. Par. p. 235:—(1) *A. mirabilis*, Clerck, pl. v. fig. 10; (2) *A. marginata*, De Geer, t. vii. p. 281. 24.

The latter is identical with *Araneus fimbriatus* of Clerck, and was selected as the type of the genus under "*Araignée loup bordée*," De Geer, in 1810, by Latreille. *A. mirabilis* was in 1837 referred to *Ocyale*, Sav.; but the type of *Ocyale*

being of a different genus, Simon made the genus *Pisaura* for its reception in 1885.

Type, *Dolomedes fimbriatus* (Clerck), 1757.

LYCOSA, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 2, line 38.

To this genus were originally referred all the species named by Walckenaer under "Les Chasseuses," Faun. Par. p. 237:—(1) *Aranea allodroma*, Clerck, pl. v. fig. 2; (2) *A. agretyca*, Walck., Cl. pl. iv. fig. 2; (3) *A. vorax*, Walck., Albin, 4. 17; (4) *A. agilis*, Walck.; (5) *A. saccata*, Linn.; (6) *A. velox*, Walck., Cl. pl. iv. fig. 2; (7) *A. piratica*, Cl. pl. iv. fig. 5; (8) *A. lugubris*, Walck., Albin, pl. iv. fig. 19.

Of these, *allodroma*, *agretyca*, *vorax*, and *velox* were taken out in 1832 and placed under *Tarentula* by Sundevall (Act. Holm. p. 24). The first under *cinerea* (sec. Simon, Ar. Fr. iii. p. 278); the second (which sec. Simon, Ar. Fr. iii. pp. 283, 284, = both *ruricola*, De Geer, and *terricola*, Thor.) under *ruricola*; the sixth, by implication as congeneric, referring to the same figure in Clerck's work as does number (2); the third under the same name or as *trabalis* (this species also sec. Simon, Ar. Fr. iii. p. 259 = *pulverulenta*, Clk., in part, which is congeneric with *trabalis*). No. 7, *piratica*, was taken out by Sundevall (Act. Holm. p. 192, 1832) as the type, being the only species referred to it, of *Pirata*. Nos. 4, 5, and 8 were taken out by C. Kech (Ar. xiv. p. 100) and referred to *Pardosa* in 1848, leaving no species under *Lycosa*. The type therefore must be one of these three; and since none of them were removed under any other genus between this time and 1869-70, when Thorell selected *lugubris*, Wlk., as the type of the genus *Lycosa*, this species remains as the type.

Latreille, in 1810 (Consid. gén. Nat. Ord. Crust., Arach. et Ins. p. 423 &c.), selected "*Ar. tarentula*, Fabr.—L'araignée loup, Geoff.," as the type of his *Lycose* = *Lycosa*, as noted also by Simon (Ar. Fr. iii. p. 233).

Now *Aranea tarentula*, Linn., Fabr., = *Lycosa tarentula*, Latr., is the species which is "subtus læte croceo, fascia transversa nigra," and does not represent any of those species originally included in the genus, and cannot therefore be selected, even by the author himself, as the type of the genus.

Of the three remaining species, *agilis*, Wlk. = *palustris*, Linn. (sec. Simon, 321), and *saccata*, Linn. = *amentata*, Clk., while *lugubris* is the species commonly known by that name, the last being selected by Thorell as the type in 1869-70.

Type, *Lycosa lugubris*, Walck., 1802.

SALTICUS, Latreille, 1804, Nouv. Dict. xxiv. p. 135, col. 2, line 51.

Latreille included under this name two groups:—A. “Les Chercheuses,” Walk. Faun. Par. p. 248 (1802); and B. “Les Sauteuses,” id. p. 243; quoting the following species: (1) *Aranea cinnaberina*, Oliv.—4. *guttata*, Rossi; (2) *Aranea scenica*, Linn.; (3) *Aranea formicaria*, De Geer.

This genus, which included also a number of other species—*A. tardigrada*, *pomatia*, *chalybeia*, *psylla*, *cuprea*, *coronata*, *virgulata*, *pubescens*, *nidicolens*, *fontalis*, *lunulata*, *bicolor*, *calida*, *nigra*, *tripunctata*, *litterata*, and *muscorum*—under “Les Sauteuses,” was first split up by Walckenaer in the following year 1805 in the ‘Tableau,’ pp. 21 & 22. He withdrew first *A. cinnaberina* under *Eresus* (p. 21), and next (p. 22) under *Attus* all the other species named, leaving nothing under *Salticus*, and ignoring it altogether.

No further subdivision or selection in connexion with these two last-named genera took place until 1810, when Latreille definitely selected *A. scenica*, Fabr., as the type of *Salticus*, Consid. gén. Nat. Ord. Crust., Arach. et Ins. p. 423.

Thorell has evidently overlooked this selection of types by Latreille in 1810; and most authors have followed Sundevall, who, in 1832, selects under *Salticus*, typus, *S. formicarius*, De Geer, a selection which of course cannot stand.

Type, *Salticus scenicus* (Clerck), 1757, = *A. scenica*, Fabr. & Linn.

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X.—On the Anatomy of certain Agnathous Pulmonate Mollusks. By WALTER E. COLLINGE, F.Z.S., Lecturer on Zoology and Comparative Anatomy in the University of Birmingham.

[Plates I. & II.]

TOWARDS the end of 1899 Mr. Henry Suter sent me a series of examples of various New Zealand land-mollusks preserved in alcohol, and expressed a wish that I would give some account of their internal anatomy. I take this opportunity of expressing to him my best thanks for his kindness. About the same time Mr. William Moss, of Ashton-under-Lyne, sent me specimens of *Schizoglossa novoseelandica*, Pfr.; to him also my best thanks are here tendered. Finally, my best thanks are due to the Council of the Birmingham Natural Ann. & Mag. N. Hist. Ser. 7. Vol. vii. 5

History and Philosophical Society for defraying the cost of the drawings illustrating this paper.

The anatomy of the Agnathous Pulmonates has received but little attention; hence anything like a classification based on anatomical characters is at present quite impossible. Woodward \* has given an interesting account of *Natalina caffra*, Fér., and other contributions to the anatomy of this genus have been made by Pilsbry † and Pace ‡. Godwin-Austen § has given an account of the anatomy of *Paryphanta Hochstetteri*, Pfr.; but I am unable to confirm many of his statements. Other references to the anatomy of the Australian and New Zealand species are to be found in the various papers of Hedley and Suter.

#### RHYTIDA, Albers.

*Rhytida Greenwoodi*, Gray. (Pl. I. figs. 1-16.)

Animal yellowish brown, darker on the dorsum anteriorly; a deep groove characterizes the median dorsal line beyond the visceral mass. Mantle yellow, with irregular black markings; collar shows slight indications of division into right and left mantle-lobes. Eyes situated some little distance backward from the end of the upper tentacle. Male generative orifice 10 millim., female generative orifice 11 millim. from the right upper tentacle. Rugæ on the head almost square, on the sides of the body anteriorly round, in parallel lines in both cases; posteriorly very small and irregular. Sulci faint sepia-colour or white. Peripodial groove ill-defined. Foot-fringe whitish, with very minute sepia-coloured spots. Lineoles absent. Foot-sole not distinctly divided into median and lateral planes, laterally sepia-coloured, dirty white in the median portion.

Length (in alcohol) 38 millim.

*Hab.* Levin, Manawater, New Zealand.

This species, the type of the genus, was described by Gray in 1849 ||. All the descriptions yet given, such, for example, as those by Reeve ¶, Pfeiffer \*\*, Hector ††, Hutton ‡‡, and

\* Proc. Malac. Soc. Lond. 1895, vol. i. pp. 270-277, pl. xvii.

† Proc. Acad. Nat. Sci. Philad. 1889, pp. 277-279, and 1890, pp. 241-243.

‡ Proc. Malac. Soc. Lond. 1895, vol. i. pp. 232-233.

§ *Op. cit.* 1893, vol. i. pp. 5-9, pl. i.

|| Proc. Zool. Soc. 1849, p. 165.

¶ Conch. Icon. vol. vii. sp. 434, pl. lxxxii. fig. 434.

\*\* Mon. Hel. viv. vol. iii. p. 156.

†† Catal. Land Moll. N. Zeal. 1873, p. 18.

‡‡ Man. N. Zeal. Moll. 1880, p. 16.

Tryon \*, relate to the shell of the animal only, no description having yet been given of the animal. A figure of the radula has been published †, and Suter ‡ has given a figure of the animal with the shell attached, but the drawing leaves much to be desired.

### *Anatomy.*

*The Alimentary Canal.*—The buccal mass is large, measuring 18·5 millim. in length in the alcoholic specimens examined. The muscular attachments, as in the allied genus *Paryphanta*, are very strong. The buccal retractors are inserted posteriorly and ventro-laterally, laterally there are a series of muscles which have their origin on the floor of the body-cavity (Pl. I. fig. 10, *r.m.*). Posteriorly the buccal mass has the appearance of having a muscular cap (Pl. I. figs. 10, 11), but on dissection this is found to be due to the upward curving of the terminal portions of the muscular sheath of the radula. The radula is curved downwards in the extreme anterior region and laterally embraces the muscular sheath; looked at from the opening of the mouth it has the appearance shown in figure 7 (Pl. I.).

The *oesophagus* enters the dorsal surface of the buccal cavity about 4·5 millim. from the anterior end; it is a thin narrow tube, enlarging to a wider cavity behind the salivary glands §. These latter are two large glands situated on the posterior portion of the buccal mass (Pl. I. fig. 10, *s.gl.*); they are fused together in the median line. From the anterior end of each a long fine salivary duct is given off, and these enter the buccal cavity slightly below and behind the opening of the oesophagus (Pl. I. fig. 10).

*The Pedal Gland* (Pl. I. figs. 12, 13).—Lying on the floor of the body-cavity is a small flattened structure—the pedal gland. The actual gland measured 13 millim. in length; at its posterior end it makes a bend to the right side and then again towards the left, thus being formed by what may be described as three limbs; the third limb is partly covered by a series of strands of pedal muscles. The retractor muscle is attached ventrally and arises from the floor on the right side. Attached to the underside of the third limb and lying deeply

\* Man. Conch. 1885 (ser. 2) vol. i. p. 126, pl. xxiv. fig. 74.

† Trans. N. Zeal. Inst. vol. xvi. p. 167, pl. x. fig. P.

‡ Journ. of Malac. 1899, vol. vii. pl. iii. fig. 1.

§ Owing to part of the animal having been left in the shell, which I did not receive, I have been unable to describe the remainder of the digestive system.

in the pedal muscles is a spongy mass about 4 millim. in length (Pl. I. fig. 12).

*The Generative Organs* (Pl. I. figs. 8, 9, and 14-16).—As already pointed out, the generative orifices are really distinct and lie about 1 millim. apart and 11 millim. from the right upper tentacle (Pl. I. figs. 1, 8, and 9). The female orifice is surrounded by a prominent white lip, the dorsal and anterior portion of which is produced as a thin fold forward, and forms the dorsal boundary of the male generative orifice (Pl. I. figs. 8, 9). This latter leads into a long narrow tube—the penis. At its commencement the inner walls are plicated; passing backward there is a thickened muscular ridge on the ventral side, which is covered with a series of fleshy tooth-like projections (Pl. I. fig. 16). On careful dissection the penis is found to be folded upon itself, the distal limb scarcely being distinguishable until separated by dissection. Passing forward almost as far as the external orifice, it again makes a bend and becomes slightly larger, almost sac-like, the internal wall again showing plications in this region. From the distal end of this sac-like portion the vas deferens arises as a fine densely convoluted tube (Pl. I. fig. 14, *v.d.*) which joins the prostatic portion of the common duct. There is a short retractor muscle attached to the end of the first bend of the penis (Pl. I. fig. 14, *r.m.*). The female generative orifice leads into a short wide cavity—the vagina,—into the upper portion of which the receptaculum seminis and free oviduct open. The receptaculum seminis is sessile, consisting of a long tube-like diverticulum; at its distal end a small retractor muscle is inserted. Internally the wall is thrown into a series of wavy folds. The free oviduct is short. Internally its walls show a series of projections which branch and anastomose (Pl. I. fig. 15). The common duct is folded from right to left and showed no variation from that figured in any of the three dissections. There is a large albumen gland. The hermaphrodite gland had been broken away in the missing portions of the liver &c.; the duct, however, remained as a fine and densely convoluted tube (Pl. I. fig. 14, *h.d.*).

#### PARYPHANTA, Albers.

*Paryphanta Hochstetteri*, Pfr. (Pl. II. figs. 17-21.)

The anatomy of this species was described by Lieut.-Col. Godwin-Austen in 1893. I dissected three of the specimens sent to me by Mr. Suter, but found considerable differences in the male generative organs from those described and figured

by Godwin-Austen, in consequence of which I decided to obtain further material and carefully work through the system again. Owing to this the publication of the present paper has been somewhat delayed. The later dissections fail to verify the above-mentioned account, and I must take exception to the comparisons and conclusions the author has drawn at the close of his paper.

On unravelling the terminal ducts of the generative organs the penis with its darkly pigmented proximal portion is very conspicuous. In life it lies across the buccal mass, the right tentacular retractor muscle crossing over it at the proximal end (Pl. II. fig. 17). In the last specimen dissected it measured 37 millim. in length. It is a large muscular organ, consisting for the greater part of its length of a simple tube, the terminal portion only, to which the retractor muscle is attached, being solid. I failed to find any knob-like process or nipple-like crenulations, as figured by Godwin-Austen (*op. cit.* pl. i. fig. 12), although the lumen of the tube was carefully traced for 32 millim. The vas deferens is a long fine tube closely bound to the sides of the penis for the greater portion of its length. Godwin-Austen states (*op. cit.* p. 7) that "the vas deferens is short and unites with it [the penis] very low down, not far from the generative aperture." As shown in figure 18 (Pl. II.) the vas deferens leaves the penis towards its distal end, and is closely bound to its wall by strands of connective tissue; towards the proximal end of the penis it folds itself around that organ, and then passing down to the region of the vagina, it runs along its left dorsal side as a convoluted tube; at the point where the receptacular duct enters the vagina the vas deferens dips beneath the free oviduct, reappearing on the right side, still exhibiting convolutions; it then passes across to the left side, where it becomes continuous with the prostatic portion of the common duct. In order to verify what I had made out by dissection, the penis of a further specimen was taken and sections cut by the freezing microtome; these fully bore out the conclusions drawn from the dissections (*cf.* Pl. II. fig. 19,  $\times^1 - \times^5$ ).

On the supposition that the vas deferens in this species was very short &c., Godwin-Austen proposed to place the genera *Paryphanta*, *Ælea*, and *Schizoglossa* in a new subfamily—Paryphantinæ: "*Schizoglossa* bearing the same relationship to *Paryphanta* as *Girasia*, Gray, does to *Macrochlamys* among the Zonitidæ."

*The Pedal Gland* (Pl. II. figs. 20, 21).—The position occupied is similar to that in *Rhytida Greenwoodi*. The gland measured 17.5 millim. in length; at its posterior end it

makes a bend to the left side and then dips down into a cavity bounded by the pedal muscles. To this portion the short retractor muscle is attached on the right side (Pl. II. fig. 21).

*Paryphanta Edwardi*, Suter. (Pl. II. figs. 22–25.)

Animal a deep blue, darker laterally than on the dorsum. Mantle greyish white, with very fine sepia markings on the collar, which is divided as in the genus *Rhytida*. Generative orifice 8.5 millim. from the right upper tentacle. Rugæ irregular, very small posteriorly. Sulci bluish white. Peripodial groove ill-defined. Foot-fringe bluish white and finely spotted, no lineoles. Foot-sole sepia-coloured, with a tinge of blue in the median portion, not divided into median and lateral planes.

Length (in alcohol) 43 millim.

The shell and radula of this species were described by Suter in 1899\*. It differs considerably from the preceding species. Suter regards it as standing nearest to *P. atramentaria*, Shuttl., from Victoria, a species I am unacquainted with.

*Anatomy.*

*The Alimentary Canal.*—The buccal cavity calls for no special mention. The œsophagus enters on the dorsal surface; tracing this posteriorly it widens a little, forming the crop, around which the salivary glands are closely wrapped; the ducts leave the anterior borders and enter the buccal mass at the side of and just behind the œsophagus. Behind the crop there is a thin tube-like portion of the canal, which again widens before reaching the stomach.

*The Pedal Gland* (Pl. II. figs. 23, 24) is very similar to that in *P. Hochstetteri*, Pfr., differing, however, in its greater length, measuring *in situ* 24 millim., and in turning forwards and downwards to the left side. Imbedded in the pedal muscles and quite distinct from this gland is a small glandular body like that found in *Rhytida Greenwoodi*, Gray.

*The Generative Organs* (Pl. II. fig. 25).—On turning back the body-wall the penis is seen to lie in a very similar position to that in *P. Hochstetteri*. It measured 58 millim. in length. It is an almost straight tube, widening in the distal half. In structure it is similar to that in the preceding species. Being larger the vas deferens is easily made out from the left side of the distal end of the penis to the union with the prostatic canal. It is a simple tube not convoluted.

\* Proc. Malac. Soc. Lond. 1899, vol. iii. p. 290, pl. xv. figs. 14, 15.



The vagina is considerably larger than in *P. Hochstetteri*; at its extreme distal end a short sessile receptaculum seminis is seen. The free oviduct is very short and arises latero-dorsally on the right side, passing in an oblique direction forwards. The common duct is a long, almost straight, double tube. The remaining organs call for no special mention.

Until more species of this genus have been anatomically examined any comparisons are of little value. *P. Edwardi* is very distinct from *P. Hochstetteri* so far as the generative organs are concerned, though it is very probable that there exist intermediate species which would connect the two.

### SCHIZOGLOSSA, Hedley.

*Schizoglossa novoseelandica* (Pfr.), em. Hedley.

(Pl. II. figs. 26-30.)

*Daudebardia novoseelandica*, Pfr. Mal. Blatt. 1861 (1862), vii. p. 146; Hutton, Man. N. Zeal. Moll. 1880, p. 12; Pfeiffer, Mon. Hel. viv. v. p. 10.

*Daudebardia neozelanicus*, v. Mart.

*Daudebardia*? *novoseelandica*, Kobelt, Jahrb. d. D. mall. Gesell. 1879, vii. p. 26; Fischer, Man. de Conch. 1887, p. 256.

*Schizoglossa novoseelandica*, Hedley, Proc. Linn. Soc. N. S. W. 1893 (ser. 2), vii. p. 389, pl. ix. figs. 1, 2.

Animal (in alcohol) brownish yellow, darker on the dorsum, posteriorly and latero-posteriorly splashed with irregular black markings. Dorsum marked by two parallel lines running from the anterior edge of the mantle to the head, and well-marked lateral grooves running from the mantle to the lips. Posterior to the mantle the visceral mass slightly overhangs the tail-region. No caudal mucous pore. Respiratory orifice in the antero-lateral margin of the mantle. Rugæ large, ill-defined laterally. Sulci almost black. Peripodial groove indistinct. Foot-fringe yellow, with greyish-yellow lineoles. Foot-sole greyish yellow, with faint transverse wrinkles, not divided into median and lateral planes.

Length (in alcohol) 25 millim., foot-sole 8 millim. broad.

*Hab.* Near Stratford, North Island, New Zealand.

The genus *Schizoglossa* was constituted by Hedley in 1893\* for the reception of the *Daudebardia novoseelandica* of Pfeiffer †. The species was originally described from the shell only. Hedley (*op. cit.*) was the first to give a description of the animal and its structure and to figure the same and shell; he therefore must be regarded as the authority for this species.

\* Proc. Linn. Soc. N. S. W. 1893 (ser. 2), vol. vii. p. 389.

† Mal. Blatt. 1861 (1862), Bd. vii. p. 146.

The specimens upon which I have worked were sent by Mr. R. Murdoch to Mr. W. Moss, and were collected near Stratford, North Island, New Zealand.

Although Hedley's account was a valuable contribution at the time to our knowledge of this species, it left much to be desired as regards the figures and the minute detail of the anatomy. I have endeavoured in the present paper to give more careful drawings of the animal, and am able to supplement in a few points his account of the internal structure. Unfortunately in all the specimens the pallial complex had been damaged in removing the shells before they came into my possession, so that I am unable to give any description of this interesting region. A detailed account of the anatomy from fresh specimens is much to be desired.

### *Anatomy.*

The *alimentary canal* is very short. The buccal mass measured 12 millim. in length (Pl. II. fig. 28). The œsophagus enters the dorsal surface 5 millim. from the anterior end; it is a short wide tube, and leads directly into the crop, the internal walls of which are plicated. The salivary ducts enter a little behind and lateral to the œsophageal opening.

The *pedal gland* (Pl. II. fig. 29) has the usual position; it is considerably smaller than in either the genus *Rhytida* or *Paryphanta*.

*The Generative Organs* (Pl. II. fig. 30).—The vestibule is a spacious chamber leading directly into the vagina; on the left side the penis opens. This organ is a short tube and exhibits little difference from the vas deferens, except that it is slightly wider. In none of the specimens dissected had it the form figured by Hedley (Proc. Linn. Soc. N. S. W. 1893, vii. pl. x. fig. 9). All the portion from just above the retractor muscle to the entrance into the vestibule is covered by a mass of connective tissue, and when this is dissected away the appearance is as figured (Pl. II. fig. 30, *p.*). The retractor muscle is small and short; it arises from the body-wall immediately below the penis. The vas deferens is a short tube not sharply marked off from the penis. Where the common duct commences the oviducal portion internally has richly folded walls, and the prostatic canal can be easily traced the whole of its length. I failed to find any trace of a receptaculum seminis. There is a large albumen gland and a small hermaphrodite gland, the duct of the latter being comparatively short and slightly convoluted.

## EXPLANATION OF PLATES I. &amp; II.

*Rhytida Greenwoodi*, Gray.

- Fig. 1. View of the animal from the left side,  $\times 1\frac{1}{2}$ .  
 Fig. 2. View of the posterior portion of the dorsum from above,  $\times 1\frac{1}{2}$ .  
 Fig. 3. Latero-ventral portion of the head,  $\times 4$ .  
 Fig. 4. Lateral view of the head, with buccal cavity partly extended,  $\times 2$ .  
 Fig. 5. The same, seen from the ventral side,  $\times 2$ .  
 Fig. 6. Anterior view of the mouth,  $\times 3$ .  
 Fig. 7. Diagrammatic figure of the radula as seen from the anterior end.  
 Figs. 8, 9. Male and female generative orifices.  
 Fig. 10. Lateral view of the buccal mass,  $\times 2$ .  
 Fig. 11. Dorsal view of posterior end of same.  
 Fig. 12. The pedal gland,  $\times 3$ .  
 Fig. 13. Posterior portion of the same seen from below.  
 Fig. 14. The generative organs.  
 Fig. 15. Internal wall of the free oviduct,  $\times 2$ .  
 Fig. 16. Penis dissected, to show the fleshy tooth-like projections,  $\times 2$ .

*Paryphanta Hochstetteri*, Pfr.

- Fig. 17. Diagram to show relation of the penis to the buccal mass and right tentacular retractor muscle.  
 Fig. 18. The generative organs.  
 Fig. 19. Transverse sections of the penis. The position of each section is indicated in the preceding figure by the lettering  $\times^1$ - $\times^6$ .  
 Fig. 20. The pedal gland,  $\times 2$ .  
 Fig. 21. Lateral view of posterior portion of same,  $\times 2$ .

*Paryphanta Edwardi*, Suter.

- Fig. 22. View of the animal from the left side,  $\times 1\frac{1}{2}$ .  
 Fig. 23. The pedal gland,  $\times 2$ .  
 Fig. 24. Lateral view of posterior portion of same,  $\times 2$ .  
 Fig. 25. The generative organs.

*Schizoglossa novoseelandica* (Pfr.), em. Hedley.

- Fig. 26. View of the animal from the left side,  $\times 2$ .  
 Fig. 27. Dorsal view of the same,  $\times 2$ .  
 Fig. 28. Lateral view of the buccal mass &c.,  $\times 3$ .  
 Fig. 29. The pedal gland,  $\times 2$ .  
 Fig. 30. The generative organs,  $\times 3$ .

In figures 1, 22, 26, and 27 the animals are represented without the shell.

## Reference letters.

- |  |   |
|--|---|
| <i>alb.gl.</i> Albumen gland.          | <i>r.m.</i> Retractor muscle.             |
| <i>b.c.</i> Buccal cavity.             | <i>r.d.</i> Receptacular duct.            |
| <i>b.r.m.</i> Buccal retractor muscle. | <i>r.s.</i> Receptaculum seminis.         |
| <i>f.ov.</i> Free oviduct.             | <i>r.t.r.</i> Right tentacular retractor. |
| <i>h.d.</i> Hermaphrodite duct.        | <i>s.d.</i> Salivary duct.                |
| <i>h.gl.</i> Hermaphrodite gland.      | <i>s.gl.</i> Salivary gland.              |
| <i>æ.</i> Œsophagus.                   | <i>v.</i> Vestibule.                      |
| <i>ov.</i> Oviduct.                    | <i>v.d.</i> Vas deferens.                 |
| <i>p.</i> Penis.                       | <i>vg.</i> Vagina.                        |
| <i>pr.</i> Prostate.                   |   |

XI.—*Descriptions of some new Species of Heterocera.*

By HERBERT DRUCE, F.L.S. &amp;c.

Fam. *Syntomidæ*.*Eucereon Birchelli*, sp. n.

*Female*.—The head, antennæ, collar, tegulæ, and thorax pale brown; abdomen blackish brown; legs pale brown, banded with white. Primaries pale brown, irrorated with dark brown scales, a black spot at the end of the cell: secondaries semihyaline blackish brown.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Colombia, Bogota.

Fam. *Arctiidæ*.*Rhodogastria roseibarba*, sp. n.

*Male*.—The head, collar, tegulæ, and thorax pale greyish fawn-colour; one black spot on the front of the head, two on the collar and on each of the tegulæ, and two at the base of the thorax; palpi red, the second and third joint tipped with black; antennæ reddish brown; legs red; abdomen cream-colour, the two anal segments pale pink, the base clothed with pink hairs. Primaries semihyaline brownish white, the costal margin, apex, inner margin, and veins all brownish fawn-colour: secondaries semihyaline white, clothed on the inner margin with long pink hairs, the outer margin near the apex shaded with pale fawn-colour.

Expanse  $2\frac{3}{4}$  inches.

*Hab.* Sooloo Islands (*Pryer, Mus. Druce*).

*Ecpantheria albiscripta*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, and thorax blackish grey, the collar and tegulæ edged with white; abdomen bluish black, the sides banded with orange-yellow; the legs grey, banded with white. Primaries blackish grey, with several dark marks on the costal margin; a number of fine white lines cross the wing from the costal to the inner margin, forming a series of small spots: secondaries pure white, with three black spots on the costal margin; on the underside the costal margin is edged with yellow.—*Female* very similar to the male, excepting it is much darker in colour and that the

secondaries are black, partly crossed by a waved white band near the apex.

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

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

#### Fam. *Cylopodidæ*.

##### *Menis ithrites*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black. Primaries chrome-yellow, the apex broadly black, the inner margin edged with black: secondaries black, the costal margin from the base to the apex chrome-yellow.

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

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

#### Fam. *Notodontidæ*.

##### *Symmerista fulgens*, sp. n.

*Male*.—Head, collar, and tegulæ pale fawn-colour; thorax and upperside of the abdomen dark brown; antennæ and legs brown. Primaries pale fawn-colour, the costal margin, anal angle, and inner margin dark brown; a reddish-brown band extends from the apex to the inner margin almost to the base of the wing; a large greyish spot irrorated with black scales above the anal angle: secondaries pale greyish brown, darkest at the apex and round the outer margin; the fringe brown.—*Female* very similar to the male, but slightly paler in colour.

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

*Hab.* Venezuela, Merida (*Mus. Druce*).

##### *Heterocampa amata*, sp. n.

The head, collar, and tegulæ pale green, the thorax and abdomen pale brown, the anal segments greenish brown; the underside of the abdomen and legs yellowish green. Primaries pale green, the inner margin broadly clouded with dark brown; a large square-shaped yellow spot about the middle of the inner margin, beyond which a white waved line extends partly along the outer margin: secondaries pale yellowish green, shaded with brown on the inner margin, the fringe yellowish white.

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

*Hab.* Venezuela, Merida (*Mus. Druce*).

*Heterocampa* (?) *antonia*, sp. n.

*Male*.—Head, antennæ, thorax, and abdomen pale reddish brown; the tegulæ and the base of the thorax green, the segments of the abdomen edged with white; legs reddish brown. Primaries pale reddish brown, thickly mottled with bright green scales; a submarginal pale green line extends from the apex to the anal angle: secondaries pale reddish brown.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* Borneo (*Mus. Druce*).

*Heterocampa* (?) *latex*, sp. n.

*Male*.—Head, collar, and thorax greenish brown; abdomen pale brown, yellowish at the base; the anal segment and the tuft dark green. Primaries pale green, with some faint greyish marks in the cell; a pale brown curved line crosses the wing beyond the cell from the costal to the inner margin, some very minute brown spots on the costal margin close to the apex, and a row along the outer margin; the fringe alternately green and brown: secondaries pale yellow, the costal margin broadly green, with two dark brown short lines close to the apex; the fringe yellow.

Expanse 2 inches.

*Hab.* W. Africa, Gambia (*Mus. Druce*).

*Heterocampa* *oxyra*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs pale brown; the underside of the abdomen whitish. Primaries pale brown, thickly irrorated with grey scales; a large square-shaped grey spot about the middle of the costal margin, extending over the cell, a few dark brown spots close to the apex: secondaries white, the inner margin shaded with yellow, the marginal line brown, the fringe white.—*Female* very similar to the male, but greyer in colour and not so distinctly marked; the secondaries clouded with brown along the costal margin and at the apex.

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

*Hab.* Venezuela, Merida (*Mus. Druce*).

*Edema* *audax*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs pale greyish fawn-colour. Primaries pale greyish fawn-colour, yellowish along the inner margin; a large

black spot below the end of the cell, beyond which a row of minute black dots crosses the wing from the costal to the inner margin; a white streak extends from the base of the wing almost to the end of the cell; the costal margin is irrorated with black dots: secondaries pale yellowish brown, darkest at the apex and partly round the outer margin; the fringe pale yellowish brown.

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

*Hab.* Panama, Chiriqui (*Mus. Druce*).

*Rosema dolorosa*, sp. n.

The head and collar white, tegulæ dark green, thorax and antennæ brown, abdomen and legs yellow. Primaries dark green, the costal margin edged with white; a large brown spot at the end of the cell, the outer margin broadly brown, deeply dentated on the inner margin: secondaries pale chrome-yellow, the costal margin and apex black.

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

*Hab.* Brazil, Cabo (*Mus. Druce*).

*Cerura Dohertyi*, sp. n.

*Male*.—Head, collar, tegulæ, and thorax pinkish white; antennæ and abdomen black, the anal tuft white. Primaries pinkish white, a black spot at the base and three rather large black spots on the costal margin, a white spot at the end of the cell, and a zigzag submarginal black line extending from the apex to the anal angle; the veins black near the outer margin; several very indistinct black lines cross the middle of the wing; the fringe alternately black and white: secondaries dark blackish grey.

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

*Hab.* Perak (*Doherty, Mus. Druce*).

*Notodonta (?) pira*, sp. n.

The head, collar, tegulæ, thorax, and legs greyish brown, abdomen pale grey. Primaries dark greyish brown, crossed beyond the middle from the costal to the inner margin by a wide pale greyish band, divided into two by a dark brown spot close to the apex; the marginal line black, the fringe dark brown: secondaries dusky white, darkest at the apex and round the outer margin.

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

*Hab.* Central China, Hunan (*Mus. Druce*).

*Ichthyura rubida*, sp. n.

*Male*.—Head and front of the thorax dark brown; tegulæ, thorax, and abdomen pale reddish brown; antennæ reddish brown. Primaries reddish brown, crossed from the costal to the inner margin by two very indistinct pale lines; a sub-marginal row of small black dots extends from the costal margin near the apex to the anal angle: secondaries pale reddish brown.—*Female* very similar to the male, but paler in colour.

Expanse, ♂  $1\frac{3}{10}$ , ♀  $1\frac{1}{2}$  inch.

*Hab.* Trobriand Isl., Kiriwini (*Mus. Druce*).

*Hyleora lacerta*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, and legs dark blackish brown; antennæ yellowish brown; abdomen yellow, the anal segment black. Primaries dark blackish brown; a rather wide reddish-grey curved band extends from the apex to the inner margin nearest the anal angle; a greyish-white band extends from the base below the cell, joining the first band near the end of the cell; a marginal row of brown spots from the apex to the anal angle; the fringe very dark brown: secondaries reddish brown, yellow at the base and along the inner margin; the fringe brown.—*Female* almost identical with the male, but larger and rather more distinctly marked with black on the primaries.

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

*Hab.* West Australia (*Mus. Druce*).

*Blera peruda*, sp. n.

*Male*.—Head, antennæ, thorax, abdomen, and legs pale brown, the anal tuft grey. Primaries white, crossed near the base from the costal to the inner margin by an olive-green band edged on both sides by a fine black line; the band becomes narrow in the middle and widens again on the inner margin, the inner margin edged with olive-green; a black spot at the end of the cell and an elongated olive-green mark on the costal margin close to the apex: secondaries white, the inner margin shaded with yellowish brown; the fringe white.

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

*Hab.* Venezuela, Merida (*Mus. Druce*).

*Cleapa psecas*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and legs black-brown; abdomen pale brown. Primaries dark brown,



shaded with grey from the middle to the inner margin; a dark brown spot at the end of the cell and a dark brown elongated streak close to the anal angle; the fringe dark brown: secondaries white, broadly bordered with brown.

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

*Hab.* East Africa, Dar-es-Salaam (*Mus. Druce*).

Fam. **Noctuidæ**.

*Gadirtha cristata*, sp. n.

*Male*.—The head, antennæ, collar, tegulæ, thorax, and abdomen dark grey; the underside of the abdomen and legs whitish grey; the first joint of the palpi black, the second and third pale grey. Primaries grey, thickly irrorated with black scales; a black streak in the cell, two below the cell, one beyond the cell, and one close to the apex; a zigzag black line crosses the wing beyond the middle from the costal to the inner margin close to the anal angle, two golden-green streaks on the costal margin, and one near the anal angle; the inner margin near the base is irrorated with golden-green scales; a marginal row of small black dots extends from the apex to the anal angle; the fringe alternately grey and white: secondaries semihyaline white, slightly dusky at the apex, the fringe white.—*Female* very similar to the male.

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

*Hab.* Venezuela, Merida (*Mus. Druce*).

*Gadirtha similis*, sp. n.

*Female*.—The head, collar, and antennæ black; palpi, tegulæ, thorax, and upperside of the abdomen brown; the underside of the thorax, abdomen, and legs black. Primaries greyish brown, palest about the middle; three black bands near the base, the first on the costal margin, the second in the middle, and the third on the inner margin; a fine ring-shaped black mark in the cell and an oval-shaped mark at the end of the cell; below the cell extending to the inner margin are several zigzag dark brown lines; a curved black line irrorated with golden-green scales on the outer side crosses the wing beyond the middle from near the apex to the inner margin; near the apex are several black streaks; the marginal line black; the fringe alternately black and brown: secondaries dark brown, paler at the base and along the inner margin; three small black lines close to the anal angle; the fringe dark brown.

Expanse  $2\frac{3}{4}$  inches.

*Hab.* Venezuela, Merida (*Mus. Druce*).

XII.—*Descriptions of Four new African Freshwater Fishes.* By G. A. BOULENGER, F.R.S.

*Gnathonemus Abadii.*

Depth of body  $3\frac{2}{3}$  times in total length, length of head  $5\frac{1}{2}$  times. Head very slightly longer than deep, with feebly curved upper profile; snout  $\frac{2}{7}$  the length of the head; mouth small, on a line with lower border of eye; chin with a globular dermal appendage; teeth minute, conical, 3 in the upper jaw, 5 in the lower; eye rather large,  $\frac{2}{3}$  the length of the snout, which equals the interocular width. Dorsal 35, originating very slightly in advance of anal, its length  $1\frac{2}{3}$  in its distance from the head. Anal 34, slightly nearer the root of the caudal than the base of the ventral, as long as the head,  $1\frac{3}{4}$  as long as the ventral, reaching far beyond the base of the latter. Caudal scaled in its basal half, with pointed lobes. Caudal peduncle  $3\frac{1}{2}$  times as long as deep, as long as the head. 98 scales in the lateral line,  $\frac{26}{28}$  in a transverse series on the body,  $\frac{21}{20}$  in a transverse series between dorsal and anal, 16 round caudal peduncle. Brownish above, silvery white beneath.

Total length 240 millim.

A single specimen from Djebba, Upper Niger, presented to the British Museum by Capt. G. F. Abadie.

A very distinct species, more nearly allied to *G. Ussheri*, Gthr., and *G. Greshoffi*, Schilth.

*Barilius Loati.*

Depth of body equal to length of head, 4 times in total length. Head twice as long as broad; snout obtusely pointed, projecting strongly beyond the lower jaw,  $1\frac{1}{2}$  to twice as long as the eye, the diameter of which is contained 5 to 6 times in the length of the head,  $1\frac{1}{2}$  to twice in the interocular width; mouth extending to below the posterior third of the eye; no barbels; the naked space between the præopercle and the suborbitals about  $\frac{1}{3}$  the width of the latter. Gill-rakers very short, rudimentary. Dorsal III 7-8, originating at equal distance from the occiput and the root of the caudal, or a little nearer the latter, the second half of its base above the anal; its anterior rays longest,  $\frac{2}{3}$  to  $\frac{2}{3}$  the length of the head. Anal III 13-15, notched, the anterior rays much longer than the others, about as long as the

longest dorsals. Pectoral pointed,  $\frac{3}{4}$  the length of the head, not reaching the ventral, which does not extend beyond the vent. Caudal forked. Caudal peduncle not twice as long as deep. Scales 52-55  $\frac{9-10}{5}$ , 3 between the lateral line and the root of the ventral. 10 to 12 more or less distinct dark vertical bars on each side of the body.

Total length 180 millim.

Several specimens from Wady Halfa, Upper Nile, collected by Mr. W. L. S. Loat.

### *Chrysiichthys Sharpii.*

Depth of body  $5\frac{1}{2}$  times in total length, length of head 4 times. Head much depressed,  $\frac{1}{4}$  longer than broad, nearly smooth above; snout broadly rounded, projecting a little beyond the lower jaw, measuring nearly  $\frac{1}{3}$  the length of the head and  $\frac{2}{5}$  the width of the mouth; eye oval,  $\frac{1}{6}$  length of head,  $\frac{2}{5}$  interocular width; occipital process smooth, a little longer than broad, in contact with the interspinous shield; nasal barbel very thin,  $\frac{2}{3}$  the diameter of the eye; maxillary barbel  $\frac{3}{5}$  the length of the head, not reaching the base of the pectoral spine; inner mandibular barbel  $\frac{2}{3}$  the length of the outer, which measures  $\frac{2}{5}$  the length of the head. Vomeropterygoid teeth forming a crescentic band hardly interrupted mesially, this band measuring nearly half the width of the band of præmaxillary teeth. Dorsal 15; spine finely striated, not serrated, half as long as the head; longest soft ray  $\frac{2}{3}$  the length of the head. Adipose dorsal not longer than deep, its base half that of the rayed fin and 7 times in the distance intervening between the two fins. Anal V 13. Pectoral spine as long as dorsal spine, striated, with 12 rather strong retrorse serræ on the inner edge. Ventral not reaching anal. Caudal deeply forked, with long pointed lobes, the longest rays nearly 3 times as long as the median. Caudal peduncle not quite twice as long as deep.

Total length 370 millim.

A single specimen, a skin, from Lake Mwero, presented to the British Museum by Mr. Alfred Sharpe, C.B.

### *Mastacembelus Greshoffi.*

Depth of body 19 times in total length, length of head 9 times. Vent much nearer the end of the snout than the caudal fin, its distance from the head 3 times the length of the latter. Snout 3 times as long as the eye, which is a little shorter than the trifid rostral appendage; buccal cleft extending to below

anterior border of eye; a strong erectile spine below the nostril; 4 spines at angle of præopercle, upper very strong. Dorsal and anal confluent with caudal, which is pointed; D. XXXI 150; spines short; distance between first spine and head  $\frac{2}{5}$  length of latter; A. II 150. Pectoral  $\frac{1}{3}$  length of head. Scales very small, 15 between origin of soft dorsal and lateral line. Brownish, marked with darker.

Total length 200 millim.

Stanley Pool, Congo. Collected by Mr. Greshoff. The specimen, now in the British Museum, through the kindness of Prof. Hubrecht, had been provisionally referred to *M. cryptacanthus*, Gthr., by Mlle. Schilthuis (Tijdschr. Nederl. Dierk. Ver. [2] iii. 1891, p. 84).

XIII.—*On the Identity of Polytrema planum of Carter with P. miniaceum var. involva.* By FREDERICK CHAPMAN, A.L.S., F.R.M.S.

IN the Ann. & Mag. Nat. Hist. for 1876 Dr. H. J. Carter figured and described \* a species of *Polytrema* found encrusting old corals, which he compared with a spreading *Melobesia* in its habit of growth. In the following year † the same author described other specimens of a similar organism showing a more advanced stage of growth; and observing a relationship between the structure of this and certain adherent types of *Gypsina*, he proposed to drop the former name, both generic and specific (a method opposed to accepted rules of nomenclature), and to re-name the form *Gypsina melobesioides*. The last-named specimens Carter did not figure. A few weeks ago, however, by the kind assistance of Prof. Jeffrey Bell, I was so fortunate as to find, in the Zoological Department of the Natural History Museum, Carter's type specimen, labelled *Gypsina melobesioides*. This specimen has encrusted the lower part of a sponge from Mauritius.

The enveloping form of *Polytrema* which has been found in such abundance in the rocks and reef-deposits of the atoll of Funafuti, and to which I had given the name *Polytrema miniaceum* var. *involva*, is identical with Carter's type specimen. This identification could not be satisfactorily established from the meagre figure of *Polytrema planum* which Carter gives, whilst his reference to the mature

\* Ser. 4, vol. xvii. pp. 211, 212, pl. xiii. figs. 18, 19.

† *Ibid.* ser. 4, vol. xx. p. 172.

organism was not accompanied by any figure. By referring to my description of this foraminifer from Funafuti\*, it will be seen that it plays a very important part in the formation and consolidation of reef-rocks, and under certain conditions forms calcareous nodules as large as or larger than a pigeon's egg by continuous laminar growth. The young form of these extraordinary developments, however, resembles the *Polytrema planum* of Carter. My object in writing this note, therefore, is to withdraw the name *involve* in favour of *P. planum*.

The various forms of *Polytrema* are not alone in making encrusting growths and nodules, for other well-known adherent foraminifera, such as *Gypsina* and *Carpenteria*, encrust and enclose organic particles until they produce more or less spheroidal and elliptical nodules of considerable size; and these I hope to deal with shortly.

XIV.—*Remarks upon the Genus Rhysodes, with Descriptions of some new Oriental Species.* By GILBERT J. ARROW.

THE small Coleopterous family Rhysodidæ, the known species of which are fast becoming numerous, has been separated into various genera according to slight characters, many of which will probably be found insufficient as new forms occur. They will, however, serve for present purposes, if some agreement can be arrived at as to their relative value. The confusion arising from the want of such agreement was largely dispelled by Mr. George Lewis, who published in 1888 a list of the known species. His views, however, have not been entirely adopted abroad, while the adoption of his genus *Epiglymmius* and another (*Rhysodiastes*) since proposed by Fairmaire necessitate, in my opinion, the formation of several more for species exhibiting equally good differential characters. Since commencing this paper I have learnt that M. Grouvelle contemplates the publication of a monograph on the family; and since he has more complete materials than myself, I have reduced my original intention to that of a partial review of the genus *Rhysodes* alone. I shall accordingly leave generic questions entirely to that entomologist, and in the list of species which follows I include all the forms known to me which are distinguished by the possession of wings and the external conformation which accompanies that condition.

\* Journ. Linn. Soc. Lond., Zool. vol. xxviii. (1900) pp. 1 and 17, pl. ii. fig. 3, and text-fig. 2.

Although the family appears to be represented in every part of the world, its geographical distribution has given no support whatever to those who have attempted its classification. It is remarkable that, although the European species described amount only to five, each of the four genera into which the family has been divided is represented among them (for *Clinidium marginecolle*, Reitter, is very near the type of Fairmaire's genus *Rhysodiastes*). The distribution of the Rhysodidæ, indeed, is altogether highly peculiar, Tropical and South America alone seeming to show any individuality in its representatives, which belong only to the apterous section. The South-American *quadristriatus*, though hitherto remaining in *Rhysodes*, also belongs to *Rhysodiastes*, as well as *Clinidium costatum* of Chevrolat (not Guérin, as in Mr. Lewis's catalogue).

Several other rectifications require to be made in the list of species of *Rhysodes* given by Mr. Lewis. *R. proprius*, Broun (wrongly quoted "*probrius*" and referred to p. 215 instead of p. 216 in the 'Manual of New Zealand Coleoptera'), must be removed to *Clinidium*. On the other hand, *R. pensus*, Broun, has been incorrectly transferred to the latter genus as synonymous with *C. arcuatum*, Chev. This is evidently a mere slip, as there is no connexion between the two. *R. pensus* is one of the most easily recognizable species of *Rhysodes*. *R. tubriceps*, Fairm., has already been announced by its author, who was himself responsible for sinking the name, as distinct from *R. canaliculatus*, Cast. No reference to the last species is given by Mr. Lewis; it was described in the 'Revue Entomologique,' vol. iv. p. 56.

Of the new species described here three are from India, and are the first hitherto recorded from that country. The metropolis of the family is evidently the Indian Ocean, where it seems the species will ultimately be found very numerous.

The following table will, I hope, simplify the identification of the new forms: to increase its usefulness I have included all the species of the genus known to me:—

Head with lateral lobes approximating before and behind; median elevation ending posteriorly	
beyond hind border.....	<i>eminens</i> , Broun.
at hind border.....	<i>sulcatus</i> , Fabr.
	<i>comes</i> , Lewis.
before posterior pit.....	<i>strabus</i> , Newm.
	<i>armatus</i> , sp. n.
	<i>crassiusculus</i> , Lewis.
in posterior pit.....	<i>malaiicus</i> , sp. n.
	<i>batchianus</i> , sp. n.
	<i>nicobarensis</i> , Group.

*exaratus*, Serv.  
*americanus*, Lap.  
*malabaricus*, sp. n.  
*quadraticollis*, sp. n.  
*Taprobanae*, Fairm.  
*nipponensis*, Lewis.  
*Boysi*, sp. n.  
*tubericeps*, Fairm.  
*bucculatus*, sp. n.

Head with lateral lobes approximating behind only.

Head with lateral lobes approximating in the middle .....

Head with lateral lobes fused with median elevation .....

*anguliceps*, sp. n.

*pensus*, Broun.

*Rhysodes armatus*, sp. n.

Cylindricus, piceus, parum nitidus; capite post oculos supra et sub-  
 utrinque producto, lobis posterioribus vertice biapproximatis,  
 parvissime punctatis, spatio anteriore elevato brevi, medio con-  
 stricto; prothorace elongato, antice semicirculariter arcuato,  
 postice vix contracto, lateribus medio fere rectis, disco trisulcato,  
 sulcis externis latis, carinis 4 fere parallelis, mediis 2 antice et  
 postice jungentibus; elytris late punctato-striatis; corpore sub-  
 tus grossissime punctato; tibiis anticis apice bidentatis, dente tertio  
 mediano post apicem.

♂, tibiis anticis apice bidentatis, dente tertio mediano post apicem.  
 tibiarum anticarum dente quarto paulo post medium femori-  
 busque anticis medio dentatis, tibiis intermediis et posticis apice  
 lamella longe bispinosa munitis.

Long. 7.5-9 mm.

*Hab.* Andaman and Nicobar Islands.

The specimens were collected by the late Mr. Roepstorff.

This species is very closely related to *R. strabus*, Newm.,  
 of which the type is in the British Museum, but may be  
 distinguished by its rather longer and more parallel-sided  
 prothorax and the coarser punctation in the elytral striae.  
 These two species, together with *R. crassiusculus*, Lewis,  
 differ from all others known to me by the remarkable arma-  
 ture of the legs of the male, as well as by the perforation at  
 the back of the head, which is very small and punctiform  
 and distant from the median elevation. There are also punc-  
 tures upon the smooth parts of the head and thorax, which  
 are characteristic of this small group.

*R. nicobarensis*, Grouv., which inhabits the same islands  
 as *R. armatus*, has a very different head, the median elevation  
 extending into the posterior perforation, which is very large.

*Rhysodes malaicus*, sp. n.

Niger, nitidus, elongatus, capitis lobis prominentibus, supra paulo  
 distantibus, antice et postice leviter convergentibus, spatio mediano

elevato lato, ad loborum medium non attingente, supra oculos carina lævi; prothorace antice semicirculariter arcuato, lateribus curvatis, postice paulo contractis, supra æqualiter quadri-costato; elytris striatis, striis valde et confluentur punctatis, humeris prominentibus; prosterno impunctato, epipleuris prothoracalibus irregulariter punctatis, corporis reliquo subtus grosse punctato, tibiis anticis apice quadri-spinosis.

♂, femoribus anticis medio dentatis; tibiis posticis apice lamella spinosa armatis.

Long. 7.5 mm.

*Hab.* Penang.

The typical specimens, of both sexes, were found by Mr. Lamb. The insect very closely resembles *R. nicobarensis*, Grouv., in which, however, the two outer costæ of the thorax are much narrower than the two inner ones. The punctures of the elytra also readily distinguish the two species, those of the latter having so completely coalesced longitudinally as to be nowhere entirely distinct.

*R. aterrimus*, Chev., which is described from the same region, has, if the very loose description can be relied upon at all, a very differently formed head to that of the present species.

*Rhysodes batchianus*, sp. n.

Niger, nitidus, parum elongatus, capitis lobis fortiter emarginatis, antice paululo convergentibus, spatio mediano postice valde dilatato, fere ad loborum medium attingente, supra oculos carina lævi; thoracis lateribus leviter curvatis, postice perpaulum contractis, dorso subæqualiter quadri-costato, costis internis medio valde dilatatis; elytris conjunctim in latitudine ad thoracem æqualibus, fortiter striato-punctatis; corpore subtus grosse punctato, prosterno epipleurisque prothoracalibus impunctatis, metasterno medio excavato.

Long. 7.5 mm.

*Hab.* Batchian.

I do not know the male of this species, but its distinctive characters are no doubt the same as in the preceding one, to which *R. batchianus* is closely allied. It is much less attenuated, however, and the two inner costæ of the prothorax are thicker in the middle. Similarly, the two outer costæ are thicker than the corresponding parts of *R. nicobarensis*.

*Rhysodes malabaricus*, sp. n.

Niger, nitidus, capite longitudine ad latitudinem æquali, lobis prominentibus, extus paulo planatis, vertice fere circulariter perforato,



elevatione mediana angusta ad foramen attingente; antennis brevibus, articulis 2°, 3° et 4° subglobosis, ultimo paulo elongato, cæteris hemisphæricis; prothorace subovali, lateribus antice et postice incurvatis, disco 4-carinato, carinis latitudine fere æqualibus; elytris punctato-striatis, punctis confluentibus, carina semicirculari ad apicem, humeris paulo rotundatis, singulo dente minutissime armato; prosterno impunctato, epipleuris uniseriatim punctatis; metasterno late longitudinaliter sulcato; abdomine grosse punctato, segmento ultimo crebre; pedum anteriorum tibiis utroque latere bidentatis.

♂, femoribus medio acute dentatis, posticorum tibiis apice fortiter incurvatis.

Long. 6.5 mm.

*Hab.* S. India, Malabar.

The head of this insect is comparatively short and the posterior lobes are broad, very prominent, and appear rather flattened externally owing to the projection of the eyes in front. The antennæ are rather short and thick. The thorax and elytra are similar to those of *R. malaicus*.

*Rhysodes quadraticollis*, sp. n.

Niger, nitidus, compactus, capite haud elongato, longitudine quam latitudinem parum majore, lobis posterioribus intus valde emarginatis, antice vix, postice valde approximatis, elevatione mediana latissima, ad loborum medium attingente; prothorace quadrato, lateribus fere rectis, antice paulo, postice non convergentibus, margine antico parum arcuato, postico truncato, disco toto trisulcato, carinis fere æqualibus, duabus internis medio paulo crassatis; elytris quam prothoracem vix latioribus, humeris haud rotundatis, undique punctato-striatis; pedibus obscure rufis, tibiis anticis intus 4-dentatis.

♂, femoribus anticis medio dentatis; tibiis posticis spinose lamellatis.

Long. 5-7 mm.

*Hab.* Malay Archipelago, Tenimber.

Several specimens of this, collected by Mr. Doherty, have been presented to the British Museum by Mr. George Lewis. It more nearly approaches *R. batchianus* than any other species I know; but its squarely-built form, with almost straight sides to the thorax making a nearly continuous outline with the sides of the elytra, distinguish it from all others.

*Rhysodes Boysi*, sp. n.

Niger, nitidus, depressus, capite trigoni sine carinis aut canaliculis lateralibus, lobis paulo sat profunde emarginatis, foramen parvum

circulari formantibus, elevatione mediana latissima hujus marginem attingente; antennis gracilibus, articulis globosis; thorace elongato, lateribus arcuatis, antice et postice paulo contractis, supra canaliculo medio profundo, sulcis duobus posterioribus decrescentibus ab margine ad medium, striisque tenuis marginalibus; elytris grosse striato-punctatis, interstitio quarto postice valde elevato; corpore subtus fere glabro, tibiis anterioribus quadri-dentatis.

Long. 7 mm.

*Hab.* India.

The above description is drawn up from two specimens, both females, of which one is now in the British Museum and the other in the Hope Department at Oxford. They were collected by Capt. Boys, and, although no record has been kept of the part of India in which they were found, there is good reason for supposing them to have inhabited the Himalayas.

The prothorax in this species is not costate, but furnished with one entire median groove and two tapering depressions extending from the base, where they are very broad, nearly to the middle. It resembles *R. niponensis*, Lewis, but is more depressed, the elytra more deeply sculptured, and the elevated ridges at the apex of the latter much longer, extending about a quarter of their length. The anterior femora are not toothed in the female.

*Rhysodes bucculatus*, sp. n.

Angustus, niger, nitidus, capite elongato, lobis parum prominentibus, parcissime irregulariter punctatis, intus postice convergentibus, elevatione mediana quam latitudinem triplo longiore; prothorace antice semicirculariter arcuato, lateribus postice paulo contractis, angulis fere rectis, disco toto trisulcato, carinis lateralibus angustis; elytris grosse lineato-punctatis; pedibus obscure rufis.

♂, femoribus anticis medio dentatis; tibiis posterioribus apice intus laminato-productis.

Long. 6-7 mm.

*Hab.* Malay Archipelago, Sumbawa.

Several specimens were collected by Mr. Doherty and presented to the British Museum by Mr. George Lewis. This insect is allied to *R. Taprobanae*, Fairm., from Ceylon, but with readily apparent differences. Besides being larger and more elongate, it is uniformly black with the exception of the legs, whereas the Ceylon insect has elytra of a deep chestnut-colour. In the latter, also, the elytra are rather differently sculptured, the punctures being situated in definite

striæ and often confluent. In *R. bucculatus* there is no trace of striæ except adjoining the suture, and the punctures are separate.

*Rhysodes anguliceps*, sp. n.

Niger, nitidus, parum elongatus, capitis lobis intus non emarginatis, lateraliter post oculos acute productis, supra oculos arcuate canaliculatis, elevatione mediana lata non ad loborum medium attingente; antennis longitudine mediocris; prothoracis lateribus antice valde, postice paulo, incurvatis, disco trisulcato, carinis duabus mediis latis; elytris profunde punctato-striatis, humeris non dentatis; metasterno postice impresso, non sulcato, tibiis utroque bidentatis.

♂, femoribus anticis minute dentatis; tibiis posticis apice laminato-productis.

Long. 6·5 mm.

*Hab.* S. India, Malabar.

Specimens of this are contained in the British Museum and in the Hope Department at Oxford. It differs from all the other species known to me by the structure of the head, of which the posterior lobes, instead of being, as usual, more or less kidney-shaped, have a circular outline interrupted only at the sides of the head, where they are rather sharply produced backwards. The curved channel above the eyes on each side is also a very distinctive character.

XV.—*Notes on Diptera from South Africa.*

By Miss GERTRUDE RICARDO.

[Concluded from vol. vi. p. 178.]

**Bombylidæ.**

*Triplasius bivittatus*, Loew, Neue Beitr. iii. p. 7 (1855); id. Dipt. Südafrik. p. 181 (1860).

Loew described the female; this is probably the male. The dividing nerve, which forms three submarginal cells by joining the second longitudinal and the anterior branch of the third longitudinal vein, is only present on one wing. The dark spots on the hind part of the wing in Loew's description are here rather reduced to dark shading of all the cross-veins, with the exception of the one spot in the apex of the first posterior cell and a faint one on the apex of

the anterior branch of the third longitudinal vein. *T. bivittatus* seems nearly allied to *Bombylius lateralis*, Fabr., the shading on the cross-veins and the three submarginal cells being the chief differences.

Group A of Loew.—Species with the greater part of the body black-haired.

a. Long-haired.

? *Bombylius lateralis*, Fabr., Syst. Antl. p. 129 (1805); Wiedem., Dipt. Exot. i. p. 165 (1821); id. Auss. zweifl. Ins. i. p. 337 (1828); Macq., Dipt. Exot. ii. (1) p. 89 (1840); Loew, Neue Beitr. iii. p. 9 (1855); id. Dipt. Südafrik. p. 182 (1860).

Two males from Cape Town (*Cregoe*).

As the specimens are gummed on a card, it is not possible to examine them thoroughly. One of the specimens has the cross-vein dividing the second posterior from the discal cell entirely wanting, evidently only an aberration.

*Bombylius ornatus*, Wiedem., Auss. zweifl. Ins. i. p. 345 (1828); Macq., Dipt. Exot. ii. (1) p. 91 (1840); Loew, Neue Beitr. iii. p. 9 (1855); id. Dipt. Südafrik. p. 182 (1860); Peters, Reise nach Mossambique, Zool. p. 13 (1862).

Six males and two females from Pretoria (*W. L. D.*).

*Bombylius analis*, Fabr., Ent. Syst. iv. p. 48 (1794); id. Syst. Antl. p. 130 (1805); Coquebert, Illustr. Icon. 85 (1799), tab. xx. fig. 5; Wiedem., Zool. Mag. ii. p. 42 (1818); id. Auss. zweifl. Ins. i. p. 331 (1828); Meigen, Syst. Besch. vii. p. 213 (1838); Loew, Dipt. Südafrik. p. 183 (1860); Karsch, Ent. Nachr. xii. p. 53 (1885).

♀. *Bombylius discoideus*, Fabr., Ent. Syst. iv. p. 409; id. Syst. Antl. p. 130; Coquebert, *l. c.* fig. 6.

*Bombylius thoracicus*, Fabr., Syst. Antl. p. 130.

*Bombylius suffusa*, ♀, Walker, List Dipt. ii. p. 275.

Eleven males and thirteen females from Pretoria (*W. L. D.*) and Johannesburg (*Cregoe*). The Walker type is from Sierra Leone and is identical with the female of *analis*. In some of the male specimens the hairs on the apex of the abdomen are more or less fulvous.

*Bombylius fulvonotatus*, Wiedem., Zool. Mag. ii. p. 41 (1818);  
id. Dipt. Exot. i. p. 162 (1821); id. Auss. zweifl. Ins. i.  
p. 332 (1828).

One male from Rustenburg (*Kranz*).

*Systæchus mixtus*, Wiedem., Dipt. Exot. i. p. 165 (1821);  
id. Auss. zweifl. Ins. i. p. 336 (1828); Loew, Neue Beitr.  
iii. p. 52 (1855); id. Dipt. Südafrik. p. 189 (1860).

*Bombylius mixtus*, Wiedem., l. c.

*Bombylius scutellaris*, Wiedem., Auss. zweifl. Ins. i. p. 343.

*Bombylius scutellatus*, Macq., Dipt. Exot. ii. (1) p. 94.

One male and four females from Pretoria (*W. L. D.*).  
Two of the females are much denuded.

*Systæchus albidus*, Loew, Dipt. Südafrik. p. 190 (1860);  
Karsch, Ent. Nachr. xii. p. 55 (1885).

Three males from Pretoria (*W. L. D.*).

*Systæchus simplex*, Loew, l. c.; Schiner, Reise der Novara,  
p. 137 (1866).

One male from Cape Town.

*Systæchus*?, sp. n.

One female from Angola in bad condition.

*Corsomyza nigripes*, Wiedem., Nov. Dipt. gen. 15 (1820);  
id. Dipt. Exot. i. p. 159 (1821); id. Auss. zweifl. Ins. i.  
p. 328 (1828); Loew, Dipt. Südafrik. p. 198 (1860);  
Schiner, Reise der Novara, p. 139 (1866).

One male from Cape Town.

*Lomatia acutangula*, Loew, Dipt. Südafrik. p. 203, tab. ii.  
fig. 10 (1860).

Two females from Pretoria (*W. L. D.*).

*Lomatia pictipennis*, Wiedem., Auss. zweifl. Ins. i. p. 302  
(1828); Macq., Dipt. Exot. ii. (1) p. 62 (1840); Loew,  
Dipt. Südafrik. p. 205, tab. ii. fig. 12 (1860).

*Anthrax pictipennis*, Wiedem., l. c.

*Anisotamia centralis*, Macq., Dipt. Exot. ii. (1) p. 82.

*Anthrax aurata*, Macq., l. c. Suppl. 1, p. 111.

Two males and one female from Namaqualand (*Cochrane*);  
Pretoria (*Zutrzenka*); Johannesburg.

*Lomatia? liturata*, Loew, Dipt. Südafrik. p. 205, tab. ii. fig. 13 (1860).

Two males from Barberton (*W. L. D.*; *Rendall*).

These are labelled thus with a query by Osten Sacken (1895); they are in too poor condition to identify with certainty.

*Lomatia nigrescens*, sp. n.

Two males from Pretoria (*W. L. D.*).

Belongs to Division III. of Loew, species with clear wings, and is allied to *L. tenera*, Loew (Dipt. Südafrik. p. 208).

Black, with black hairs on the face and white pubescence on the thorax and abdomen.

Face wholly black with black hairs, with the exception of a small tuft of white hairs between the antennæ. Eyes subcontiguous. Antennæ with black pubescence. Thorax with yellowish hairs on the anterior border, sides and upper parts of breast, with scattered white hairs on the dorsum and scutellum and on the upper surface of the abdomen, and tufts of white hairs on the sides of the latter, those on the last segments black. Underside with scattered long white hairs. Legs with black pubescence. Wings yellow at extreme base, the auxiliary and first longitudinal vein yellow, the others brown; the small cross-vein situated on the last third of the discal cell; the first posterior cell nearly the same width throughout.

Length 7 millim.

Type (male), Pretoria (*W. L. D.*).

*Anthrax fulvipes*, Loew, Dipt. Südafrik. p. 210, tab. ii. fig. 14 (1860).

One male from Pretoria (*W. L. D.*).

*Argyromæba spectabilis*, Loew, Dipt. Südafrik. p. 213 (1860); Karsch, Ent. Nachr. xii. p. 55 (1885).

*Anthrax spectabilis*, Loew, *l. c.*

? *Anthrax pithecius*, Fabr., Syst. Antl. p. 122; Wiedem., Dipt. Exot. i. p. 125; id. Auss. zweifl. Ins. i. p. 363.

? *Anthrax confusemaculatus*, Macq., Dipt. Exot. Suppl. 5, p. 74, tab. iii. fig. 9.

One male from Pienaars River (*W. L. D.*); one ? male from Natal.

## EXOPROSOPA, Macq.

The figures of the *Exoprosopa* species in Table II. of Loew's Dipt. Südafrik. are incorrectly given in the letterpress in many instances, and should stand thus :—

- E. maculosa*, fig. 42.
- E. venosa*, fig. 41.
- E. balioptera*, fig. 40.
- E. rasa*, fig. 39.
- E. angulata*, fig. 37.
- E. umbrosa*, fig. 36.
- E. corvina*, fig. 35.
- E. reticulata*, fig. 34.

I have followed the grouping of the species given by Loew, as forming a convenient classification.

## Division I.

- B. Wings obliquely bordered with black on the anterior half and the posterior half clear.

*Exoprosopa dimidiata*, Macq., Dipt. Exot. Suppl. 1, p. 107, tab. ix. fig. 11 (1846); Loew, Dipt. Südafrik. p. 225 (1860).

Four females from Pretoria (*W. L. D.*) and Barberton (*Rendall*).

These agree with Loew's description, with the exception that the colour of the first two joints of the antennæ and of the legs is more reddish brown than black.

*Exoprosopa eluta*, Loew, Dipt. Südafrik. p. 227, tab. ii. fig. 25 (1860).

Eight males and three females from Pretoria (*W. L. D.*) and Warm Baths, Waterberg.

In some of the specimens the shading of the wing is very faint when it reaches the second basal cell; in one specimen there is an extra cross-vein on the basal half of the first posterior cell in one wing only; in another the stump of a vein is emitted into the discal cell from the angle of the cross-vein which divides it from the third posterior cell. The third joint of the antennæ (wanting in Loew's type) is the same colour as the others.

*Exoprosopa parva*, sp. n.

Two males and two females from Pretoria and Pienaars River (*W. L. D.*).

Black, with red face, scutellum, and sides of abdomen.

Face black in the centre, with long white hairs and yellowish scaly hairs; forehead black, with black pubescence and yellowish scaly hairs. Antennæ black, the first two joints with black hairs, thickest on the lower side. Proboscis not extending beyond the oral opening. Hind part of head with silvery-white scaly hairs, the collar composed of brownish-yellow hairs, becoming white below. The thorax has some yellow-brown scaly hairs, with long yellowish hairs on the shoulders and at the sides, and white ones at the base of wing and on the posterior half; the pubescence on the breast-sides consists of white hairs, with some yellow ones intermixed. Scutellum red, black at the base, with yellowish scaly hairs and white pubescence, bordered with black bristles. Abdomen blue-black, from the second segment onwards bordered laterally with red, with black pubescence and yellowish scaly hairs, the latter being thickest on the sides; on the anterior border of the second segment is a narrow band of white hairs and on the posterior margin of the last segment a yellowish white fringe of hairs: the hairs at the sides of the abdomen are whitish, thickest on the first two segments; some black hairs are intermixed on the last segments. Underside of abdomen red, with whitish pubescence. Legs red, all the coxæ, the anterior femora, the apex of the anterior tibiæ, and all the tarsi black; the pile on the legs is whitish.

Wings grey, with faint brown shading on the fore border, much fainter than that of *eluta*, Loew, not reaching beyond the second basal cell, from the apex of which it extends in a sloping line to the fore border where the auxiliary vein ends; veins brown, the base of the second longitudinal vein is just below the small cross-vein, the first posterior cell is somewhat narrowed at its opening, the second and third about equal in width. In the second male specimen the shading of the wing is fainter than in the type.

Length 9 millim.

Type (male), Pretoria (*W. L. D.*); type (female), Pretoria (*W. L. D.*).

The two females I believe to be the female of this species vary thus from the males:—The first two joints of the antennæ are reddish; the abdomen wholly black, with the exception of a square red mark on each side of the second



segment; the hairs at the sides of abdomen are not so thick and the band on the second segment not so distinct; the underside is red only at the base, then black, with white pubescence. Legs rather darker.

This species is nearly allied to *Exoprosopa indecisa*, ♂, Walker, the single specimen of which (the type) is in the British Museum collection.

*Exoprosopa unifasciata*, sp. n.

Type (female), from Pretoria (*W. L. D.*).

Black, with reddish face, antennæ, legs, and scutellum.

Face red, black beneath, the antennæ with black pubescence and traces of yellow scaly hairs; the forehead black, with yellow scaly hairs and black pubescence. Antennæ reddish, the first two joints with black pubescence. Hind part of head with greyish scaly hairs; the collar consists of yellowish-brown hairs. Thorax with yellowish scaly hairs and yellow hairs at the sides; black bristles and black hairs at the base of wings. Breast-sides with sparse yellow and black pubescence. Scutellum red, black at the extreme base, bordered with black bristles and with greyish tomentum. Abdomen black, with a band of white hairs on the anterior border of the second segment, traces of white scaly hairs on the sides of the other segments and on their posterior borders; pubescence black, and at the sides of abdomen, except the first segment, where it is white; there is a trace of a red spot on the side of the second segment; underside black, shining, with greyish pubescence on the basal half only. Legs reddish brown, with black pubescence and bristles.

Wings grey, with dark brown shading on the fore border not quite reaching the junction of the auxiliary vein with the border, extending to the second basal cell, but so faint in that cell that the cross-veins enclosing it seem spotted, the dark shading round them being very conspicuous, so that the wing at first sight might belong to Division G of Loew. The discal cell is almost clear except at its base and along its anterior side bordered by the fourth longitudinal vein; the base of the second longitudinal vein is just below the small cross-vein; the first posterior cell is somewhat narrowed at its opening, the second and third about equal in width.

Length  $10\frac{1}{2}$  millim.

C. Wings with a black cross-band which extends to the hind border, and unites on the fore border with the extended dark shading of the base of the wing.

b. The edges of the cross-band with sharp indentations (proboscis elongated).

*Exoprosopa macroptera*, Loew, Dipt. Südafrik. p. 230, tab. ii. fig. 29 (1860).

One female from Pretoria (*W. L. D.*).

The first two joints of the antennæ are red, not black-brown as in the type described by Loew; the red-brown colour mentioned by him as occurring on the breast and base of underside of abdomen is not apparent in this specimen, and there is none on the upperside of abdomen; the white line on the hind border of the first segment in the type is here on the fore border of the second segment; a tuft of white hairs on the lower part of the thorax above the base of the wings is very noticeable in this specimen.

One male from Pretoria (*W. L. D.*).

Similar to the above, but it has reddish spots on the sides of the second and third segments, and the face is darker than in the female.

*Exoprosopa nyasæ*, sp. n.

Four males and two females from Fort Johnston, Nyasaland (*Rendall*).

Red, with a black dorsal line on the abdomen.

Face yellowish brown, with black pubescence and whitish scaly hairs. Antennæ with black hairs on the first two joints, which are red; the third joint brown; the bristle is stout and enlarged at the point, and longer than the third joint. Proboscis not quite so long as the fore femora and tibiæ together. Hind part of head red, darker in the centre, with white scaly hairs bordering the eyes. The collar is composed of yellow-brown hairs, with a few black ones intermixed. Thorax brown, with black pubescence and bristles and yellowish scaly hairs; the pubescence on the sides, the breast, and above the halteres consists of yellow-brown hairs and a few black ones, and a white tuft above the base of the wings. Scutellum reddish, black at the base. Abdomen bright red, with the first segment black, and a dorsal black stripe, consisting of triangular spots with their bases on the fore borders and their apices on the hind borders of the segments, diminishing in size and extending from the second to the sixth segment, becoming fainter on the last two; the last segment

is wholly red; there is a short line of white scaly hairs on the posterior border of the first segment, and on the anterior border of the second, and an oblong spot of thick white scaly hairs on the posterior border of the third segment; the last two segments are more or less covered with white scaly hairs; the pubescence on the dorsum of abdomen consists of short black hairs; on the sides the hairs are white on the first segment and black on all the others. Underside of abdomen red, the dorsal black stripe faintly marked, the pubescence black, with white pile. Legs red, with black pubescence and bristles.

The shading of the wings is allied to that of *E. macroptera*, but the band on attaining the margin only borders it for a short distance, from the junction of the vein dividing the second and third posterior cell to half the width of the latter (in one of the specimens it extends through three quarters of the width of the cell and above its junction with the second posterior); on its upper border it does not extend so high, not reaching the base of the anterior fork of the third vein; when it reaches the second longitudinal vein it makes a sharp turn and follows the bend of the second longitudinal vein to where it ends in the border of wing, extending a little beyond it, and entirely filling up the space enclosed by the vein; the colouring of the shading is brown and the veins brown; the vein dividing the second and third posterior cell is curved more at its upper than its lower end, differing in this from *macroptera*.

Length 13 millim.

Types (male and female), Fort Johnston, Nyasaland (*Rendall*).

The female is similar to the male, with the exception of the abdomen, which is darker; from the fourth segment the black colour entirely predominates; the scaly hairs are yellow and more abundant; the underside is red, with yellowish pubescence, only a few black hairs being intermixed, and the scaly hairs are yellow.

Length 12 millim.

*Exoprosopa basalis*, sp. n.

Type (male), from Figtree Creek, Barberton (*Rendall*), resembles the above species, but the wing is different, nearly the same as that of *E. macroptera*, and the abdomen is redder.

Abdomen with the first segment red at the sides, the black triangular spots do not extend beyond the fifth

segment; the underside is entirely red with light yellow pubescence, and black hairs at the apex. The wing differs from *E. macroptera* in the following particulars:—The base is almost entirely clear, only dark at its root, the dark part divided from it distinctly by its straight transverse border, on its upper border where it meets the clear part it does not form an S-shaped line, but a straight one across, not reaching beyond the base of the third posterior cell; the dividing vein between the first and second submarginal cells is formed with a sharp angle in its centre; the shading is brown and the veins brown.

Length 13 millim.

D. Wings with a black cross-band which does not reach the hind border, but unites on the fore border with the extended dark shading of the wing.

a. The cross-band simple.

*Exoprosopa ignava*, Loew, Dipt. Südafrik. p. 232, tab. ii. fig. 31 (1860).

Ten females from Pretoria (*W. L. D.*); Barberton (*W. L. D.*); Warm Baths, Waterberg.

The stump of the vein emitted into the discal cell is very variable, in some of the specimens not being present at all, or only on one wing, and when present it varies in position. The proboscis, in one specimen at least, is as long as in the figure of *Exoprosopa (Litorhynchus) hamatus* (Macq., Dipt. Exot. ii. p. 79, pl. xv. fig. 2), but is identical in all other respects with the others of the series: see Loew, *l. c.* pp. 223 & 232, on the length of the proboscis, which he does not consider a trustworthy specific character.

*Exoprosopa elongata*, sp. n.

Two males from Pretoria; one female from Namaqualand (*Cochrane*).

Black, face with the part bordering the mouth yellow; the underside of abdomen dull yellow-brown, the greater part of the scutellum dull red.

Face dull black, with black pubescence and whitish scaly hairs; the antennæ black, the underpart of the third joint yellowish, the third joint nearly as long as the two preceding ones together, the bristle stout, little more than half as long as the third joint. Proboscis not extending beyond the mouth. Hind part of the head with white scaly hairs bordering the eyes, the collar of bright orange-yellow hairs;

the pubescence on the sides of the thorax, on the breast, and before the halteres almost wholly yellow; there are a few black hairs on the centre of the breast and on the sides of the thorax above the yellow ones. Thorax with black pubescence and some yellow scaly hairs. Scutellum black at base, on the fore border dull red with black pubescence. Sides of abdomen with white hairs on the first, and anterior border of the second, segment, black on the others. The pubescence on the abdomen is black, with white scaly hairs on the sides of the segments from the second to the sixth, there are red spots to be seen on the second and third where the hairs seem rubbed off; underside dull yellow-brown, darker at the apex, with long yellow hairs on the anterior, and black ones on the posterior, segments, and yellow scaly hairs on the basal half. Legs black, with long black pubescence on the anterior coxæ. Wings similar to those of *E. morosa*, Loew (*l. c.* tab. ii. fig. 30), except in the following particulars:—There is no stump of a vein projecting into the discal cell; the small cross-vein is in the middle of the discal cell and the base of the second longitudinal vein is just opposite it; the second, third, and fourth posterior cells are about equal in width at their openings; the dark shading from the base extends higher up well over the base of the third posterior cell, the clear spot in the second basal cell is large and nearly square.

Length 12 millim.

Types, male, Pretoria (*W. L. D.*); female, Namaqualand (*Cochrane*).

The female is in poor preservation; the underside of the abdomen is black, with long yellow hairs on the basal half and black ones on the apex.

*b.* The cross-band divided into two parts posteriorly.

*Exoprosopa hirtipes*, Loew, Dipt. Südafrik. p. 233, tab. ii. fig. 32 (1860).

One female from Durban (*W. L. D.*).

*E.* Wings with a faint, extremely imperfect, and indistinct band which resolves itself into a dark shading of the cross-veins, on the fore border it unites with the extended dark shading of the base of the wings.

*Exoprosopa dux*, Wiedem., Auss. zweifl. Ins. i. p. 269 (1828); Loew, Dipt. Südafrik. p. 235 (1860).

One male from Pretoria.

Loew's remark no. 2 (*l. c.* p. 235), concerning the erroneous description of the bands of the abdomen of *E. heros* by Wiedemann, also applies to this species, which Loew suggests may be only a variety of *E. heros*, from which it differs in the lesser shading of the wing, which hardly extends into the anal cell.

- G. Wings with dark shading on the fore border and through dark shading of the cross-veins (not the longitudinal veins also) more or less spotted.

*Exoprosopa major*, sp. n.

Type (female) from Fort Johnston, Nyasaland (*Rendall*).

Black, scutellum and posterior borders of abdomen dull red.

Face with black pubescence and yellow scaly hairs. Antennæ black: the third joint a little longer than the first, the second short, the bristle stout, as long as the third joint. Hind part of head with white scaly hairs bordering the eyes on the sides, yellow in the centre. Collar composed of yellow hairs. The pubescence on the sides of the thorax, on the breast, and above the halteres yellow, with a few black hairs above the yellow on sides of thorax; bristles of thorax black. Thorax with some short black pubescence and some yellow scaly hairs. Scutellum dull red, black at the base and in the centre. Abdomen dull black, the posterior borders of segments from the third one red, on the sides of the second and third are red spots; the pubescence black, with yellow scaly hairs on the sides of all the segments and some long yellow hairs on the first two segments; the sides of abdomen with light yellow hairs on the first and on the anterior border of the second and third segments, black hairs intermixed with some yellow ones on the remaining segments; underside of abdomen black and red, with long light yellow pubescence. Legs black, the posterior ones with yellow scaly hairs.

Wings grey, the dark shading on the fore border is yellowish brown in colour, extending along the first longitudinal vein to its junction with the border, and on its inner side from the base of the second longitudinal vein almost to where the cross-vein of the submarginal cell joins the latter vein; at the base it fills the first basal cell; only the cross-vein at the base of the fourth posterior cell and the first part of the vein at the base of the third posterior cell, with the one dividing the first basal cell from the first posterior cell, are shaded; the small cross-vein is in the

middle of the discal cell and the base of the second longitudinal is opposite it, the first posterior cell is slightly narrowed at its opening.

Length 17 millim.

I. Wings clear at base, the fore border with dark shading from which a dark band crosses the wing attaining the posterior border.

This species is distinguished by the wings, which apparently differ from any South African *Exoprosopa* species as yet described, and requires a new group in Loew's Division I., defined as above.

*Exoprosopa nova*, sp. n.

Two males from Fort Johnston, Nyasaland (*Rendall*); one female from Delagoa Bay (*Mrs. Monteiro*), in the British Museum Collection.

Black, with red on the sides and apex of abdomen, red scutellum, and reddish-yellow face.

Face red, light yellow round the mouth, pubescence black and yellow on the red parts, light yellow round the mouth, with bright yellow scaly hairs; forehead black on the vertex, with a narrow black stripe on each side bordering the eyes nearly as far as the antennæ, pubescence black. Antennæ black, the first two joints with black hairs; the bristle stout, as long as the third joint. Hind part of head with yellow scaly hairs. Collar of bright yellow hairs. The sides of thorax and above the halteres with yellow pubescence and a few black hairs above; breast with paler yellow hairs. Thorax blackish brown, with yellow scaly hairs. Scutellum red, black at the base, with yellow scaly hairs and black bristles. Abdomen black, with red on the lateral borders of all the segments except the first, and with a narrow red band on the posterior borders, broader on the fifth and sixth, the seventh segment is wholly red; pubescence black, with some yellow scaly hairs, which are most noticeable on the sides and on the last two segments; sides of abdomen with yellow hairs on the first two segments, black on the remainder; underside red, with thick and fairly long white pubescence. Legs black, with yellow scaly hairs on the femora and tibiæ; pubescence and bristles black.

Wings grey, yellowish red at the extreme base and on the fore border, not quite reaching the junction of the first longitudinal vein in the border; the dark brown band extends in an oblique direction to the posterior border, filling the first third of the first posterior cell, nearly the half of the discal and fourth posterior cells, the base of the third posterior and

the upper half of the anal cell, the lower half of the latter and almost the whole of the second basal cell being clear; veins yellowish red on the basal half, and then brown; the small cross-vein is in the middle of the discal cell, and the base of the second longitudinal is below it, the first posterior cell is narrowed at its opening.

Length 14 millim.

Types, male, Fort Johnston; female, Delagoa Bay, in British Museum Collection.

The female differs slightly in the wing, but is evidently the same species. The pubescence on the first two joints of the antennæ is yellow on the underside; the red on the abdomen is not so marked, being chiefly on the second and third segments, the last two are black with the posterior borders red. The wings are paler in colour, the yellowish red becoming faint brown, and there is dark shading round the vein which divides the discal from the second posterior cell, not present in the male.

Length 13 millim.

Division II.—The discal cell with an angle, from which a branch is emitted into the third posterior cell.

*Exoprosopa angulata*, Loew, Dipt. Südafrik. p. 242 (1860).

One male from Cape Town.

Division III.—The discal cell with an angle, from which a vein is emitted which divides the third posterior cell into two cells.

*Exoprosopa dubia*, sp. n.

Four males and five females from Pretoria (*W. L. D.*).

The wing is very similar to that of *E. reticulata*, Loew. Black.

Face with black pubescence and white scaly hairs. Antennæ with black hairs on the first two joints; the bristle short and stout, barely half as long as the third joint. Hind part of head with some white scaly hairs. Collar composed of yellow hairs above, black beneath; the pubescence on the sides of the thorax and on the breast is black, with a few yellow hairs on the anterior part of the thorax, on the dorsum of the thorax it is black, with yellow scaly hairs forming a stripe on the extreme lateral margins. Scutellum with black bristles and some yellow scaly hairs. Abdomen with white hairs on the side of first segment, and black on the others; on the dorsum the white scaly hairs are chiefly on the sides of the segments, the last two are almost entirely



covered by them, and in some specimens there are a few scattered ones on the posterior borders of the middle segments; pubescence black: the underside is black with the posterior margins narrowly red, the pubescence consisting of long black hairs and some greyish tomentum. Legs black.

Wings dark brown, becoming lighter on the posterior border, with a light spot in the second basal cell; there is an irregular long, narrow, clear stripe in the centre of the discal and anal cells, the apex of the wing is quite clear; there are spots of darker shading on the anterior part of the vein between the first and second submarginal cells, on the root of the fore branch of the third longitudinal vein, on the upper part of the vein dividing the discal from the second posterior cell, a faint one on the base of the nerve between the second and third posterior cells, one at the base of the inner part of the third posterior cell, and one on the cross-vein dividing the second basal cell from the fourth posterior, one encloses the cross-vein between the third and fourth longitudinal veins, and one occurs at the base of the second longitudinal vein; in some of the specimens there is a faint spot on the end of the second longitudinal vein; veins brown, the small cross-vein is in the centre of the discal cell, and the root of the second longitudinal is just below it; the first posterior cell is half as wide as the second posterior at its opening, the third at its opening is only a little wider than the second and about the same width as the fourth.

Length 12 millim. Some of the specimens measure only 9 millim.

Types (male and female), Pretoria (*W. L. D.*).

The female type has an extra faint spot on the end of the upper branch of the third longitudinal vein, besides one on the end of the second longitudinal.

Length 9 millim.

#### HYPERALONIA.

Rondani, *Archiv. Zool. Canestr.* iii. p. 57 (1863); Osten Sacken, *Biol. Centr.-Am., Dipt.* i. pp. 78-80 (1886).

In this species a tooth at the base of the ungues on the posterior legs is present, as in *Exoprosopa*, so that the absence of these cannot be taken as a characteristic of the genus, as suggested by Osten Sacken in *Biol. Centr.-Am.*, where he remarks that no species from the Cape had yet been discovered.

*Hyperalonia vittata*, sp. n.

Three males and three females from Fort Johnston, Nyasaland (*Rendall*).

Allied to *H. rufa*, Wiedem., from S. Africa (Auss. zweif. Ins. i. p. 291).

Reddish, with dark wings, the cross-veins shaded.

Face red, pale yellow round the mouth, with yellow scaly hairs and some black hairs above the mouth and between the antennæ; these last red, the third joint brown, the first two joints with short black pubescence; forehead darker, with yellow scaly hairs and black pubescence; palpi yellow. Hind part of head reddish, with short black pubescence and yellow scaly hairs. Thorax dull black, the posterior corners red, with orange-yellow pubescence on the sides and anterior margin and scattered fulvous pile on the dorsum with some black hairs, bristles at the sides black; breast-sides with yellow pubescence. Scutellum dull red, black at the extreme base; the pubescence black, and black bristles. Abdomen dull red, with a central black stripe, widest on the first segment and ending on the sixth, rather densely covered with fulvous pile and some black pubescence; the sides of the first three segments with thick yellow hairs, on the sides of the remaining segments a few black hairs: underside of abdomen red, with light yellow pubescence. Legs red, the last three joints of the posterior tarsi more or less black, all the tarsi of the anterior and middle legs black; on the red-coloured part with yellow pile and on the black part of legs with black pubescence; bristles black.

Wings brown, lighter at the apex and on the posterior border, all cross-veins shaded; the first posterior cell narrowed at its opening, the second a little narrower than the third, and the fourth widest of all; the anal cell narrowed.

Types (male and female), Fort Johnston, Nyasaland (*Rendall*).

The female has the dorsal black stripe on abdomen a little broader, the posterior border of the thorax is red and the wings a little lighter.

Length 15 millim. There is a great variation in size in this species, one of the males and two females measuring only  $10\frac{1}{2}$  millim.

## Nemestrinidæ.

(Hirmoneuridæ, Loew.)

*Prosæca Westermanni*, Wiedem., Dipt. Exot. i. p. 155 (1821);  
id., Auss. zweifl. Ins. i. p. 247 (1828); Schiner, Reise  
Novara, p. 113 (1866).

*Nemestrina Westermanni*, Wiedem., l. c.

Three males and one female from Barberton (*Harrison*,  
*Rendall*) and Pretoria (*W. L. D.*).

? *Prosæca*, sp.

One male, antennæ wanting, from Barberton (*Harrison*).

## NEMESTRINA sensu lato.

Two female specimens from "near Eureka, Barberton"  
(*Rendall*), with two-jointed antennal bristle, which precludes  
their inclusion in *Prosæca*, Schiner, and the shape of the  
palpi, which are thick and apparently two-jointed, prevents  
their being included in *Rhynchocephalus*, Fisher.

## Cyrtidæ.

*Psilodera fasciatus*, Wiedem., Zool. Mag. iii. p. 14 (1819);  
id., Auss. zweifl. Ins. ii. p. 14 (1828); Loew, Dipt. Süd-  
afrik. p. 257 (1860).

*Cyrtus fasciatus*, Wiedem., l. c.

*Psilodera fasciata*, Erichson, Entomogr. p. 146.

*Psilodera capensis*, Gray, Griff. Anim. Kingd., Ins. xv. tab. 128. fig. 4;  
Westwood, Trans. Ent. Soc. v. p. 92.

One male from Barberton (*Rendall*).

This agrees with Wiedemann's and Loew's descriptions,  
but the third posterior cell is pedunculated; Loew expressly  
states it is not, and that it is thus distinguished from *cingu-  
lata*, Loew, and *bipunctata*, Wiedem.

A specimen labelled *fasciata* in the British Museum Col-  
lection is identical with the above specimen, but has the cell  
pedunculated; it seems probable that this is a character that  
varies in this species.

*Syritta*?, sp. n.

One male from Pretoria (*W. L. D.*).

Allied to *S. flaviventris*, Macq., Dipt. Exot. ii. (2) p. 75,  
and Schiner, Reise Novara, p. 367, but apparently distinct  
from it; as Schiner states that Macquart's species possess no  
tooth-like spines on the hind femora, and this specimen has  
them.

*Eristalis crassipes*, Fabr., Syst. Antl. p. 137 (1805); Wiedem., Auss. zweifl. Ins. ii. p. 157 (1828); Macq., Dipt. Exot. ii. (2) p. 31, tab. 8. fig. 1 (1840); Loew, Dipt. Südafrik. p. 322 (1860); Peters's Reise, p. 16 (1862).

*Simoides crassipes*, Loew, Cefvers. af K. Vet.-Akad. Förhandl. 1857, p. 382.

*Eristalis pachymerus*, Wiedem., Zool. Mag. iii. p. 17.

Three females from Fort Johnston, Nyasaland (*Rendall*), and Barberton (*Rendall*).

*Eristalis assimilis*, Walker, List Dipt. pt. iii. p. 611 (1849).

*Eristalis capito*, Loew, Dipt. Südafrik. p. 321.

Five males from Pretoria (*W. L. D.*) and one male and one female from Fort Johnston, Nyasaland (*Rendall*).

These are exactly similar to Walker's type, and also agree exactly with the description of *E. capito* given by Loew, placed in his Div. I. group *b* (*Megaspis*). Walker's name must therefore take precedence, but Loew's description will hold good.

*Eristalis curtus*, Loew, Dipt. Südafrik. p. 319 (1860).

Two males and four females from Pretoria (*W. L. D.*); one male and one female from Fort Johnston, Nyasaland (*Rendall*).

*Eristalis taniops*, Wiedem., Zool. Mag. ii. p. 42 (1818); id. Auss. zweifl. Ins. ii. p. 182 (1828); Loew, Dipt. Südafrik. p. 324 (1860).

*Helophilus pulchriceps*, Mg., Syst. Beschr. iii. p. 375; Macq., Suites à Buff. i. p. 505.

*Eristalis pulchriceps*, Germar, Faun. xxiii. tab. 22.

*Eristalis torridus*, Wlk., List Dipt. iii. p. 612.

*Eristalis aegyptius*, Wlk., l. c. p. 621.

Three females from Barberton (*Rendall*) and Pretoria (*W. L. D.*).

Loew pointed out that *E. aegyptius*, Wlk., is identical with this species, and I believe the same to be the case with *E. torridus*, Wlk., on comparing the type in the British Museum Collection.

*Plagiocera hæmorrhœa*, Gerst., Decken's Reise, p. 391, pl. xvi. fig. 6 (1873).

Two females from Uganda (*Ansorge*) and Fort Johnston.

*Asarkina salviæ*, Fabr., Ent. Syst. iv. p. 306 (1794); Syst. Antl. p. 250 (1805); Loew, Dipt. Südafrik. p. 311 (1860); Verrall, Trans. Ent. Soc. Lond. 1898, p. 414.

One male from Durban (*W. L. D.*).

## MUSCARIA SCHIZOMETOPA.

## Group GONIIDÆ.

Brauer, Denk. Akad. Wiss. Wien, lvi. pt. i. p. 100 (1889),  
lviii. pt. ii. p. 353 (1891).

*Gonia bimaculata*, Wiedem., Auss. zweifl. Ins. ii. p. 344 (1828).

Two specimens from Barberton (*Rendall*) and Pretoria (*W. L. D.*).

*Pseudogonia nigra*, Macq., Dipt. Exot. ii. p. 49 (1838).

*Gonia nigra*, Macq., *l. c.*

*Gonia fasciata*, nom. præocc., Wiedem., Auss. zweifl. Ins. ii. p. 344 (1828); Brauer, *op. cit.* lviii. pt. ii. p. 403 (1891).

One female from Pretoria (*W. L. D.*).

## Group HYSTRICIDÆ.

Brauer, *op. cit.* lvi. pt. i. p. 132, lx. pt. iii. note 27 (1893).

*Dejeania bombylans*, Fabr., Ent. Syst., Suppl. p. 568 (1798); Coquebert, Illustr. Icon. Ins. 115, tab. xxv. fig. 16 (1799); Fabr., Syst. Antl. p. 281; Wiedem., Auss. zweifl. Ins. ii. p. 286; Macq., Dipt. Exot. ii. p. 34 (1840); see Karsch, Ent. Nachr. xii. p. 338 (1886).

*Stomoxys bombylans*, Fabr., *l. c.*

*Tachina bombylans*, Wiedem., *l. c.*

*Dejeania capensis*, Rob. Desv. Myodaires, p. 314 (1830).

*Dejeania variabilis*, Jaenicke, Abh. Senck. Gesell. vi. p. 393, pl. xlv. fig. 9.

Four specimens from Barberton (*Rendall*); Transvaal, Natal Frontier, Pretoria (*W. L. D.*).

## Group SCHINERIA.

Brauer, *op. cit.* lvi. pt. i. p. 141 (1889).

One female with bright red abdomen from Barberton (*Rendall*) allied to *Paraphania diabolus*, Wiedem. (*Tachina*), Dipt. Exot. ii. p. 302, placed by Brauer in his genus *Paraphania*, but cannot be included in that genus, the palpi being somewhat different, and the first posterior cell is closed at

the border, not open as in *Paraphania*; there is no stump of a vein on the bend of the fourth longitudinal vein. It will apparently require a new genus.

*Paraphania*, Brauer, is now said to be identical with *Orectocera*, v. d. Wulp, in which it should be sunk.

#### Group SARCOPHAGIDÆ.

Brauer, *op. cit.* lvi. pt. i. p. 121, lviii. pt. ii. p. 413.

*Sarcophaga? hæmorrhoidalis*, Meig., Syst. Besch. v. p. 28 (1826); Karsch, Ent. Nachr. xii. p. 263 (1886); id. Berl. ent. Zeit. xxxi. p. 377 (1887).

One male and two females from Fort Johnston; three females from Pretoria (*W. L. D.*) and Kimberley (*H. W. Brown*).

#### *Sarcophila*, sp.

One male from Brak Kloof, Farm Marck, Cape Colony (*Mrs. G. White*).

#### SARCOPHAGINÆ, sp.

One male from Honey Nest Kloof, Cape Colony; one female from Fort Johnston, Nyasaland (*Rendall*).

Apparently one species; judging from the antennæ they would belong to this subfamily, but in other characteristics they appear more allied to the *Muscinae* and may perhaps require a new genus placed between the two subfamilies.

#### Group RHINIIDÆ.

Brauer, *op. cit.* lvi. pt. i. p. 154, lviii. pt. ii. p. 418.

#### *Rhinia*, sp.

One female allied to *R. cribrata*, Bigot, Ann. Soc. Ent. Fr. (5) iv. p. 239 (1874), from Pretoria (*W. L. D.*).

#### Group MUSCINÆ.

Brauer, *op. cit.* lvi. pt. i. p. 154.

#### *Musca domestica*, L.

One male from Fort Johnston, Nyasaland (*Rendall*); one female from Pienaars River (*W. L. D.*).

*Calliphora marginalis*, Wiedem., Auss. zweifl. Ins. ii. p. 395 (1828); Macq., Dipt. Exot. ii. p. 143 (1838); Karsch, Berl. ent. Zeit. xxxi. p. 377 (1887).

*Lucilia marginalis*, Wiedem., l. c.

*Somomyia marginalis*, Rondani, Atti del Accademia di Bologna, anno 1862.

Three females from Pretoria (*W. L. D.*), Barberton (*Rendall*), and Fort Johnston, Nyasaland (*Rendall*).

This well-known species is now placed under *Calliphora* by Brauer, who divides this genus from *Lucilia* by the cheeks being hairy, not bare as in the latter genus, and the third longitudinal vein is spiny at the base, not as far as the cross-vein as in *Lucilia*.

#### *Calliphora*, sp.

One male and one female *in coitu*, allied to *Lucilia Barthii*, Jaenicke (Abh. Senck. Gesell. vi. p. 374), from Barberton (*Rendall*).

### ÆSTRIDÆ.

#### AULACEPHALA.

Macq., Dipt. Exot. Suppl. 4, p. 167, tab. xv. fig. 6 (1850).

*Aulacocephala*, Gerst., Jahresb. 1855; id. Wiegmann, Arch. 1857, p. 131; id. Verh. z.-b. Gesell. 1863; Brauer, Monogr. Æstriden, Wien, 1863, p. 169; Denk. Akad. Wiss. Wien, lvi. pt. i. p. 158.

*Aulacephala badia*, Gerst., Verh. z.-b. Gesell. (1863); Brauer, l. c. p. 170.

One female from Fort Johnston, Nyasaland (*Rendall*).

### MUSCIDÆ ACALYPTERA.

#### BROMOPHILA.

Loew, Monogr. Dipt. N. Amer. iii. p. 35 (1873).

*Bromophila caffra*, Macq., Dipt. Exot. Suppl. 1, p. 217, tab. xix. fig. 2 (1846).

*Dichromyia caffra*, Macq., l. c.

*Scatophaga zamid*, Walker, List Dipt. iv. p. 983 (1849).

Eight males and nine females from Rustenburg, Warm Baths, Waterberg; Fort Johnston, Nyasaland (*Rendall*); Pretoria (*W. L. D.*); Zomba (*Rendall*); Delagoa Bay.

#### *Sepedon*, ? sp. n.

One specimen from Pretoria (*W. L. D.*).

**Bibionidæ.**

*Plecia dorsalis*, Macq., Dipt. Exot. i. p. 86 (1838).

Three females from Pretoria (*W. L. D.*).

**Hippoboscidæ.**

*Hippobosca rufipes*, Olfers, De Veget. et Animat. corp. in corpor. animatis reperiundis, Berol. 1816, p. 101; Wiedem., Auss. zweifl. Ins. ii. p. 604 (1830); Schiner, Reise Novara, p. 372 (1866).

*Hippobosca maculata*, Macq., Suites à Buff. ii. p. 638.

*Hippobosca Wahlenbergiana*, Jaenicke, Abh. Senck. Gesell. vi. p. 406, pl. xlv. fig. 13.

Four specimens from Pretoria (*W. L. D.*) and Barberton (*Rendall*).

XVI.—*Descriptions of Brazilian Coccidæ.*

By ADOLPH HEMPEL, S Paulo, Brazil.

[Continued from vol. vi. p. 398.]

Genus PHENACOCCLUS, Cockerell.

*Phenacoccus spiniferus*, Hempel.

Adult female oval in form, not very convex; pinkish, both surfaces dusted with a white powder; about thirty-six short white tufts around the lateral margin; four anal tufts are slightly longer than the others.

Parasitized females become cylindrical in form and the derm becomes chitinized. The marginal tufts are slightly longer on the posterior margin than on the rest of the body.

Antennæ of nine joints, joint 3 the longest. Length of antennæ varying from .50 to .53 millim. Approximate formula: 3 (1 2) 9 7 8 6 (4 5). Length of the segments of the antennæ: (1) 67, (2) 67, (3) 71, (4) 42, (5) 42, (6) 45, (7) 53, (8) 49, (9) 64. All antennal segments bear hairs. Legs ordinary, not bearing many hairs. Length of segments of first pair of legs: femur, with trochanter, 292; tibia and tarsus 312. Claw short; digitules large, with expanded ends. Tarsal digitules hair-like, with buttoned ends. Eyes small, conical. Rostrum short, about as wide as long, bearing two hairs. Mentum dimerous, with



numerous hairs. Rostral loop reaching to the second pair of legs. Anal ring with six large hairs. Anal tubercles not conspicuous, each one ending in a long seta and bearing two short sharp spines and many hairs and small glands. On the dorsal surface near the lateral margin there are about thirty-five groups of spines, each group consisting of two short sharp spines. Both surfaces bear hairs and numerous small triangular spinnerets. Besides these there are, on the ventral surface of the last five segments of the abdomen, many transverse rows of larger round spinnerets.

*Larva* (just hatched).—Oval in form; light yellow, eyes brown. Anal tubercles prominent, each ending in a long seta. Antennæ 6-jointed, joint 6 the longest. Legs large; digitules fine, hair-like. Anal ring with six hairs. Rostral loop long, reaching to the end of the body. Length .310 millim.

*Hab.* São Paulo. In the grooves of the petioles of leaves of a cultivated tree.

#### Genus SOLENOCOCCUS.

##### *Solenococcus tuberculus*, Hempel.

Adult female test oval in outline, dorsum very convex. There is one median longitudinal dorsal row of seven small tubercles; and two rows on each side, the dorso-lateral with six tubercles, the lateral with three tubercles. Around the lateral margin there is a row of from eighteen to twenty tubercles. The caudal end is slightly recurved and is provided with a round aperture. The test is elastic and tough, of a brown colour, but fine lines of whitish wax radiate from the tubercles, giving it a general grey appearance. There are two inconspicuous white lines on the side near the margin; these converge on the ventral surface. The test is securely fastened to the back, within smooth, shiny, of a dark brown colour.

Length 7 millim., width 5 millim., height 3.75 millim.

Adult female smooth, shiny, steely blue above, yellowish beneath, filling the entire test. Boiled in a solution of KOH it colours the liquid light brown. The antennæ are represented by two small tubercles, each bearing a brush of hairs. Legs wanting. Rostrum widely removed from antennæ, situated midway between the two pairs of spiracles. Mentum small, dimerous. Anal ring apparently with eight large hairs. Anal lobes large, the inner edge serrated, bearing several setæ. Just above the anal ring there is a semicircular chitinous plate which bears two hairs at its base. On the

dorsal surface, cephalad of the anal tubercles, there are four groups of large round glands, each group consisting of from eight to thirteen glands. There are double rows of small round spinnerets from the spiracles and antennæ to the lateral margin. On each side near the spiracles there are three or four groups of round spinnerets. Both surfaces bear many filamentous glands, round simple spinnerets, and double spinnerets in the form of a figure 8, these, however, being more numerous on the dorsal surface.

*Larva* (just hatched).—Elliptical, yellow; eyes small, brown. Antennæ short and thick, of six joints, joint 3 the longest. Rostral loop long, nearly reaching the anal ring. Anal ring bears six thick hairs. Anal tubercles large, each terminating in a long seta, and bearing two short thick spines on the inner margin and several hairs at the base. The lateral margin of the body is serrated and bears several fine hairs. On the dorsum there are six longitudinal rows of double or figure-of-8 glands. Legs short, digitules 4, very long and slender.

Length .52 millim.

*Hab.* São Paulo. On *Baccharis* sp.; singly on the stem near the ground.

The young emerge from the test through the caudal aperture.

#### *Solenococcus baccharidis*, Hempel.

Adult female test light brown, oval, smooth; dorsum very convex. Young specimens sometimes exhibit a few small tubercles on the dorsum. Radiating from the lateral margin there are from eleven to thirteen short whitish filaments or processes. The test is thin, elastic, and tough, the caudal end being slightly recurved and bearing a small round orifice. Below there are two converging white lines on each side.

Length 4 millim., width 3.20 millim., height 2.50 millim.

Adult female, denuded of wax, dark brown, derm shiny. Boiled in a solution of KOH it colours the liquid a deep yellowish brown. Antennæ represented by two tubercles, each bearing a brush of hairs. The legs are usually wanting, but may be present in the younger individuals as tubercles, each terminating in a claw. Rostrum large, situated between the first pair of spiracles. Mentum dimerous. The posterior end of the abdomen is chitinized and prolonged into a tail, which bears the anal ring and tubercles. Anal ring with eight large hairs. Just above the anal ring there is a semi-circular chitinous plate, with two hairs at the base. Anal

tubercles prominent, each ending in a long seta and bearing several shorter ones. There are double rows of round spinnerets from the spiracles and antennæ to the lateral margin. Both surfaces bear many filamentous glands, figure-of-8 spinnerets, and some hairs and simple round spinnerets. The glands and spinnerets are more numerous on the dorsal surface.

*Larva* (just hatched).—Very active, elliptical, yellow; eyes small, brown; antennæ of six joints, joint 6 is the longest, joint 3 nearly equals joint 6 in length. Rostral loop long, nearly reaching the anal ring. Anal ring of six hairs. Anal tubercles prominent, each terminating in a long seta and bearing on the inner margin two short curved spines, and several hairs at the base. Legs long, stout; digitules 4, very long and slender. Lateral margin of the body serrated and bearing short hairs. Dorsum bears six longitudinal rows of figure-of-8 glands.

Length .44 millim.

*Hab.* Ypirauga and São Paulo. On trunk and branches of *Baccharis dracunculifolia*.

It is sometimes found in large numbers and is securely fastened to the bark.

### Genus *CRYPTOKERMES*, Hempel.

Adult female resembling *Kermes*; enclosed in a rough spherical test. Legs and antennæ nearly obsolete. Caudal portion of derm with a dense mass of sharp spines. Abdomen bears seven pairs of spiracles.

Type *Cryptokermes brasiliensis*, Hempel.

#### *Cryptokermes brasiliensis*, Hempel.

Adult female test rough, hard, brittle, spherical, with a round orifice at the caudal end; semitransparent, dark brown in colour; 6 millim. in diameter. Adult female light yellow, filling the entire test. Derm soft, except in the caudal region, where it becomes chitinized, and has massed upon it a large number of sharp spines. Antennæ not observed. Legs represented by small tubercles with large claws, serrated on the inner edge.

Two pairs of large spiracles are present on the thorax and seven pairs of smaller ones on the abdomen.

Anal ring hairless. The caudal end of the intestine is chitinized for a short distance and bears a thick collar, which sometimes shows reticulations. Both surfaces of the body

are covered with small and large round spinnerets and hairs with tubercular bases.

*Female* (second stage).—Test elongate, elliptical, the ends nearly acuminate. It is rough like the adult, but not so brittle. The roughness is due to the fact that the test is secreted and formed from small globules of wax. Denuded of the test it is oval in form, buff in colour, with eight or nine deep transverse furrows on the dorsum. The dorsum also bears near the lateral margin the seven pairs of spiracles, which open into the furrows. The external openings are surrounded by a small quantity of white powdery secretion, and are readily seen with a lens. Under the insect there is a slight cushion of white powdery secretion.

Boiled in a solution of KOH it makes the liquid turbid, giving it a light yellow colour. The antennæ are represented by short thick tubercles, with a terminal brush of stiff hairs. Legs are represented by thick tubercles, with minute claws. Rostrum is large, extending from the antennæ beyond the first pair of legs. Mentum large, dimerous. Rostral loop very long, usually coiled. Two small oval eyes are situated just in front of the antennæ. Collar on the intestine, and spines and spinnerets the same as in the adult. The abdomen also bears on the ventral surface masses of minute hairs.

*Hab.* Poços de Caldas, State of Minas Geraes. Very abundant on limbs and trunk of *Schinus* sp., a kind of matté.

Frequently the tests of 2-6 individuals coalesce, forming one mass. The females of the second stage usually secrete from the caudal end a stiff tube of white wax, which usually has a small drop of clear liquid on the end. I had at first thought this insect might be a *Kermes*, but on studying it closely I found that a new genus had to be erected for it. Prof. T. D. A. Cockerell, to whom I sent specimens, also thought that it belonged to a new genus.

#### Genus STIGMACOCCUS, Hempel.

Adult female forming a more or less spherical test, with a large aperture on the apex. Antennæ 7- or 8-jointed. Anal ring hairless. Abdomen with eight pairs of spiracles.

Type *Stigmacoccus asper*, Hempel.

#### *Stigmacoccus asper*, Hempel.

Adult female test large, chrome-yellow, the outside blackened by a fungus and very rough; inside smooth and shiny. The shape is more or less spherical, slightly compressed laterally, with a round or elongate hole on the apex.

This hole is from 1 to 1.5 millim. in diameter. The inside of the test is spherical, with two rows of small white spots of secretion, corresponding to the stigmata of the abdomen. Frequently a large part of the abdomen is protruded out of the apical hole; but usually only a fine white thread protrudes from it. Length 9 millim., width 7-8 millim., height 8.5 millim. The thickness of the wall of the test is 1.25 millim. to 2 millim. The wax is brittle. The diameter of the cavity is about 5 millim. The female, removed from the test, is flat, nearly elliptical in shape, with the abdomen slightly attenuated posteriorly. It attains a length of 11 millim., and a width of 6.5 millim. Colour yellow, with a pinkish tint; derm very soft, except on the head, where there is an area of the derm chitinized, flat, and of a dark brown colour. The abdomen is transversely wrinkled. Boiled in a solution of KOH it colours the liquid a deep purple, almost black. The derm becomes soft and colourless, except in the cephalic region.

Antennæ variable, of seven or eight joints, although eight is the typical number. Length about .950 millim., each joint bears thirty or more hairs. Length of joints: (1) 178, (2) 110, (3) 110, (4) 110, (5) 110, (6) 110, (7) 89, (8) 141. Approximate formula: 1 8 (2 3 4 5 6) 7. Legs long and full of hairs. The coxa is nearly twice as wide as long; the trochanter bears about thirty round glands; the tibia is frequently bent back near the distal end, while the tarsus is always curved. Length of joints of first pair of legs: coxa 187, trochanter and femur 812, tibia 687, tarsus 350, claw 97. Claw sharp, much curved, with two short hair-like digitules. Tarsal digitules wanting. Rostrum ordinary, situated close to the antennæ. The abdomen bears eight pairs of spiracles, each with a number of small pentagonal spinnerets around the external opening. The thoracic region also bears two pairs of stigmata; these are large, chitinized, with the external orifices flask-shaped, and many small spinnerets grouped about them. Anal ring hairless. The derm on the posterior end of the body is thickly set with peculiar glands, disk-shaped, and apparently three-celled. The remainder of the derm bears numerous small hairs and glands.

*Hab.* On the bark of the ingá tree (*Inga* sp.), growing along the banks of the Rio Mogy-guassú, near Pirassununga, State of São Paulo; and from Joinville, State of Catharina. The insects are usually crowded on the underside of the limbs and branches, and are covered with a black fungus, and accompanied by many individuals of an ant (*Camponotus* sp.).

Genus *APIOCOCCUS*, Hempel.

The female constructs a flexible, spherical test. Legs wanting. Antennæ represented by small tubercles. Anal ring hairless. The cephalic portion of the derm bears a mass of small round spinnerets.

Type *Apiococcus gregarius*, Hempel.

*Apiococcus gregarius*, Hempel.

Adult female test spherical, hard and tough, with a small round orifice on one side. Surface slightly roughened, not shiny, of a dark sepia-brown colour. Size 2 to 3 millim. in diameter.

Adult female spherical, filling the entire test, light yellowish brown in colour. Boiled in a solution of KOH it colours the liquid light yellow. The cephalic portion of the derm is chitinized and bears a large number of spinnerets and some hairs. Antennæ, small tubercles, with a terminal brush of thick stiff hairs. Rostrum large, rectangular, occupying the space between the two pairs of spiracles. Mentum dimerous with bifid tip. Anal ring hairless. Anal tubercles not conspicuous, each one bearing about 12 sharp spines. Around the anal orifice there are about 50 more sharp spines, and about 80 small round glands, arranged in two elongate masses. The derm, especially near the caudal region, bears many small round spinnerets and hairs. The derm also has many invaginations, forming small pockets. Scattered over the ventral and dorsal surfaces are many peculiar conical spines. These spines are characteristic, and are possessed by every member of this genus.

*Larva* (just hatched).—Oval, orange-yellow in colour. Antennæ of six joints; joint 6 the longest. Legs short and thick, claws greatly curved; digitules 4, long, with buttoned ends. The abdomen terminates in two long setæ. Anal tubercles not developed. On the dorsal surface, between the setæ, there are eight sharp spines. The lateral margin also bears several sharp spines. On the lateral margin of the abdomen and head there are about twenty-four large, blunt, club-shaped spines, and on the dorsal surface about sixteen longer ones. Those on the dorsum are arranged in one transverse row of six, on last segment of the thorax; and two sublateral rows of five each, on the head and thorax. Rostral loop long, extending to the end of the abdomen. Size .360 millim. long.

*Hab.* Ypirauga, State of São Paulo.

Crowded together on the twigs of a plant of the order Myrtaceæ.

*Apiococcus singularis*, Hempel.

Adult female test spherical, with a small round orifice in one side. Outer surface rough, black; but beneath the surface it is a dark coffee-brown. Inside of test smooth, dark brown, covered with white powdery secretion. Size of largest specimens 5 millim. in diameter.

Adult female spherical, light yellow in colour, filling the entire test. Boiled in a solution of KOH it colours the liquid a golden yellow. Derm semichitinous, with many small round spinnerets massed on the cephalic region. Antennæ, small tubercles, with the usual terminal brush of stiff hairs. Rostrum large, but placed farther cephalad than in the preceding species. Legs wanting. Anal ring hairless. The spiracles are tubes with both ends expanded into disks. The outer disk is densely set with round spinnerets. A great number of fine tracheæ radiate from the inner opening. Anal tubercles not developed, but indicated by a mass of six or seven sharp spines on each side. Clustered around the anal orifice there are about sixteen small, sharp spines, two longer setæ, and many small round spinnerets. The derm bears the customary spinnerets, hairs, invaginations, and peculiar conical spines. The invaginations or pockets are large and nearly spherical, one individual having nearly forty of them.

*Larva* (just hatched).—Elliptical, light yellow in colour. Antennæ of six joints, joint 6 the longest, but joint 1 nearly equalling it in length. Legs short and thick. Digitules 4, slender; rostral loop long. Anal tubercles not developed. The abdomen ends in two long setæ, between which are six short, sharp spines and two long hairs. Around the margin there are from twenty-eight to thirty short, thick spines. On the thorax and head there are ten short, thick spines, arranged in two longitudinal submedian rows of five spines each. Length .340 millim.

*Hab.* Ypirauga, State of São Paulo.

Scattered singly on twigs of a shrub of the order Myrtaceæ.

*Apiococcus asperatus*, Hempel.

Female test spherical, hard, thick, black, the outside roughened by small tubercles. Beneath the surface it is a dark brown colour. The inside of the test is smooth, and is coated with a thin layer of white secretion. Size 3 millim. in diameter.

Female spherical, filling the entire test; light yellow in colour. Boiled in a solution of KOH it colours the liquid

light yellow. Derm partly chitinized, with a large mass of round spinnerets on the cephalic portion. Antennæ close together, as small tubercles, with a terminal brush of stiff hairs. Legs wanting. Rostrum large, situated between the two pairs of spiracles. Spiracles smaller than in the preceding species, but with many spinnerets on the external orifice, and a large number of fine tracheæ radiating from the inner orifice. Anal ring hairless. Anal tubercles not developed, but indicated by a mass of about ten spines on each side. Besides these, there are around the anal orifice about thirty spines, two long and two shorter setæ, and about eighty round spinnerets arranged in two elongate masses. The derm bears the customary spinnerets, hairs, and conical spines. The invaginations of the derm are few and small as compared with those of *A. singularis*.

*Hab.* Ypirauga, State of São Paulo.

Singly on twigs of a plant of the order Myrtaceæ,

*Apiococcus globosus*, Hempel.

Test of the adult female spherical, hard, and tough, with the inside and outside smooth, and with a small circular orifice in one side. Colour white, with a creamy tinge. The tests of the immature insects are oval. Size of largest test 2.75 millim. in diameter. The material of which the test is made is of a horny nature, and does not dissolve in a solution of KOH.

Adult female globose, filling the entire test; light yellow in colour; abdomen with several transverse wrinkles. Derm soft, with a large number of small round spinnerets massed on the cephalic area. Antennæ small, of two segments, with a terminal brush of stiff hairs. Legs wanting. Rostrum large, rectangular, situated between the two pairs of spiracles. Mentum dimerous. Rostral loop long, folded upon itself. Spiracles large, disk-shaped; the outer disk thickly set with round spinnerets, the inner end surrounded by a large number of fine radiating tracheæ. Anal ring hairless. Anal orifice surrounded by about sixteen sharp spines and numerous spinnerets. The derm bears large numbers of spinnerets, some hairs, and the characteristic conical spines. The invaginations of the derm are small, but numerous.

*Hab.* São Paulo. On the bark of a shrub of the order Myrtaceæ.

Genus *Tectococcus*, Hempel.

Female gall-forming; body ovate. Legs present. Antennæ of six joints. Anal ring hairless.

Type *Tectococcus ovatus*, Hempel.



*Tectococcus ovatus*, Hempel.

Female forming circular galls convex on both sides, like a lens. The gall is formed on both sides of the leaf, with an aperture on the underside. The sides of the gall are usually slightly elevated around the aperture, which is filled with a mass of loose white secretion. The inside of the gall is spherical and smooth, and is dusted with a white powder. Galls about 8 millim. in diameter and 5 millim. thick.

Adult female ovate, inflated, the caudal end acuminate; brown, dusted with a white powder. Derm soft. Dorsum transversely wrinkled. Length 2·10 millim., width 1·50 millim. Antennæ close together, short, thick, of six joints, joint 1 being the longest. Length of antennæ ·217 millim. Length of the joints: (1) 49, (2) 30, (3) 30, (4) 36, (5) 30, (6) 36. Approximate formula: 1 (4 6) (2 3 5). All the joints, except joint 3, bear hairs. Legs ordinary. Length of the joints of first pair of legs: femur with trochanter 151, tibia 98, tarsus with claw 84. Digitules of tarsus and claw not very long, stout, with expanded ends. The trochanter bears one very long hair and one shorter one. Rostrum large, situated near the antennæ. Mentum apparently monomerous. Anal ring hairless. Anal orifice guarded by four sharp spines. Anal tubercles not present. The abdomen ends in two short setæ. The derm bears many small round spinnerets and rather long hairs.

Eggs small, elliptical; light yellow in colour.

*Hab.* São Paulo and Ypirauga, State of São Paulo.

The galls are produced on the leaves of a shrub of the order Myrtaceæ.

Subfamily *ASTEROLECANIINÆ*.Genus *LECANIODIASPIS*, Targ.*Lecaniodiaspis rugosus*, Hempel.

Adult female scale oval to subcircular, light brown in colour. Dorsum transversely wrinkled and with a slight longitudinal ridge, and covered with a thin grey secretion of wax. The lateral margin is ornamented by a border composed of from twenty to twenty-five bits of wax.

Length 3·25 millim.; width 2·75 millim.; height ·50 millim.

Adult female broadly oval in outline. Antennæ cylindrical, variable, of eight joints. Average length ·302 millim. Approximate formula: 4 (2 3 5 6) 1 7 8, or 3 4 (2 5) 6 1 (7 8).

Length of joints: (1) 31, (2) 45, (3) 45, (4) 49, (5) 45, (6) 45, (7) 25, (8) 22. All of the joints except joints 3 and 4 bear hairs. Rostrum large; rostral loop long. Legs present as short cylindrical tubercles terminating in a long claw. Spiracles small, close together, with a few round spinnerets about the orifice. Anal ring apparently with ten hairs. Just behind the anal ring there is a chitinous plate with a deep notch in the middle. The abdomen ends in two inconspicuous tubercles, each bearing a terminal seta and a few short spines. Around the lateral margin there are a few short, sharp, spine-like hairs. On each side of the cephalic region on the dorsal surface there is a group of two large spines, one longer than the other; behind these there is another spine, and behind the second one another, so that we have two longitudinal rows of four spines each. These spines are large, slightly curved, with the ends rounded and slightly expanded, and are from 53 to 66  $\mu$  long. The entire surface of the body is thickly set with small V-shaped spinnerets and numerous fine filamentous glands about 44  $\mu$  long.

Male scale cream-coloured, elliptical, rounded at both ends; transversely wrinkled, and with a longitudinal median ridge and a slight groove around the dorsum near the lateral margin. Length 1.50 millim.; width .50 millim.

*Hab.* Ypirauga, State of S. Paulo. Thickly covering the trunk and branches of an unidentified forest-tree.

Should this insect attack cultivated trees, it would do much harm by its great numbers.

This species has a superficial resemblance to *L. celtidis*, Ckll., but can be readily distinguished by the segments of the antennæ, the absence of functional legs, and the presence of spinnerets and filamentous glands.

#### Subfamily TACHARDIINÆ.

#### Genus TACHARDIA, Blanch.

#### *Tachardia cydoniæ*, Hempel.

Adult female scale dark coffee-brown, smooth, shiny, slightly elongated, with three processes or rays on each side. Dorsum not very convex, with a slight hump in the middle, behind which is an opening with the lac slightly raised around it. Lac not brittle.

Length 3.75 millim.; width 2.50 millim.; height 1.50 millim.

Adult female boiled in a solution of KOH colours the liquid a deep red. The insect is slightly longer than wide

and has three slight lobes on each side. The antennæ are short and thick, about  $\cdot 093$  millim. long, and apparently composed of four segments. The last joint has several short terminal hairs. The mentum and rostrum are well developed and close to the antennæ. Rostral loop short. The two lac-glands are large and have the opening guarded by six or more short sharp spines. Near the lac-glands there are two large spiracles that have forty to fifty round spinnerets about the external orifice. Near the rostrum there is another pair of smaller spiracles. The legs are sometimes present as small sharp tubercles. The dorsal horn is strong and straight, blunt,  $\cdot 110$  millim. long. Anal ring with ten long hairs. Around the anal ring, and enclosing it, there is a chitinous horn or collar, which bears twelve short plates; these plates may vary in number. The sides are nearly parallel and the ends finely serrated. The collar bears many minute tubercles and several short hairs at the base. On the dorsum, between the collar and the dorsal horn, there are four tubercles, each one bearing fifty to sixty large round spinnerets. On the ventral surface, near the antennæ and spiracles, there are four groups of about fifteen small elongate glands each. The derm bears a few spinnerets and small hairs. Length 2 millim.; width  $1\cdot 50$  millim.

*Larva* (just hatched).—Small, elongate, dark purple, almost black. Antennæ of six joints; joint 6 the longest, joint 3 the next longest, joint 5 bears two very long hairs. Rostral loop long. Legs slender, long; tarsus and claw each with a pair of digitules. The body ends in two very long setæ, at the base of which are several short spines. Between these is the chitinous ring, bearing six or eight processes. Within this ring is the anal ring, which bears six hairs. There is a notch on each side on the prothorax, in which are situated the large spiracles. The openings of these spiracles are furnished with about ten round spinnerets. On each side of the dorsum there are three or four longitudinal rows of small tubercles, each one ending in a hair. On the ventral surface there are two longitudinal median rows of short hairs. Length  $\cdot 440$  millim.

*Hab.* S. Paulo. On cultivated quince, *Cydonia* sp.

The insects are usually found singly on the underside of the branches. Sometimes the lac of two or three individuals will fuse.

*Tachardia rubra*, Hempel.

Female scale, when occurring singly, nearly circular, with a slight tendency to form five or six lobes. The lac from

different individuals usually fuses, but does not form large masses. The outside is dull and smooth, with many filaments of white secretion scattered over it. The lac is a red-orange colour and brittle only in very old specimens.

Size of largest individuals:—Length 5 millim.; width 4·25 millim.; height 2·5 millim.

Adult female denuded of wax, subcircular, convex, with a tendency to form six lobes. Boiled in a solution of KOH it colours the liquid a deep red. The lac-glands are large, club-shaped, and do not have the spines at the external opening as in *T. cydoniæ*. The antennæ are apparently of four segments; they are ·084 millim. long, club-shaped, and the terminal joint bears two short hairs. Rostrum and mentum small. Rostral loop short. Legs wanting. Anal ring with ten large blunt hairs, which protrude but little beyond the chitinous ring. The chitinous plates on the caudal ring are ten in number, with nearly parallel sides, and the ends coarsely serrated. The dorsal horn is ·089 millim. long, blunt, and slightly curved at the base. The large spiracles are close to the lac-glands and have many spinnerets around the external orifice. The small spiracles are situated near the rostrum and have twelve to fifteen spinnerets about the external orifice. The four tubercles between the caudal ring and dorsal horn are well developed and bear many round spinnerets. The surface of the body bears many small tubercles, each ending in a hair. The four groups of elongate glands found on the ventral surface of *T. cydoniæ* were not seen in this species.

Length 3 millim.; width 3 millim.; height 2 millim.

*Larva* as in *T. cydoniæ*. Length ·500 millim. The rostrum is very large and the rostral filaments are longer than in the preceding species.

*Hab.* Cachoeira and Santa Barbara, State of S. Paulo. Clustered in great numbers on the branches of a species of *Croton* and on other plants.

#### *Tachardia parva*, Hempel.

The younger females have a test of brown lac, elongate, with a tubercle in the middle of the dorsum and three processes on the lateral margin on each side. In the older specimens the test is globular and of an orange-brown colour.

Specimens varying from 2–2·75 millim. long and 1·25–2 millim. high.

The female, denuded of wax, has three conspicuous lobes on each side. Length about 1·25 millim.; width ·75 millim.

Boiled in a solution of KOH it colours the liquid deep pink. The antennæ are short and nearly of equal thickness throughout. The lac-glands are large and very near the large spiracles. Around the opening of the large spiracles and between these and the other spiracles are many spinnerets. Rostrum and mentum large; rostral loop short. The legs are represented by inconspicuous short, sharp tubercles. On the ventral surface in front of the antennæ there are two groups of about sixteen elongate glands each, and behind the antennæ there are two more groups of from eight to ten glands each. The dorsal horn is .146 millim. long, sharp, with two small tubercles at the base. The anal ring bears ten long sharp hairs, which protrude almost their entire length beyond the chitinous collar or caudal ring, and flare outwards. The caudal ring is large and bears many minute tubercles and a few hairs at the base. This ring terminates in ten short chitinous plates, which have nearly parallel sides and the ends deeply and irregularly incised. The four tubercles on the dorsal surface between the caudal ring and dorsal horn are small, but bear from forty to fifty round spinnerets each. The entire surface of the body is covered with small tubercles, each one terminating in a hair. The ventral surface has the appearance of bearing many transverse rows of minute hairs.

*Hab.* Cachoeira and Ypirauga, State of S. Paulo. On twigs of a bush of the order Myrtaceæ.

Many of the insects are covered with a black fungus. The individuals are usually distinct, the lac seldom fusing.

#### *Tachardia rosæ*, Hempel.

Female test elongate, deep orange-red in colour, with a hump on the dorsum and three processes on each side radiating from the lateral margin, giving it a star-shaped appearance. There are usually two fine filaments of white secretion in front of the dorsal hump, probably arising from the large spiracles. Many of the individuals are distinct, with soft plastic lac, but in the older specimens the lac is hard and brittle and usually fused into larger masses.

Average size :—Length 4 millim. ; width 3 millim. ; height 1.75 millim.

The adult female, denuded of wax, has three small tubercles on each side. Boiled in a solution of KOH it colours the liquid a deep red claret-colour. Antennæ small, club-shaped, with two or three short hairs on the last joint. The joints are confused and indistinct, but appear to be four. Length

·089 millim. Rostrum and mentum ordinary. Rostral loop short. Legs wanting. The external openings of the large pair of spiracles are surrounded by about sixty round spinnerets. The small spiracles are close together and have five or six spinnerets at the external opening. The four dorsal tubercles between the caudal ring and dorsal horn are small, each one bearing about forty spinnerets. Dorsal horn straight and sharp, ·151 millim. long. Anal ring with ten large hairs, which do not protrude far beyond the caudal ring. The chitinous caudal ring ends in ten plates and bears many minute tubercles and several small spines at the base. The chitinous plates are short, narrow at the base, with the ends expanded and serrated. On the ventral surface, near the antennæ and spiracles, are four groups of about sixteen elongate glands each. Scattered over the body are six or more areas in which the derm is partly chitinized and bears minute hairs and glands.

*Larvæ* elliptical, as in *T. cydonicæ*. Length ·450 millim.

*Hab.* São Paulo. Clustered on the branches of cultivated roses in various parts of the city.

#### *Tuchardia ingæ*, Hempel.

Adult female scale subglobular, dorsum slightly flattened, with an aperture in the centre. The lac is dull, shiny when the surface becomes rubbed, semitransparent, thick, brittle, light green with brown stripes. Some fine white filaments usually protrude from the dorsal orifice. The lac of many individuals usually unites to form a confused mass.

Diameter 5·25 millim.; height 3·75 millim.

Denuded of lac the insect is three-lobed. Lac-tubes and horn all of equal length and standing erect on the dorsum. Length 3·50 millim.; width 3 millim.; height 2·50 millim.

Boiled in a solution of KOH it colours the liquid very deep purple.

Antennæ, small tubercles about ·110 millim. long, apparently consisting of six joints. Legs represented by very small conical tubercles, ending in a claw. Length of the first pair 18  $\mu$ . Antennæ very close together. Rostrum large, placed just behind the antennæ. Rostral loop short. First pair of legs inserted very close to the rostrum. The large stigmata have each about 140 to 150 spinnerets around the external orifice, while the small ones have each 10 to 12 spinnerets around the external orifice. Dorsal horn straight and blunt, about ·173 millim. long. Lac-glands large, with an oblong orifice lined with numerous glands. Anal ring

with ten long diverging hairs. The plates of the chitinous ring are deeply incised. The posterior dorsal tubercles each with 45 to 70 round spinnerets. The derm also bears many small glands and spinnerets.

*Hab.* On branches of *Inga* sp., growing along the banks of the River Mogy-guassú, near the town of Mogy-guassú, State of S. Paulo.

This insect has a peculiar appearance and resembles a berry or seed so closely as to be deceiving.

[To be continued.]

XVII.—*Contributions from the New Mexico Biological Station.*

—X. *Observations on Bees collected at Las Vegas, New Mexico, and in the adjacent Mountains.* II. By T. D. A. COCKERELL\*.

*Colletes americana*, Cresson.

Las Vegas, Aug. 11, at flowers of *Solidago canadensis*, 1 ♀ (*W. Porter*).

*Colletes bigeloviæ*, Ckll.

Beulah (*W. Porter*).

*Colletes gilensis*, Ckll.

Las Vegas, July 21, at flowers of *Petalostemon oligophyllus*, 4 ♀ (*Ckll.*); Aug. 1, 3 ♀ (*Porter & Ckll.*); Gallinas River at La Cueva, Aug. 6, 2 ♀ (*Porter & Ckll.*). The joints of the palpi measure as follows in  $\mu$ :—Maxillary palpi, (1) 200, (2) 110, (3) 140, (4) 130, (5) 110, (6) 110; labial palpi, (1) 170, (2) 150, (3) 140, (4) 160.

*Petalostemon oligophyllus* is the plant heretofore reported from Las Vegas as *P. candidus*; I am indebted to Miss A. M. Vail for the correct identification.

*Prosapis basalis*, Smith.

Beulah, July 28, 1 ♂ (*Ckll.*). New to New Mexico. This and other species of *Prosapis* were taken on moist ground by a stream.

*Prosapis mesillæ*, Ckll.

Las Vegas, June 19, at flowers of alfalfa, ♀ (*Ckll.*); Aug. 4, ♂ (*W. Porter*).

\* The first part of this paper appeared in *Ann. & Mag. Nat. Hist.*, May 1900, p. 401.

*Prosapis rudbeckiæ*, subsp. *ruidosensis*, Ckll.Beulah, July 28, Aug. 18 (*Ckll.*).*Prosapis tridens*, Ckll.Beulah, July 28, 2 ♂, with face-marks light yellow (*Ckll.*).  
New to New Mexico.*Prosapis varifrons*, Cress.Beulah, July 28, 5 ♂ (*Ckll.*); Dailey Cañon, Aug. 10  
(*T. D. A. & W. P. Ckll.*). New to New Mexico.*Halictus amicus*, Ckll., var. *a.*

♀. Face narrower than type; possibly a distinct species.

Las Vegas, at flowers of *Gaura coccinea*, June 18 (*Ckll. & Porter*). The *Gaura* is properly a moth-flower, but is more or less visited by bees when it first opens.*Halictus anomalus*, Rob.Las Vegas, at flowers of *Convolvulus arvensis*, June 17, ♀ (*Ckll.*); July 4, ♀ (*Ckll.*); July 29, at flowers of *Verbesina encelioides*, ♀ (*Ckll.*); Aug. 14, at flowers of *Grindelia squarrosa*, ♀ (*Martin D. Ckll.*). New to New Mexico. Robertson says the abdomen of *anomalus* is impunctate, but the punctures can be seen with a compound microscope.This species has only two submarginal cells, and as it has the size and form of *H. perdificilis*, I wondered whether the Las Vegas specimens might not merely be aberrant examples of that insect. A close examination, however, revealed the following important differences:—

	<i>H. anomalus</i> from Las Vegas (♀).	<i>H. perdificilis</i> , type from Santa Fé (♀).
1st abdominal segment.	With sparse minute punctures; not tessellate.	Distinctly and strongly tessellate; sparsely punctured.
2nd abdominal segment.	Stronger punctures; not tessellate; anterior and posterior halves punctured alike.	Distinctly transversely lineolate; rather closely punctured on anterior half, practically impunctate on posterior.
Median line of mesothorax.	Not grooved; a mere line.	Strongly grooved.
Mesothorax.	Bluish green.	Brassy green.
Metathorax.	Same colour as rest of thorax.	Dark blue, contrasting.

*H. anomalus* differs from *H. semicæruleus* in not having



the bluish lustre on the abdomen, in the shorter metathoracic enclosure, &c. *H. semicæruleus*, however, has the first two abdominal segments nearly as in *anomalus*, not as in *perdifficilis*.

*Halictus armaticeps*, Cresson.

Las Vegas, June 17, at flowers of *Convolvulus arvensis*, ♀ (Ckll.); July 29, at flowers of *Verbesina encelioides*, ♀ (Ckll.); Beulah, May 30, at flowers of *Salix*, ♀ (W. Porter). This is the insect heretofore reported from New Mexico as *H. ligatus*, but Mr. Ashmead believes it is not the true *ligatus* of Say, and I must agree with him, after comparing Say's description.

*Halictus bardus*, Cresson.

Beulah, May 30, at flowers of *Salix*, ♀ (W. Porter).

*Halictus coriaceus*, Smith.

Beulah, May 30, at flowers of *Salix*, ♀ (W. Porter).

*Halictus Lerouxii*, Lep.

Las Vegas Hot Springs, at flowers of *Salix*, ♀ (W. Porter).  
New to New Mexico.

*Halictus mesillensis* (Ckll.), var. *α*.

♀. Head and thorax olive-green. Las Vegas, Aug. 5, at flowers of *Aplopappus spinulosus*, ♀ (Ckll.). This differs from *H. nymphalis* (received from Mr. Robertson) by the distinctly punctured first abdominal segment, the rather smaller size, and the darker, less brightly coloured tegulæ.

The original *mesillensis*, described as a variety of *nymphalis*, has also the punctured first abdominal segment.

*Halictus pruinosus*, Rob.

Las Vegas, July 5, at flowers of *Verbesina encelioides*, ♀ (S. L. Mize); July 11, at flowers of *Cleome serrulata*, ♀ (Ckll.); July 31, at flowers of *Grindelia*, ♀ (Ckll.).

*Halictus ruidosensis*, Ckll.

Beulah, July 26, five females (W. Porter).

*Halictus sisymbrii*, Ckll.

Las Vegas, June 17, at flowers of *Convolvulus arvensis*, ♀ (Ckll.); July 31, at flowers of *Cleome serrulata*, ♀ (Ckll.); July 2, at flowers of *Sidalcea neomexicana*, ♀ (M. Holzman).

*Agapostemon texanus*, Cresson.

The following records all relate to females:—Romeroville, Aug. 6 (*Porter & Ckll.*); Gallinas River at La Cueva, Aug. 6 (*Porter & Ckll.*); Las Vegas, at flowers of *Gaura coccinea* (*Ckll.*); at flowers of *Asclepias verticillata* (*M. Winters*); June 17, at flowers of *Convolvulus arvensis* (*Ckll.*); July 2, at *Sidalcea neomexicana* (*M. Holzman*); July 5, at *Cleome serrulata* (*N. Stern*); at garden pæony (*W. Porter*); July 8, at *Lycium vulgare* (*W. Porter*); July 9, at *Lepachys colum-naris* (*M. Holzman*); July 11, at *Cucurbita fætidissima* (*N. Stern*); July 12, at marigold (*A. Garlick*).

*Panurginus Boylei* (*Ckll.*).

Las Vegas, July 26 and 29, at *Verbesina encelioides*, ♂ (*Ckll.*); July 31, at *Grindelia*, ♂ (*Ckll.*); Aug. 3, at *Helianthus annuus*, 2 ♂, one parasitized by a ♀ *Stylops* (*W. Porter*).

Var.  $\alpha$ . ♂. With a yellow line on scape in front. Las Vegas, Aug. 2 (*W. Porter*).

*Panurginus pauper*, var. *flavotinctus*, Ckll.

Las Vegas, Aug. 2, 2 ♂ (*W. Porter*).

*Calliopsis coloradensis*, Cresson.

Las Vegas, Aug. 2, ♀ (*W. Porter*); Aug. 5, at *Helianthus annuus*. The eyes in life are pale sage-green.

*Calliopsis lepidus*, Cresson, var.  $\alpha$ .

♀. Near *C. rhodophilus*, but face-marks white. ♂ differs from *rhodophilus* by the wholly black scape. The ♀ agrees with Cresson's description of *C. lepidus*, except that the hair on the basal joint of tarsi beneath is barely fulvous; the dog-ear marks on the face are present, whereas in *rhodophilus* they are wanting. I sent a drawing of the Las Vegas *lepidus* to Mr. Fox, who kindly compared it with Cresson's type, and reported: "The face-marks of *Calliopsis lepidus* agree almost exactly with your drawing. The only difference is that the lateral marks are slightly narrower than in the drawing."

Las Vegas, July 24, at flowers of *Convolvulus incanus*, ♀ (*W. Porter*); Aug. 13, flying over the ground close to some *Sphæralcea cuspidata*, 2 ♂, 1 ♀ (*Ckll.*); July 11, 1900, many females at flowers of *Melilotus officinalis* (*W. P. Ckll.*). New to New Mexico.

*Perdita zebrata*, Cresson.

Gallinas River at La Cueva, Aug. 6 (*W. Porter*).

Var.  $\alpha$ . ♂. Small, only 5 mm. long; first abdominal segment entirely black above. Two at flowers of *Cleome serrulata*, Las Vegas, July 19 (*Porter & Ckll.*).

*Spinoliella scitula* (Cresson).

Las Vegas, July 23, at *Cleome serrulata*, 1 ♀ (*W. Porter*). Mr. Ashmead (*in litt.*) states that the following species, all described as *Calliopsis*, belong to his new genus *Spinoliella*:—*S. scitula* (Cress.), *S. australior* (Ckll.), *S. zebrata* (Cress.), *S. maculata* (Smith), and *S. Edwardsii* (Cress.). To these should apparently be added the following, also described as *Calliopsis*:—*S. cincta* (Cress.), *S. interrupta* (Prov.), *S. quadri-lineata* (Prov.), *S. meliloti* (Ckll.), *S. scutellaris* (Fowler), *S. visaliensis* (Fowler), *S. anthidius* (Fowler).

*Melecta miranda*, Fox.

Las Vegas, at flowers of *Zinnia grandiflora*, July 27 (*W. Porter*).

Var.  $\alpha$ . Smaller, about 9 mm. long. Las Vegas, July 9, on *Sphaeralcea cuspidata*, but not on flowers (*Ckll.*); July 19, at flowers of *Cleome serrulata* (*Ckll.*).

*Ashmeadiella buconis* (Say).

Las Vegas, July 24 (*W. Porter*); July 29 and Aug. 5, at flowers of *Verbesina encelioides*, ♀ (*Ckll.*).

*Ashmeadiella cactorum*, Ckll.

♂. Length 5 mm. Las Vegas, Aug. 4, two at flowers of *Convolvulus arvensis* (*W. Porter*).

*Melissodes agilis*, Cresson.

Las Vegas, July 5 (*N. Stern*); July 25, at flowers of *Helianthus annuus*, 1 ♂ (*W. Porter*); July 31, at *Verbesina encelioides*, 1 ♂ (*Ckll.*); Sapello Cañon, Aug. 31 (*W. Porter*); San Ignacio, Aug. 31 (*W. Porter*).

Var.  $\alpha$ . ♂. No yellow spot on mandibles. Las Vegas, July 17, at *Cleome serrulata* (*A. Garlick*); July 26, at *Verbesina encelioides* (*Ckll.*).

*Melissodes agilis*, var. *aurigena* (Cresson).

The males vary in length from 9 to 10½ mm. *Romero-Ann. & Mag. N. Hist. Ser. 7. Vol. vii.*

ville, Aug. 6 (*Porter & Ckll.*); Las Vegas, July 19, at *Helianthus*, ♂ (*L. Reed*); July 22, at alfalfa and *Helianthus annuus* (*W. Porter*); July 20, at *Aplopappus spinulosus*, ♂ (*W. Porter*); July 26, at *Verbesina encelioides*, ♀ (*Ckll.*); Aug. 3, at *Helianthus annuus*, ♂ ♀ (*W. Porter*).

*Melissodes gilensis*, Ckll.

Las Vegas, July 20 and 22, at *Cleome serrulata*, ♀ (*W. Porter*); July 24, at *Sidalcea neomexicana*, ♀ (*W. Porter*).

*Melissodes grindeliae*, Ckll.

Las Vegas Hot Springs, Aug. 10, at flowers of *Senecio Douglasii* and *Helianthus annuus*, 6 ♂ (*W. Porter*); Las Vegas, July 19, at *Verbena Macdougali*, ♀ (*W. Porter*); July 22, at *Cleome serrulata*, ♀ (*W. Porter*); July 22, at *Lepachys columnaris* and *L. tagetes*, ♀ (*W. Porter*); Aug. 5, at *Verbesina encelioides*, ♂ (*Ckll.*).

*Melissodes pallidicincta*, Ckll.

The following records all relate to females:—Las Vegas, June 22 and 23, also 29, at *Malvastrum dissectum* (*Ckll.*); July 1, 2, and 5, at *Sidalcea neomexicana* (*M. Holzman*); July 3, at *Trifolium repens* (*N. Stern*); July 4 and 11, at *Cleome serrulata* (*N. Stern, Ckll.*); July 6, at *Verbena Macdougali* (*Ckll., M. Winters*); July 6, at *Sphæralcea lobata* (*W. Porter*); July 10 and 24, at *Asclepias verticillata* (*N. Stern, W. Porter*); July 24, at an umbellifer (*W. Porter*); Aug. 1, at *Lycium vulgare* (*W. Porter*); Romeroville, Aug. 6 (*Porter & Ckll.*).

*Melissodes tristis*, Ckll.

Las Vegas, July 20, at *Cleome serrulata*, 1 ♂. This is very probably the male of *M. pallidicincta*; but if so, it is curious that only one was caught, while the females abounded.

*Melissodes ruidosensis*, Ckll.

Beulah, July, 1 ♂ (*W. Porter*); Las Vegas, Aug. 2, 1 ♂ (*Porter & Ckll.*).

*Xenoglossa pruinosa* (Say).

Las Vegas, July 13 and 15, at flowers of *Cucurbita fœtidissima* (*M. Winters, M. Holzman, W. H. Rishel*); July 21, males asleep in flowers of *Cucurbita fœtidissima*, at 7.45 P.M. (*Ckll.*); July 22, at flowers of *Asclepias speciosa*, 1 ♀ (*W. Porter*).

*Anthophora maculifrons*, Cresson.

The male abdomen ends in four spines. Las Vegas, July 18, at *Sphæralcea lobata*, 1 ♀ (*W. Porter*); July 19, at *Lycium vulgare*, ♂ (*W. Porter*); Aug. 9 to 12, at *Grindelia squarrosa*, 5 ♂ (*S. L. Mize & W. Porter*); Aug. 9, at *Verbena Macdougali*, 4 ♂, 2 ♀ (*W. Porter*).

*Anthophora (Amegilla) cardui*, Ckll.

Las Vegas, July 11, at *Cleome serrulata*, ♂ (*Ckll.*); Aug. 11, at *Petalostemon oligophyllus*, ♂ (*W. Porter*); Las Vegas Hot Springs, Aug. 10, at *Verbena Macdougali*, ♂ (*W. Porter*).

*Anthophora (Amegilla) cleomis*, Ckll.

The ♂ abdomen ends in two blunt spines. Las Vegas, July 6, at *Sphæralcea lobata*, ♂ (*W. Porter*); July 9, at *Sidalcea neomexicana*, ♂ (*M. Holzman*); July 19, at *Lycium vulgare*, 1 ♀, 3 ♂ (*W. Porter*); July 20, at *Verbena Macdougali*, ♂ (*W. Porter*); July 23, at *Salvia lanceolata*, ♂ (*W. Porter*); Aug. 1, at *Cleome serrulata*, ♀ (*W. Porter*); Rociada, Aug. 20, ♀ (*W. Porter*).

*Anthophora (Amegilla) montana*, Cresson.

Las Vegas, July 8, at *Lycium vulgare*, ♀ (*W. Porter*); July 10, at *Cleome serrulata*, ♀ (*M. Winters*); July 14 and 19, at *Cleome serrulata*, ♀ (*A. Garlick*).

*Anthophora (Amegilla) urbana*, var. *alamosana* (Ckll.).

In the male the thoracic hair has no black intermixed, and the clypeus and lateral face-marks are white. Las Vegas, June 19, at alfalfa, ♂ (*Ckll.*); July 8, at *Lycium vulgare*, ♀ (*W. Porter*).

*Clisodon terminalis* (Cresson).

Beulah, July (*W. Porter*); Aug. 18, at flowers of *Polemonium* (*W. Porter*); Harvey's Ranch, Aug. 22 (*W. Porter*); Sapello Cañon, Aug. 31 (*W. Porter*). A species of the Canadian zone.

*Apis mellifera*, var. *ligustica*, Spinola.

Las Vegas, July, at *Cleome serrulata*, alfalfa, &c.

Numerous critical species, some of them evidently undescribed, are left over for subsequent treatment.

East Las Vegas, New Mexico, U.S.A.,  
Nov. 2, 1900.

## BIBLIOGRAPHICAL NOTICES.

*Recent Foraminifera. A Descriptive Catalogue of Specimens dredged by the U.S. Fish Commission Steamer 'Albatross.'* By JAMES M. FLINT, M.D., U.S.N., &c., Smithsonian Institution, U.S. National Museum. From the Report of the U.S. National Museum for 1897, pp. 249-349, with 80 plates. 8vo. Washington: Government Printing Office, 1899.

THE author, who is the "Honorary Curator, Division of Medicine, U.S. National Museum," proves himself to be a genuine naturalist by his able treatment of these Foraminifera, their specific identification and the relative value of their varieties. For some years he has been collecting from the bottom material brought up by the 'Albatross' at about 225 stations, chiefly in the North Atlantic, with others from the Gulf of Mexico and Caribbean Sea, and a few from the Pacific.

The abundance and excellence of the illustrations, which are wonderfully arranged with artistic neatness and scientific exactness, present an important feature in opening the volume. "A uniform enlargement of about 15 diameters has been maintained in the figures . . . useful to mark distinctly the relative size of the objects."

In the Museum the specimens are described as being mounted with an arrangement admirably suited for the convenience of microscopists and others. It is thus described at pages 251 and 252:—

"The exhibition series has been mounted expressly for public display. The individuals of each species are attached in various attitudes to the bottom of the shallow cavity of a concave blackened disk of brass. For security each disk is provided with a removable fenestrated brass cap having a top of thin glass. These disks are arranged in concentric rows upon a large circular metal plate, which occupies the place of the stage of an ordinary microscope. The circular plate is given both a rotary and a too-and-fro movement by means of a friction-roller and a rack-and-pinion, so that all the mounts may be successively brought under the microscope. The specimens thus arranged are enclosed in a box having a glass top, through which the objective of a microscope projects." Each of the illustrative plates contains from one to seven of these mounts very carefully photographed.

The concise and yet satisfactory definitions of families, sub-families, genera, and 231 species (pages 258-264) are ably designed to assist the student in learning the history of these beautiful and truly interesting protozoans.

The structure and development of these Microzoa are briefly described (pages 252-256), and at page 257 details are given of the methods of sorting and arranging the specimens and more especially of making and mounting *sections* of such as are required.

The author truly says that "the literature of the subject is very large," and adds that "with Carpenter's 'Introduction to the Study of Foraminifera,' Brady's 'Report on the Foraminifera collected by H.M.S. Challenger,' and Sherborn's 'Index to the Genera and Species of Foraminifera' [published by the Smithsonian Institution, 1895-96], the student will be able to begin work in an intelligent manner and to find references to all that has been published on this subject up to the most recent date." T. R. JONES.

*A Treatise on Zoology.* Edited by E. RAY LANKESTER, M.A., F.R.S.  
Part II. *Porifera and Cœlentera.* London: A. & C. Black, 1900.

THE present volume (the second in order of the complete series), dealing with the Porifera and Cœlentera, is in all respects equal to that reviewed in these pages a short time since.

The Editor contributes an Introduction on the cœlomic system, wherein he contrasts the distinctions between the Proto- and Metazoa. This is a most important and valuable contribution. How much depends on a right understanding of the cœlom will be readily appreciated after a perusal of these pages. "Cœlom," says Prof. Lankester, "is not a term to be used for any and every body-cavity other than the gut (as some eminent writers seem to suppose), but definitely designates a morphological element of high importance."

For the terms Enterocœla and Cœlomata, Prof. Lankester proposes to substitute Cœlentera and Cœlomocœla. Possible objections to this proposition are anticipated and answered, and probably most will be induced to adopt his suggestion.

The remarkable displacement of the cœlom by an irregularly distended system of blood-spaces, "a hæmocœl" (which, Prof. Lankester has elsewhere shown, takes place in the Arthropoda and Mollusca), is lucidly described in this Introduction. For the swelling of the peripheral portions of the hæmal system Prof. Lankester suggests the term "phlœbedesis." The lacunar blood-holding spaces resulting from it form the "hæmocœl."

This introductory chapter is compressed into some 37 pp. and may well be described as a kind of literary pemmican. It is the most lucid and succinct account that has yet appeared.

Prof. Minchin deals with the Sponges; and this part may well be described, without exaggeration, as a masterly contribution, without an equal in any language. It will be invaluable as well to the student of other groups as to the specialist in the Porifera alone. With regard to the derivation of the Sponges, Prof. Minchin has definitely pronounced in favour of a Choanoflagellate ancestry.

Dr. Fowler deals with the Hydrozoa. These he breaks up into two groups, Hydromedusæ and Scyphomedusæ. The last he regards as more nearly allied to the Anthozoa, and suggests the desirability of uniting these two under the class name Scyphozoa. The fresh-water Medusæ and the Graptolithidæ are treated of as appendices

to the Hydromedusæ. A satisfactory classification of the Antho- and Leptomedusæ is not, it is insisted, at present possible.

The section on the Anthozoa has been written by Mr. G. C. Bourne; and certainly no one else is better qualified for this task. His account of the Ctenophora is interesting. The supposed Planarian affinities of Ctenoplana and Cœloplana Mr. Bourne views with disfavour. Again, Mr. Bourne joins issue with Dr. Willey concerning the claim of the Ctenoplana and Cœloplana to be regarded as primitive forms. We have no evidence, Mr. Bourne contends, to show whether they are primitive or derived forms.

The illustrations are numerous and well executed. A large number are original. Some of these are drawn by the authors themselves. Those by Prof. Minchin and Mr. Bourne are especially good. Many of those illustrating the external forms of sponges are by Mr. P. J. Bazand, and are really excellent.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

February 21st, 1900.—J. J. H. Teall, Esq., M.A., F.R.S.,  
President, in the Chair.

The following communication was read:—

‘Further Evidence of the Skeleton of *Eurycarpus Oweni*.’  
By Prof. H. G. Seeley, F.R.S., F.L.S., V.P.G.S.

The original specimen from which this species was named was obtained from the Sneewberg (South Africa) in 1876, and after being doubtfully referred to *Dicynodon* was described and figured in 1889. It was presented to the British Museum by Mr. Thomas Bain, through Sir Henry Barkly. The skull was found with the complete specimen, and a short memorandum of its characters, with a sketch of the skeleton, including the skull, was made by Mr. T. Bain and has been preserved in the British Museum. Half of the counterpart of the slab was presented to the Author by the Rev. C. Murray, and by means of it complete casts of part of the skeleton have been obtained.

From Mr. Bain’s sketch the Author is able to give some account of the skull, including its dimensions. From the material mentioned above, he gives new facts with regard to the vertebral column, the ribs, the shoulder-girdle, the fore-limb, the hind-limb, and the armour, which was present upon the limbs and the fore part of the body.

The locality from which the animal was obtained had already



yielded to Mr. A. G. Bain *Lycosaurus pardialis*, *Tigrisuchus simus*, *Cynosuchus suppostus*, *Scalaposaurus constrictus*, and *Dicynodon leoniceps*. It would therefore appear to be one of the chief localities for the Lycosaurian types of Theriodontia and to be on the horizon of the *Dicynodon*-beds. The recovery of the missing half of the Murray slab, with the evidence of the skull and pelvis which it would give, is to be desired in completion of our knowledge of this fossil animal.

March 21st, 1900.—H. W. Monckton, Esq., F.L.S.,  
Vice-President, in the Chair.

The following communication was read:—

‘On a Bird from the Stonesfield Slate.’ By Prof. H. G. Seeley,  
F.R.S., F.L.S., V.P.G.S.

During his residence at Oxford the late Earl of Enniskillen made a collection of Ornithosaurian bones from Stonesfield, which was acquired by the British Museum in 1866. Among these is one identified by the Author in 1899 as the right humerus of a bird about as large as a flamingo. The bone is complete, except for fracture through the proximal articulation, and the specimen is, on the whole, well preserved. The chief characters available for comparison are the form of the shaft, the character of the proximal end, especially the ulnar tuberosity and the radial crest, and the form of the distal end. The character which first showed the fossil to be a bird was the ulnar tuberosity; probably the flamingo approaches as closely as any living genus to the Stonesfield fossil in this feature. The radial crest shows affinities with those of the flamingo and the eider-duck. The impression left by the humero-cubital muscle on the external surface above the condyles is almost identical with that seen in the flamingo. ‘The varied affinities of this large Carinate bird appear to lie midway between the ducks and geese on the one side, and the herons and flamingos on the other. It may be placed in a new family; but its characters are in all respects such as might have occurred in an existing bird. There is no indication of affinity to the *Archæopteryx*, or that the bird diverged in any way from modern types.’

April 25th, 1900.—J. J. H. Teall, Esq., M.A., F.R.S.,  
President, in the Chair.

The following communication was read:—

‘On a complete Skeleton of an Anomodont Reptile from the Bunter Sandstone of Reichen, near Basel, giving new Evidence of the Relation of the Anomodontia to the Monotremata.’ By Prof. H. G. Seeley, F.R.S., F.L.S., V.P.G.S.

This skeleton was originally described by Wiedersheim under the name of *Labyrinthodon Rüttimeyeri* in 1878. The bones are now differently interpreted:

The reputed humerus is the interclavicle.

” ” scapula is the humerus.

” ” supra-scapula is the left coracoid (fig. 2).

” ” ” ” ” right scapula (fig. 1).

” ” right and left clavicles are the ribs.

” ” right and left coracoids are the pre-coracoid and coracoid of the right side.

Five digits are identified in place of four in 1878. These osteological identifications are inconsistent with reference of the type to the Labyrinthodontia, and it is accordingly described as a new genus, which is placed in association with *Procolophon* as a separate family in the tribe Procolophœnia.

The Author discusses various views which have been expressed with regard to the position of the Labyrinthodonts. He has already separated these animals from the Amphibia and combined them with the Ichthyosauria in a group of reptiles named Cordylomorpha, and he enumerates a series of characters which constitute so close a link between the two types ‘that it is not possible, in the absence of evidence, to conceive of their being referred to different classes of animals.’

‘But if the order Labyrinthodontia is transferred to the Reptilia, it is then manifest that by including such genera as *Branchiosaurus* and *Archegosaurus*, in which gill-arches are found, it introduces into the Reptilia a character hitherto unknown, and commonly regarded as Amphibian. . . . If the osteology of an ordinal type is Reptilian, it cannot be placed in the Amphibia, because two or three genera, or the whole group preserve gill-arches. . . . The Labyrinthodontia may or may not be a homogeneous subclass or order, though the circumstance that many writers have separated its groups on different principles, and into a varying number of orders, is some evidence that it includes a wide range in character. . . . In no part of the skeleton is there a close correspondence between living Amphibia, which are probably unknown before the Tertiary period, and the extinct Labyrinthodontia, which are only known with certainty in the Carboniferous, Permian, and Triassic periods of time.’

‘If the sub-orders of Labyrinthodontia are sub-orders of Reptilia and not of Amphibia, the transition which *Pareiasaurus* exhibits from Labyrinthodonts to Mammals ceases to be an anomaly.’

‘The close resemblance of form of the bones in the several parts of the skeleton now described with Monotremata and Anomodontia makes the border-line between Reptiles and Mammals more difficult to define.’

The fossil is identified as an Anomodont reptile, chiefly on the basis of resemblance to *Procolophon* and *Pareiasaurus*. It is shown not to be a mammal by the large parietal foramen, the composite structure of the lower jaw, and the presence of the prefrontal bone. It differs from known Anomodonts in making a somewhat closer approximation to Monotreme mammals than has hitherto been evident, and this correspondence extends to successive segments of both the fore- and hind-limbs.

The teeth are in sockets placed obliquely, with conical crowns compressed to sharp lateral margins, and curved inward. The proportions of the vertebral column are those of *Echidna*, though the transverse processes are longer, as in *Pareiasaurus*. The ribs are like those of a Monotreme, though the sacral ribs are longer. The shoulder-girdle resembles that of *Procolophon*, and differs from typical Anomodonts in the constituent bones being unanchylosed, and in the precoracoid having a large anterior extension in advance of the scapula. The sternum appears to have been unossified, as in Crocodilia. The humerus is widely expanded at both extremities and twisted, but does not show the peculiar lateral curvature seen in Monotremes. The ulna gives no evidence of an olecranon-process; it is larger than the radius, and appears to articulate with the humerus. The pelvic bones are without acetabular or obturator-perforations, are not anchylosed together, and the ilium is not expanded transversely. The hind-limb is no larger than the fore-limb. The femur is more slender than the similar bone in *Echidna*. The fibula is prolonged proximally beyond the stout tibia, round which it may rotate. The proximal row of the tarsus is one large bone, formed of the blended astragalus and os calcis.

In conclusion, the Author argues that the points of structure are so few in which Monotreme mammals make a closer approximation to the higher mammals than is seen in this fossil and other Anomodontia, that the Monotreme resemblances to fossil reptiles become increased in importance. He believes that a group Theropsida might be made to include Monotremata and Anomodontia, the principal differences (other than those of the skull) being that Monotremes preserve the marsupial bones and the atlas vertebra. *Ornithorhynchus* shows pre-frontal and post-frontal bones, and has the malar arch formed as in Anomodonts and some other reptiles.

#### MISCELLANEOUS.

*The Dates of Esper's 'Schmetterlinge.'* By C. DAVIES SHERBORN, F.Z.S. &c., and B. B. WOODWARD, F.L.S. &c.

THE following incomplete notes (pp. 138-140) on the dates of E. J. C. Esper's 'Die europäischen Schmetterlinge in Abbildungen' &c., collected over several years, may be useful to students until further information be forthcoming. We have to thank Mr. L. B. Prout for some valuable memoranda, the references "A. V." (=Allgemeines Verzeichniss derer Bucher, &c.: Leipzig, Weidmann) coming from his manuscripts. "G. A." signifies "Göttingische gelehrte Anzeigen." The dates in square brackets are doubtful and are those used by Mr. Sherborn in his 'Index Animalium.'

The dates of Esper's 'Die ausländischen (aussereurop.) Schmetterlinge' have been published by Prof. Aurivillius in K. Vet.-Ak. Handl. xix. (5) 1882, p. 182. We think the date of the last three parts (14-16, pp. 205-254) will be found to be 1798. The 1801 titlepage belongs to the so-called second edition.

Th. I.	Heft 1	1-28-40	pls.	1-6	1777	Announced A. V., Michaelmesse, 1776, p. 159.
	2	41-72		7-12	"	
	3	73-104		13-18	"	
	4	105-116*		19-24	"	
	5	117-144		25-30	"	
	6	145-163		31-36	"	G. A. 1777, pp. 618-622.
	7	169[192]		37-42	"	
	8	Sheet Bb=pp. 193-200 with Heft 28.			1788	
	9	201-216		43-48	1777	
	10	207-388		49-50	1779	
Th. II.	Heft 1	1-		1-6	1778	G. A. 1779, pp. 1256-8.
	11	-		7-12	1779	
	12	- 80		13-18	"	
	13	81-104		19-24	1780	G. A. 1781, p. 24.
	14	105-196			1781	G. A. 1784, p. 823; A. V., Oster, 1781, p. 89.
Th. III.	Heft 15	1-32		1-6	1782	G. A. 1783, pp. 551-2.
	16	33-56		7-12	"	
	17	57-88		13-17	1783	G. A. 1784, p. 784.
	18	89-104		18-23	"	
	19	105-136		24-31	1784	
	20	137-184		32-37	1785	
	21	185-208		38-43	"	
	22	209-240		44-49	"	G. A. 1786, pp. 925-7.
	23	241-272		50-55	"	
	24	273-288		56-61	1786	
	25	289-312		62-67	"	
	26	313-323		68-73	"	
	27	329-344		74-79	"	
	28	345-396 (with pl. 113 and Sheet Bb of Th. i., and pl. 36, sheet Gg of Th. ii.).			"	G. A. 1788, pp. 324-6.
Th. IV. Bd. 1, Heft 29		1-16		80-85	"	
	30	17-32		86-91	"	A. V., Oster, 1787, p. 603.
	31	33-48		92-97	1787	
	32	49-64		98-103	"	
	33	65-72			"	
	34	73-96		104-121	"	
	35	97-112			"	
	36†	113-128			1788	
	37†	129-144		122-133	"	G. A. 1792, pp. 652-3.
	38†	145-160		134-139	"	

39†	161-176	140-145	1789		
40	177-192	146-151	1790		
41	193-208	152-155 & 99 B & 105 B	"		
42 }					
43 }					
44 }					
45 }					
46 }					
47	321-352	168-177 & 125 B & C	"		
48	353-372	178-183	1793†		
49 }			1796		
50 }			1798		
51			1798		
52			1799		
53			1804		
54			1804		
			1805		
	1-16		[1796]		
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	41-64	5-10	1795		
	65-88	11-16	1795		
	89-104	17-20	[1795]		
	105-128				
	129-172?				
	-196				
	197-220	30-40	1800 §		
	221-224	41-46	1803		
	225-276		1806		
Th. V.	Heft				
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G. A. 1792, pp. 660-1.

G. A. 1798, p. 653.

A. V., Oster. 1798, p. 150.

A. V., Mich. 1799, p. 348.

A. V., Oster. 1804, p. 164.

A. V., Mich. 1804, p. 432.

A. V., Oster. 1805, p. 191.

P. 6 out before p. 590 of Th. iv. Bd. 2, Abschn. 1.  
 P. 20 "In dem abgewichenen 1794ten Jahre," and  
 p. 29; and see p. 35. Probably written 1795 and  
 published 1796. E marks end of a part.  
 H marks end of a part.

P. 36 "dieses 1794sten Jahres."

G. A. 1798, p. 653; A. V., Oster. 1795, p. 120;  
 Mich. 1795, p. 282.

Pp. 129-148 are omitted, but the signatures are  
 correct; A. V., Oster. 1799, p. 136; Allg. lit.  
 Zeit. 1804, iii. p. 412.

On p. 170 Esper refers to 1795; A. V., Oster. 1800,  
 p. 151; Oster. 1802, p. 187.

See Brit. Mus. 461. g. 8, with original wrapper.  
 A. V., Oster. 1806, p. 159.

\* ? 112 or 126.

† Fibig and Nau, *Bibl. gesamt.* Nat. 1789-91, agree with these dates and supply numbers of plates.

‡ Michaelmas 1793, Meyer, *Zool. Annalen*, p. 50; A. V., Mich. 1793, p. 266.

§ "Bechstein and Scharfenberg (*Naturg. schädli.* Forstinssect. i. p. 26) give the dates of the work as 1777-1800, and indicate pl. 40 of the 'Spannerphal,' as the last out. They also state at that date [1800] 112 (out of 123) Tagsschnitt-plates had appeared, 46 (out of 47) Schwärmer, 205 (out of 219) Spinner and Eulen."—L. B. PROUT *in litt.*

Fortsetzung der Tageschmutterlingen :					
1	pp.	1-		[1780]	1780 quoted on p. 9; A. V., Oster. 1781, p. 89.
2		- 68		[1780]	1780 quoted on p. 45; A. V., Mich. 1781, p. 206.
3		69-100	pls.	1781	} G. A. 1782, p. 1237, and 1783, p. 592. } G. A. 1784, p. 823. } G. A. 1788, p. 324.
4		101-124		1781	
5		125-140		1782	
7	(pars)	141-156		1783	
		157-184		1786	
		185-190			
Fortsetzung der Abendschmutterlingen :					
6		197-212		1782	} (With text to Heft 14 of main work.) } G. A. 1784, p. 823. } G. A. 1788, p. 324.
7	(pars)	213-228		1783	
		229-234		1786	
Supplement Band. 1 Abschn. Tageschmutterl. :					
	Heft 1	1- 8		1789	} G. A. 1792, p. 653. } G. A. 1798, p. 654.
	3	9- 60		1793	
	5	[no text]		1793	
		61- 88		[1797]	} On O <sub>3</sub> we read "in dem abgewichenen sommer's dieses 1799sten Jahres." } Completed 1805, Engelmann; Hagen.
		89-104		[1799]	
		105-120		[1805]	
Suppl. Band. 2 Abschn. Abendschmutterl. :					
	Heft 2	1- 4		1789	} G. A. 1792, p. 653. } G. A. 1798, p. 654.
	4	5- 16		1793	
		17- 40		[1797]	} On p. 32 "im abgewichenen 1797 Jahre." } Completed 1806, Engelmann; Hagen.
		41- 52		[1806]	
Suppl. Band. 3 Abschn. Nachtschmutterl. :					
	Heft 1	1-36		1789	} G. A. 1792, p. 653. } G. A. 1798, p. 654.
		[no text]		1793	
		37- 64		[1797]	} P. 91 quotes 1798. } Completed 1807, Engelmann; Hagen.
		65- 94		[1799]	
		95-104		[1807]	
Suppl. Band. 2 Theil. Fortsetzung 1, 2, 3, 4 Theile :					
		1- 8		[1805]	} By T. v. Charpentier.
		9-16		1830	
		17-24			
		25-48			

[Ed. 2 is identical with ed. 1, plus xxii pp. of introduction and pp. 25-48 of Suppl. 1-4 Th., which is by Charpentier.]

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\*.\* It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.



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## CATALOGUE

OF THE

## PHYSIOLOGICAL SERIES OF COMPARATIVE ANATOMY

IN THE

MUSEUM OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

By PROF. C. STEWART, LL.D., F.R.S. &c.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 38. FEBRUARY 1901.

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XVIII.—*On some Fossils of Wenlock Age from Mulde, near Klinteberg, Gotland.* By FREDERICK CHAPMAN, A.L.S., F.R.M.S.; with Notes by Prof. T. RUPERT JONES and Dr. F. A. BATHER.

[Plate III.]

SOME few years ago Mr. F. A. Bather, D.Sc., F.G.S., favoured me with a sample of richly fossiliferous clay collected at Mulde brick-works in the island of Gotland; and since it yielded a large number of Ostracoda and other minute fossils, some of them new, the following notes have been written on them. The sample did not happen to contain any of the larger species (Brachiopods, Trilobites, &c.) well known from this locality.

Prof. Gustaf Lindström has already described a large number of fossils from Gotland, and has published a complete list of them (1050 spp.) so far as then known\*.

The Ostracoda of Gotland have been specially dealt with

\* 'A List of the Fossils of the Upper Silurian Formation of Gotland,' Stockholm, 1885.

by L. Kolmodin \*, Prof. T. Rupert Jones †, and J. Kiesow ‡, whilst A. Krause has described many forms from a similar fauna in the Silurian Drift of N. Germany §.

Nevertheless the material we possess appears to come from an unworked locality, and the Ostracoda and some other groups of fossils afford many special points of interest.

The clay obtained from Mulde is on the horizon of bed *c* of Lindström ||, and the fauna agrees with that author's area no. 3, "das centrale Gebiet" ¶. It agrees with Lindström's statement that it is comparable in age with the Wenlock Shale of this country; it is also partly homotaxial with the Niagara group of North America.

The most abundant fossils are the Ostracoda, Polyzoa, Brachiopoda, and Pteropoda (*Tentaculites*). Besides these there are specimens representing two genera of Foraminifera, some tubicolar Annelids, and a few fragments of Crinoids and Trilobites. The matrix is a soft pale bluish clay, which is as easily washed down as a Tertiary clay, and the fossils contained in it are excellently preserved.

## PROTOZOA.

Class RHIZOPODA.

Order FORAMINIFERA.

Family **Astrorhizidæ.**

Subfamily *RHABDAMMININÆ.*

HYPERAMMINA, Brady [1878].

*Hyperammina ramosissima*, sp. n. (Pl. III. fig. 1.)

Test adherent, white, finely arenaceous; consisting of a flattened tube, with widely divergent branches, obscurely

\* 'Bidrag till kannedomen om Sverges Siluriska Ostracoder' (Upsala, 1869); also, 'Översigt Kongl. Vetensk.-Ak. Förhandlingar,' 1879, no. 9, pp. 133-139, pl. xix.

† 'Notes on some Silurian Ostracoda from Gothland' (Stockholm, 1887); also "On some Silurian Ostracoda from Gothland," *Ann. & Mag. Nat. Hist.* ser. 6, vol. i. 1888, pp. 395-411, pls. xxi., xxii.

‡ "Ueber Gotländische Beyrichien," *Zeitschr. deutsch. geol. Gesellsch.* vol. xl. (1888) pp. 1-16, pls. i., ii.

§ *Zeitschr. deutsch. geol. Gesellsch.* vol. xliii. (1891) pp. 488-521, vol. xlv. (1892) pp. 383-399.

|| "Ueber die Schichtenfolge des Silur auf der Insel Gotland," *Neues Jahrb.* 1888, vol. i. pp. 147-164.

¶ *Op. cit.* pp. 154-156.

segmented in a few places. Apertures at the terminations of the branches. Greatest length 2·66 millim.; average width of tube ·23 millim.

This species is somewhat like *Sagenina frondescens* (Brady) in habit of growth, but it has a smoother tube and is without the smoothly finished apertures at the ends of the branches; the latter also are more outspread.

Silurian; Mulde, Gotland. Attached to the interior of a Brachiopod shell.

### Family Lituolidæ.

Subfamily *ENDOTHYRINÆ*.

STACHEIA, Brady [1876].

*Stacheia amplexa* (Vine).

*Psammosiphon amplexus*, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 391, pl. xv. fig. 8.

*Stacheia amplexa* (Vine), Chapman, 1895, Ann. & Mag. Nat. Hist. ser. 6, vol. xvi. p. 323, pl. xii. figs. 6, 7.

Reference has already been made to the discovery of *S. amplexa* in the Silurian clay of Gotland in my paper on the Rhætic Foraminifera of Wedmore\*. The Gotland specimens are of a pale grey colour, but in all other respects are like the Carboniferous and Rhætic specimens.

Silurian; Mulde, Gotland. Common.

*Stacheia stomatifera*, sp. n. (Pl. III. fig. 2.)

Test calcareo-arenaceous; normally attached or resting on one surface, somewhat depressed and lobulated. Apertures slit-like and salient, on the superior face only. Longest diameter of specimen found 5 millim.

Silurian; Mulde, Gotland.

### CŒLEENTERATA.

Class ACTINOZOA.

Order ZOANTHARIA.

SYRINGOPORA, Goldfuss [1829].

*Syringopora serpens* (Linné). [Young specimens.]  
(Pl. III. fig. 3.)

*Tubipora serpens*, Linné, 1767, Syst. Nat. 12th ed. p. 1271.

*Syringopora serpens* (L.), Edwards & Haime, 1854, Mon. Brit. Foss. Corals, pt. v., Pal. Soc. p. 275, pl. lxv. figs. 2, 2a.

\* Ann. & Mag. Nat. Hist. vol. xvi. (1895) p. 324.

The specimens from Gotland are small detached corallites of the early stages of *Syringopora*. They are remarkably like *Aulopora* and *Cladochonus* in general appearance; and this bears out Messrs. Edwards and Haime's statement that "young specimens of this coral equally resemble *Aulopora*." It has previously been recorded from Dudley and Benthall Edge in Britain and from Gotland.

Silurian; Mulde, Gotland. Common.

### *ECHINODERMATA.*

Sub-branch **PELMATOZOA.**

Class **CRINOIDEA.**

[Some fragments of Crinoids were found in the washings of the Mulde clay, and Mr. Bather has been good enough to write the following note upon them.]

*Entrochus*, gen. et sp. indet.

A Crinoid stem-fragment of five columnals (Pl. III. fig. 5), total length 5·5 millim., width 1·5 millim.; each with slightly concave sides, marked, however, with faint pustules, tending to coneresce into a ridge at half the height of each columnal. Lumen small and apparently circular. Facet (fig. 6) with about twenty-eight radiating ridges, not very marked or regular and not reaching the margin, so that the suture is not crenulate.

*Trochitæ*, gen. et sp. indet.

A series of six columnals of delicate and beautiful appearance. The body of each is pentagonal in section, about ·8 millim. wide, with small pentagonal lumen, the angles of which alternate with those of the columnal. The facet (fig. 9) shows five marked grooves (or the ridges that engage in those grooves, as the case may be, fig. 8) which pass from the angles of the lumen to the sides of the facet, which they bisect, and to a slight extent render the periphery quinquelobate, reminding one of a Tudor rose. The body of the columnal bears at half its height a thin flange, circular or slightly angular in outline, the angles in the latter case corresponding to those of the body of the columnal; total width 1·75 millim.; breadth of flange ·5 millim. A similar flange is seen in certain Devonian columnals usually assigned to *Ilihodocrinus*, but on what evidence I know not.

*Trochitæ*, gen. et sp. indet.

Four columnals rather higher, apparently with circular body, circular flange, and pentagonal lumen. The facet is in one specimen (fig. 7) divided into a depressed central area and an elevated outer area, the latter divided into about twelve rounded portions (knobs almost) by grooves radiating from the central area. In this, and in all the rest to a less extent, the flange is seen to be composed of coneresced tubercles. Total width of this is about 1·2 millim.

Compare flanges of *Gissocrinus verrucosus*, Bather (Crin. Gotland, Svenska Vet.-Akad. Handl. vol. xxv. no. 2, pl. x. figs. 371, 372, 375); but the facet is not similar.

[F. A. B.]

## ANNULOSA.

## Class ANNELIDA.

## Order POLYCHÆTA (TUBICOLA).

## CORNULITES, Schlotheim [1820].

*Cornulites scalariformis*, Vine.

*Cornulites scalariformis*, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 379, pl. xv. figs. 1, 9, & 10.

Our specimens are characteristic in general form, but dwarfed, being only half the size of the specimens found in the Wenlock Shales by Vine.

Silurian; Mulde, Gotland. Rare.

## CONCHICOLITES, Nicholson [1872].

*Conchicolites Nicholsonii*, Vine.

*Conchicolites Nicholsonii*, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 381, pl. xv. fig. 2.

This species was originally described from the Wenlock Shales of this country, and Vine also found it in material from Gotland.

Our specimen is probably a young tube, since it measures only  $\frac{1}{8}$  inch (3·125 millim.) in length.

Silurian; Mulde, Gotland.

*Conchicolites tuberculifera*, sp. n. (Pl. III. fig. 4.)

Tube calcareous, tapering, slightly curved; averaging 3 millim. in length, diameter of mouth about 1 millim.

Annulations numerous, about six to 1 millim.; they are somewhat irregular and have their edges broken up into numerous closely-set tubercles.

Silurian; Mulde, Gotland.

### ORTONIA, Nicholson [1872].

#### *Ortonia pseudopunctata*, Vine.

*Ortonia conica*, Nicholson, var. *pseudopunctata*, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 383, pl. xv. fig. 3.

Tube regularly conical, attenuate, flexuose, adherent by one side; with numerous annulations. The Gotland specimens measure 2 millim. in length. The present species seems to have intermediate characters between *Ortonia minor*, Nicholson, and *Ortonia conica*, Nicholson.

The specimens are adherent to Brachiopod shells. One example has a calcareous layer extending round the distal end of the tube.

Silurian; Mulde, Gotland. Rare.

## ARTHROPODA.

### Class ENTOMOSTRACA.

#### Order OSTRACODA.

The natural relationships of many of the genera of Palæozoic Ostracoda are more or less obscure. The following table of the grouping, which has been kindly drawn up by our best authority on the subject, Prof. T. Rupert Jones, F.R.S., to whom I am indebted for many helpful suggestions in writing this section of the paper, will be of the greatest use to students of the fossil forms of Ostracoda.

The genera *Thlipsura* and *Æchmina* and also *Primitiopsis* are placed apart and after the family of the Cytheridæ and before the Cyprididæ. Regarding the two former genera, Prof. Jones remarks:—"Their alliance is not yet clear, and they are in many respects peculiar." He also says regarding *Primitiopsis*:—"Related to the Cytheridæ through the fossil *Cytheridea*, and to the Cyprididæ through the recent *Chlamydotheca*."



## OSTRACODA

[limited to genera mentioned in this paper].

Family **Leperditiidæ**, Jones.Subfamily **APARCHITINÆ**, nov.

1. *Primitia*, Jones & Holl, 1865.

Subfamily **BEYRICHIINÆ**, nov.

2. *Klædenia*, Jones & Holl, 1886.  
 3. *Bollia*, Jones & Holl, 1886.  
 4. *Beyrichia*, M'Coy, 1846.

Family **Cytheridæ**.

5. *Cythere*, Müller, 1785.  
 6. *Thlipsura*, Jones & Holl, 1869.  
 7. *Æchmina*, Jones & Holl, 1869.  
 8. *Primitiopsis*, Jones, 1887.

CYPRIDIDA.

Family **Cyprididæ**.

9. *Pontocypris*, G. O. Sars, 1865.

Family **Bairdiidæ**.

10. *Macrocypris*, G. S. Brady, 1867.  
 11. *Bythocypris*, G. S. Brady, 1880.

Family **Cytherellidæ**.

12. *Cytherella*, Jones & Bosquet, 1848.

T. RUPERT JONES,  
 Oct. 13th, 1900.

Family **Leperditiidæ**.Subfamily **APARCHITINÆ**, nov.**PRIMITIA**, Jones & Holl [1865].*Primitia valida*, Jones & Holl.

*Primitia valida*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 409, pl. xiv. figs. 7 a-c; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 405.

The surface reticulation is well preserved in the Gotland specimens; this feature was also noticed by Prof. Jones in

the examples from Fröjel, and he also records it from Woolhope and Ironbridge.

Silurian; Mulde, Gotland.

*Primitia valida*, var. *breviata*, Jones & Holl.

*Primitia valida*, var. *breviata*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 410, pl. xiv. figs. 8 *a*, *b*.

Formerly described from the Wenlock Shales.

Silurian; Mulde, Gotland.

*Primitia valida*, var. *angustata*, Jones & Holl.

*Primitia valida*, var. *angustata*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 410, pl. xiv. figs. 4 *a*, *b*.

This variety was also found in the Wenlock Shales.

Silurian; Mulde, Gotland. Very rare.

*Primitia fabulina*, Jones & Holl.

*Primitia fabulina*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 408, pl. xiv. figs. 2 *a*, *b*.

Two specimens, rather more elongate than the type figure, were found in the Gotland series. Originally described from the Wenlock series of Dudley Tunnel.

Silurian; Mulde, Gotland.

*Primitia elongata*, Krause.

*Primitia elongata*, Krause, 1891, Zeitschr. deutsch. geol. Gesellsch. vol. xliii. p. 494, pl. xxx. figs. 4 *a*, *b*; Krause, 1892, *ibid.* vol. xliv. p. 386, pl. xxii. fig. 2.

This species has been described from the Silurian Drift-gravel of Mark Brandenburg.

Silurian; Mulde, Gotland. Very rare.

*Primitia punctata*, Jones.

*Primitia punctata*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 193, pl. vii. figs. 9 *a*, *b*.

Has been previously recorded from the Wenlock Shales of this country.

Silurian; Mulde, Gotland. Very rare.

*Primitia humilis*, Jones & Holl.

*Primitia humilis*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 409, pl. xiv. figs. 6 *a*, *b*, 9 *a-c*.

The British specimens were from Woolhope and the shales of the Lower and Upper Wenlock series.

Silurian; Mulde, Gotland. Very rare.

*Primitia ornata*, Jones & Holl.

*Primitia ornata*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 411, pl. xiv. fig. 5.

This species was described from the Upper Wenlock and Woolhope series. It is a small but striking form, on account of the beautifully reticulated surface.

Silurian; Mulde, Gotland. Common.

*Primitia reticristata*, Jones.

*Primitia reticristata*, Jones, 1887, Silur. Ostrac. Gotland, p. 5; id. 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 406, pl. xxii. figs. 15 a-c.

A common form in the Gotland series and already recorded from Fröjel, in Gotland; also from the Silurian Drift of Mark Brandenburg.

Silurian; Mulde, Gotland. Very common.

*Primitia mundula*, Jones.

*Beyrichia mundula*, Jones, 1855, Ann. & Mag. Nat. Hist. ser. 2, vol. xvi. p. 90, pl. v. fig. 23.

*Primitia mundula*, Jones & Holl, 1865, Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. p. 419; Jones, Krause, 1891, Zeitschr. deutsch. geol. Gesellsch. vol. xliii. p. 495, pl. xxx. figs. 5 a-c, 6, 7 a, b.

This well-known Silurian species is represented in our collection by a fine series of well-preserved specimens.

Silurian; Mulde, Gotland. Common.

Subfamily *BEYRICHIINÆ*, nov.

*KLÆDENIA*, Jones & Holl [1886].

*Klædenia apiculata*, Jones.

*Klædenia apiculata*, Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 398, pl. xxi. figs. 1-5.

A few typical specimens occur in our washings. The original types came from Slite, in Gotland.

Silurian; Mulde, Gotland.

*Klædenia gotlandica*, sp. n. (Pl. III. figs. 12 a, b.)

Valve seen from the side suboval, elongate; ventral margin elliptically convex; dorsal margin straight, but intruded on

by the middle lobe; posterior angle full and evenly rounded, anterior rounded and narrowed off. Middle of valve with a short, low, transverse, clavate ridge or swelling, which projects a little beyond the dorsal margin. Towards the ends of the valves the sides are swollen, especially near the posterior extremity, and represent incipient lobes. Surface of valves delicately pitted. Edge view of carapace elongate-oval, with rounded ends. Length .44 millim.; height .266 millim.

This species is nearly allied to *Beyrichia* (? *Klædenia*) *plagosa*, Jones \*, which was obtained from strata of Wenlock age at Beechey Island, Canada. It differs, however, in the position and shape of the central lobe, which in our specimen is more pronounced and projects beyond the margin; and, further, the surface ornamentation in *K. gotlandica* is an even and delicate pitting.

#### BOLLIA, Jones & Holl [1886].

##### *Bollia auricularis*, Jones.

*Bollia auricularis*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 408, pl. xiii. figs. 10 a-c.

This species is not uncommon in the Gotland washings, and the measurements of the valves agree very closely with those of the originally described specimens from Ironbridge, Severn.

Silurian; Mulde, Gotland.

#### BEYRICHIA, M'Coy [1846].

##### *Beyrichia concinna*, Jones & Holl.

*Beyrichia concinna*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 356, pl. xii. figs. 22 a, b.

The Gotland specimens measure about one third more than the specimen figured by Jones and Holl from the Silurian of Dormington, but otherwise they possess the same characteristics.

Silurian; Mulde, Gotland. Common.

##### *Beyrichia muldensis*, sp. n. (Pl. III. fig. 10.)

Valve oblong, ventral margin slightly convex, ends nearly equally rounded, and with a marginal raised rim round the ends and the elliptically curved ventral border. Surface of

\* Ann. & Mag. Nat. Hist. ser. 3, vol. i. 1858, p. 243, pl. ix. fig. 2.

valve excavated and granulate. The central area is occupied by three transverse narrow lobes or ridges, which are all slightly salient at the dorsal border; the posterior and central lobes are slightly clavate; the anterior is a thin ridge and joining the raised border of the valve at the antero-dorsal angle. Length of carapace .8 millim.; height .4 millim.

This is a very neat form, and apparently has not been previously noticed in any of the washings made from the Silurian either of this country or of Gotland. The nearly symmetrical *W*-like group of the three thin central lobes, scarcely reaching the ventral region and joining on with the anterior marginal rim, is not matched in any published figures. A somewhat near approach to these features, however, is seen in *B. admixta*, Jones & Holl \*, from Woolhope, but that form is more stoutly built and its four transverse lobes are thicker and shorter in proportion; their general arrangement is also different.

Silurian; Mulde, Gotland. Frequent.

*Beyrichia Jonesii*, Boll.

*Beyrichia Jonesii*, E. Boll, 1856, Zeitschr. deutsch. geol. Gesellsch. vol. viii. p. 322, figs. 1, 2; 1862, Archiv Ver. Fr. Nat. Mecklenburg, 16 Jahr. p. 134, fig. 8; Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 359.

This has already been recorded from the Wenlock Limestone of Eastnor Park. A few typical specimens with faintly granulate surfaces occur in this collection.

Silurian; Mulde, Gotland.

*Beyrichia Klædeni*, M'Coy, var. *tuberculata*, Salter.

*Beyrichia Klædeni*, var. *tuberculata*, Salter, 1881, Geol. Mag. dec. ii. vol. viii. pp. 345, 346; Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. pp. 354, 355, pl. xii. figs. 8 *a*, *b*, 9 *a*, *b*.

Most of our specimens can be compared with the subvariety *clausa*, by which Jones and Holl have designated certain small elongated examples from the Wenlock Shales in Vine's collection, and these are possibly young individuals. There is, however, one example of the typical variety in our series.

Silurian; Mulde, Gotland. Rare.

*Beyrichia tuberculata* (Klæden), var. *lineato-tuberculata*, nov.  
(Pl. III. fig. 11.)

This is one of the many modifications of *B. tuberculata*

\* Ann. & Mag. Nat. Hist. 1886, ser. 5, vol. xvii. p. 359, pl. xii. fig. 5.

(Klœden). Six of such varieties are figured on pl. xxi. Ann. & Mag. Nat. Hist. ser. 6, vol. i. (1888) p. 402, figs. 12-17, from the Silurian of Slite, Gotland. In the present instance the lobes are more distinctly marked with three obliquely transverse furrows; the ventral edge more neatly tubercled, and the two bold curved ventral fringes far more symmetrically arranged. Length 2·5 millim.; height 1·4 millim.

Silurian; Mulde, Gotland. Frequent.

*Beyrichia Bolliana umbonata*, Reuter.

*Beyrichia Bolliana umbonata*, Reuter, 1885, Zeitschr. deutsch. geol. Gesellsch. vol. xxxvii. p. 646, pl. xxvi. fig. 21; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 401, pl. xxi. figs. 10, 11.

This species has been recorded from Fröjel. Two specimens were found at Mulde and are variable in size; their lengths measure 1·3 millim. and 2·3 millim. respectively.

Silurian; Mulde, Gotland.

*Beyrichia clavata*, Kolmodin.

*Beyrichia clavata*, Kolmodin, 1869, Bidrag till Kännedomen om Sverges Siluriska Ostracoden, p. 18, fig. 10; Jones, 1887, Silur. Ostrac. Gotland, p. 2; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 399, pl. xxi. figs. 6-9.

The washings from Mulde have yielded a very large number of this species, a fair proportion of them having the hypertrophied lobe common to this type of *Beyrichia*. Prof. Jones records *B. clavata* from Eksta and Fröjel in Gotland.

Silurian; Mulde, Gotland. Very abundant.

Family Cytheridæ.

CY THERE, Müller [1785].

? *Cythere Vinei*, Jones.

? *Cythere Vinei*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 191, pl. vii. figs. 1 *a*, *b*, & 5 *a*, *b*.

A specimen similar in every respect to those found in the Wenlock Shales of Shropshire was met with in the Gotland series. The generic relationship of this and the following is very doubtful.

Silurian; Mulde, Gotland.

? *Cythere subquadrata*, Jones.

? *Cythere subquadrata*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 191, pl. vii. figs. 6 *a, b*, & 14 *a, b*.

This species is represented from Gotland only by a single valve. It has been recorded from the Wenlock Series of Shropshire.

Silurian; Mulde, Gotland.

## THLIPSURA, Jones &amp; Holl [1869].

*Thlipsura plicata*, var. *unipunctata*, Jones.

*Thlipsura plicata*, var. *unipunctata*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 403, pl. xii. figs. 11 & 12.

A single example of this variety was found at Mulde. Silurian; Mulde, Gotland.

*Thlipsura v-scripta*, Jones & Holl, var. *discreta*, Jones.

*Thlipsura v-scripta*, J. & H., var. *discreta*, Jones, 1887, Silur. Ostrac. Gothland, p. 6; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 404, pl. xxii. figs. 9 *a-c*, 10.

Good typical specimens occur in our washings from Mulde. Silurian; Mulde, Gotland. Very common.

## ÆCHMINA, Jones &amp; Holl [1869].

*Æchmina bovina*, Jones.

*Æchmina bovina*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 412, pl. xiii. fig. 6; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 409, pl. xxii. fig. 8.

Five very perfect specimens, showing the delicate toothed margin, were found in our material. It has occurred before in the Wenlock Shales of this country and also at Fröjel in Gotland.

Silurian; Mulde, Gotland.

*Æchmina bovina*, Jones, var. *punctata*, Krause.

*Æchmina bovina*, Jones, var. *punctata*, Krause, 1892, Zeitschr. deutsch. geol. Gesellsch. vol. xlv. p. 397, pl. xxii. fig. 18.

An example of this beautiful little variety occurred at Mulde. The spike in our specimen is rather longer than that shown in Krause's figure. Krause records this variety from the "Graptolithen-Gestein" in the Silurian Drift of Mark Brandenburg in N. Germany.

Silurian; Mulde, Gotland.

## PRIMITIOPSIS, Jones [1887].

*Primitiopsis planifrons*, Jones.

*Primitiopsis planifrons*, Jones, 1887, Silur. Ostrac. Gotland, p. 5, woodcuts; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 406, pl. xxii. figs. 1 *a-d*.

Somewhat like a long *Primitia* with the reticulate ornament of *P. ornata*. The anterior border, however, is more pronounced, and the front part of the interior is partitioned off by a thin cross-wall.

Silurian; Mulde, Gotland. Frequent.

## CYPRIDIDA.

## Family Cyprididæ.

## PONTOCYPRIS, G. O. Sars [1865].

*Pontocypris Mawii*, Jones.

*Pontocypris Mawii*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 182, pl. iv. figs. 4 & 7; Krause, 1891, Zeitschr. deutsch. geol. Gesellsch. p. 512, pl. xxxiii. figs. 8 *a, b*.

Our specimens are exactly comparable with those figured by Prof. Rupert Jones from Fröjel in Gotland.

Silurian; Mulde, Gotland. Rare.

*Pontocypris Mawii*, var. *proxima*, Jones.

*Pontocypris Mawii*, var. *proxima*, Jones, 1889, Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 269, pl. xv. figs. 5 *a, b*.

A specimen occurs in our series which closely resembles the variety *proxima*. Prof. Jones records it from Wisby in Gotland.

Silurian; Mulde, Gotland.

## Family Bairdiidæ.

## MACROCYPRIS, G. S. Brady [1867].

*Macrocypris siliquoides*, Jones.

*Macrocypris siliquoides*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 181, pl. v. figs. 9 *a-c*.

This species is rare at Mulde. It has been recorded from the Wenlock Shales.

Silurian; Mulde, Gotland.



## BYTHOCYPRIS, G. S. Brady [1880].

*Bythocypris symmetrica*, Jones.

*Bythocypris symmetrica*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 186, pl. vii. figs. 3, 4, 7.

The Gotland specimens are rather variable in size, but in outline they are quite characteristic.

This species is already known from the Wenlock Series of Shropshire and from bed *c*, Fröjel, Gotland.

Silurian; Mulde, Gotland. Common.

*Bythocypris symmetrica*, var. *obesa*, Jones.

*Bythocypris symmetrica*, var. *obesa*, Jones, 1889, Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 270, pl. xv. figs. 7 *a-c*.

This variety was originally obtained from the red clay, bed *a*, of Northern Gotland (of Llandoverly age).

Silurian; Mulde, Gotland. Very common.

*Bythocypris phaseolus*, Jones.

*Bythocypris phaseolus*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 189, pl. vii. figs. 11 & 12.

This species is new to the Gotland fauna. It was described from a specimen out of the Wenlock Shales of Buildwas, Shropshire.

Silurian; Mulde, Gotland. Very rare.

*Bythocypris Hollii*, Jones.

*Bythocypris Hollii*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 184, pl. v. figs. 1 *a, b*, pl. vi. figs. 3 *a, b*, & 4 *a, b*.

This is a common and very striking form in the Gotland series. Prof. Jones records it from Fröjel and also from the Wenlock Shales of Shropshire.

Silurian; Mulde, Gotland.

*Bythocypris Hollii*, var. *oblonga*, Jones.

*Bythocypris Hollii*, var. *oblonga*, Jones, 1889, Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 270, pl. xv. figs. 1 *a-c*.

This variety differs from the type in its greater proportionate length. It was formerly known from the red clay, bed *a*, of Northern Gotland.

Silurian; Mulde, Gotland. Frequent.

Family **Cytherellidæ.**

CYTHERELLA, Jones &amp; Bosquet [1849].

*Cytherella Smithii*, Jones.*Cytherella Smithii*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 192, pl. vii. figs. 15 a, b, & 16 a, b.

This neat little species is common at Mulde, and they appear to be favourably grown as regards size. It was originally described from Woolhope.

Silurian ; Mulde, Gotland.

## Order TRILOBITA.

*Phacops (Dalmanites) limulurus*, Hall.

Several specimens of young individuals of the above species, but more or less fragmentary, were found in the Mulde clay washings. Fragments of the pygidium with the spine attached were occasionally found.

## MOLLUSCOIDEA.

## Class BRYOZOA.

## Order GYMNOLEMATATA.

## Suborder CYCLOSTOMATA.

? *Spiropora intermedia*, Vine. Rare.

*Fistulipora*, sp. Rare.

## Suborder TREPOSTOMATA.

*Callopora florida*, Hall. Rare.

*Trematopora solida*, Hall. Very rare.

*Cladopora repens* (Linné). Very common.

— *sparsa* (Hall). Very rare.

## Suborder CRYPTOSTOMATA.

*Ptilodictya lanceolata* (Goldfuss). Rare.

*Rhombopora lineinodis*, Ulrich. Common.

## Class BRACHIOPODA.

## Order INARTICULATA.

*Pholidops implicata* (Sowerby). Very abundant.

## Order ARTICULATA.

*Spirifer elevatus*, Dalman. Very rare.

*Dayia navicula* (Sow.). Common.

*Retzia Salteri*, var. *Bouchardi*, Davidson. Very rare.

*Atrypa imbricata*, Sow. Rare.

*Rhynchotrete cuneata* (Dalman). Frequent.

*Orthis (Dalmanella) canaliculata*, Lindström. Common.

## MOLLUSCA.

## Class GASTROPODA.

## Order PTEROPODA (THECOSOMATA).

*Tentaculites elongatus*, Hall. Frequent.

— *tenuis*, Sowerby. Rare.

— *wenlockianus*, Vine. Very common.

— *ornatus*, Sow. Common.

— *multiannulatus*, Vine. Frequent.

## Comparative Table of Species occurring at Mulde.

	Previously recorded from Gotland by Lindström, Jones, &c.	England (Wenlock Group).	America (Niagara Group).	Silurian (Drift), N. Germany.	Notes.
FORAMINIFERA.					
1. <i>Hyperammina ramosissima</i> , sp. n.					
2. <i>Stacheia amplexa</i> (Vine) . . . . .	..	*	..	..	Occurs also in the Rhætic of Somerset.
3. — <i>stomatifera</i> , sp. n.					

	Previously recorded from Got- land by Lindström, Jones, &c.	England (Wenlock Group).	America (Niagara Group).	Silurian (Drift), N. Germany.	Notes.
ZOANTHARIA.					
4. Syringopora serpens ( <i>Linné</i> ) . . . . .	*	*			
<i>Crinoid fragments indet.</i>					
POLYCHÆTA.					
5. Cornulites scalariformis, <i>Vine</i> . . . . .	..	*			
6. Conchicolites <i>Nicholsoni</i> , <i>Vine</i> . . . . .	*	*			
7. ——— tuberculifera, sp. n.					
8. Ortonia pseudopunctata, <i>Vine</i> . . . . .	..	*			
OSTRACODA.					
9. Primitia valida, <i>Jones &amp; Holl</i> . . . . .	*	*	..	*	
10. ———, var. breviata, <i>J. &amp; H.</i> . . . . .	..	*			
11. ———, var. angustata, <i>J. &amp; H.</i> . . . . .	..	*			
12. ——— fabulina, <i>J. &amp; H.</i> . . . . .	..	*			
13. ——— elongata, <i>Krause</i> . . . . .	..	*	..	*	
14. ——— punctata, <i>Jones</i> . . . . .	..	*			
15. ——— humilis, <i>J. &amp; H.</i> . . . . .	..	*			
16. ——— ornata, <i>J. &amp; H.</i> . . . . .	..	*			
17. ——— reticristata, <i>Jones</i> . . . . .	*	..	..	*	
18. ——— mundula, <i>Jones</i> . . . . .	*	*	..	*	
19. Klœdenia apiculata, <i>Jones</i> . . . . .	*				
20. ——— gotlandica, sp. n.					
21. <i>Bollia auricularis</i> , <i>Jones</i> . . . . .	..	*			
22. <i>Beyrichia concinna</i> , <i>J. &amp; H.</i> . . . . .	..	*			
23. ——— muldensis, sp. n.					
24. ——— <i>Jonesii</i> , <i>Boll</i> . . . . .	*	*	..	*	
25. ——— <i>Klœdeni</i> , <i>M<sup>c</sup>Coy</i> , var. tubercu- lata, <i>Salter</i> . . . . .	*	*			
26. ——— tuberculata ( <i>Klœden</i> ), var. lineato-tuberculata, nov.					
27. ——— <i>Bolliauna umbonata</i> , <i>Reuter</i> . . . . .	*	..	..	*	
28. ——— clavata, <i>Kolmodin</i> . . . . .	*	*	..	*	
29. ? <i>Cythere Vinei</i> , <i>Jones</i> . . . . .	..	*			
30. ? ——— subquadrata, <i>Jones</i> . . . . .	..	*			
31. <i>Thlipsura plicata</i> , var. unipunctata, <i>Jones</i> . . . . .	..	*			
32. ——— v-scripta, <i>J. &amp; H.</i> , var. discreta, <i>Jones</i> . . . . .	*	..	..	*	

Small specimens in the Wenlock series near Malvern. Also from Scandinavia.—T. R. J.

	Previously recorded from Gotland by Lindström, Jones, &c.	England (Wenlock Group).	America (Niagara Group).	Silurian (Drift), N. Germany.	Notes.
33. <i>Æchmina bovina</i> , Jones	*	*			
34. ———, J., var. <i>punctata</i> , Krause	..	..	..	*	
35. <i>Primitiopsis planifrons</i> , Jones	*	*			
36. <i>Pontocypris Mawii</i> , Jones	*	*	..	*	
37. ———, var. <i>proxima</i> , Jones	*	..	..	*	
38. <i>Macrocypris siliquoides</i> , Jones	..	*	..	*	
39. <i>Bythocypris symmetrica</i> , Jones	*	*	..	*	
40. ———, var. <i>obesa</i> , Jones	*				
41. ——— <i>phaseolus</i> , Jones	..	*			
42. ——— <i>Hollii</i> , Jones	*	*	..	*	
43. ———, var. <i>oblonga</i> , Jones	*				
44. <i>Cytherella Smithii</i> , Jones	..	*			
TRILOBITA.					
45. <i>Phacops</i> ( <i>Dalmanites</i> ) <i>limulurus</i> , Hall	..	..	*		
BRYOZOA.					
46. ? <i>Spiropora intermedia</i> , Vine	..	*			
47. <i>Fistulipora</i> , sp.					
48. <i>Callopora florida</i> , Hall	..	..	*		
49. <i>Trematopora solida</i> , Hall	*	..	*		
50. <i>Cladopora repens</i> ( <i>Linne</i> )	*	*			
51. ——— <i>sparsa</i> ( <i>Hall</i> )	*	..	*		
52. <i>Ptilodictya lanceolata</i> ( <i>Goldf.</i> )	*	*			
53. <i>Rhombopora lineinodis</i> , Ulrich	..	..	..	..	Upper Helderberg Series, Ohio Falls.
BRACHIOPODA.					
54. <i>Pholidops implicata</i> ( <i>Sow.</i> )	*	*			
55. <i>Spirifer elevatus</i> , <i>Dalman.</i>	*	*			
56. <i>Dayia navicula</i> ( <i>Sow.</i> )	*	*			
57. <i>Retzia Salteri</i> , var. <i>Bouchardi</i> , <i>Davidson</i>	*	*			
58. <i>Atrypa imbricata</i> , <i>Sow.</i>	*	*			
59. <i>Rhynchotreta cuneata</i> ( <i>Dalman.</i> )	*	*	*		
60. <i>Orthis</i> ( <i>Dalmanella</i> ) <i>canaliculata</i> , <i>Lindström</i>	*	..	..	..	Also occurs in the Aymestry Limestone near Wolverhampton.
PTEROPODA.					
61. <i>Tentaculites elongatus</i> , <i>Hall.</i>	..	..	..	..	Occurs in the L. Helderberg Group of N. Amer.
62. ——— <i>tenuis</i> , <i>Sow.</i>	..	*			
63. ——— <i>wenlockianus</i> , <i>Vine</i>	..	*			
64. ——— <i>ornatus</i> , <i>Sow.</i>	..	*			
65. ——— <i>multiannulatus</i> , <i>Vine</i>	..	*			

The type specimens have been placed in the British Museum (Natural History).

EXPLANATION OF PLATE III.

- Fig. 1. *Hyperammia ramosissima*, sp. n.  $\times 15$  diam.  
 Fig. 2. *Stacheia stomatifera*, sp. n.  $\times 10$  diam.  
 Fig. 3. *Syringopora serpens* (Linné). Young specimen.  $\times 15$  diam.  
 Fig. 4. *Conchicolites tuberculifera*, sp. n.  $\times 12$  diam.  
 Fig. 5. *Entrochus*, gen. et sp. indet.; from side.  $\times 8$  diam.  
 Fig. 6. The same form, upper end, showing joint-surface.  $\times 8$  diam.  
 Fig. 7. *Trochita*, gen. et sp. indet.; joint-surface.  $\times 20$  diam.  
 Figs. 8, 9. *Trochita*, gen. et sp. indet.; another form. Articular surface, with ridges on fig. 8, and grooves on fig. 9.  $\times 20$  diam.  
 Fig. 10. *Beyrichia muldensis*, sp. n.  $\times 45$  diam.  
 Fig. 11. *Beyrichia tuberculata* (Klæden), var. *lineato-tuberculata*, var. nov.  $\times 30$  diam.  
 Fig. 12. *Klædenia gotlandica*, sp. n. *a*, right valve, side view; *b*, edge view.

XIX.—On the *Squirrels of the Sciurus erythræus Group*.

By J. L. BONHOTE.

THE squirrels of this group, though showing a considerable amount of variation and forming races which closely resemble each other, fall naturally into distinct groups, each group being restricted to its own locality.

The following remarks are based on the study of a very fair series at the National Museum, but several other species have been included, which are not there represented, to show what seems to be their proper relation to the group as a whole. I have been unable to make much mention of the skulls, chiefly because the series of Indian skulls is rather deficient, and, as the skulls of these allied forms differ so slightly from each other, it is impossible to draw any deductions without a large series.

Five distinct species may be distinguished in this group, as well as several geographical races:—

- (i.) *Sciurus erythræus*, Pallas, from Assam, spreading through Bhutan, the Cachar Hills, and Manipur to Burma.
- (ii.) *Sciurus castaneiventris*, Gray, from China, its range being from Ningpo to Burma, and possibly Assam.
- (iii.) *Sciurus Styani*, Thos., between Ningpo and Shanghai.
- (iv.) *Sciurus taiwanensis*, sp. n., from Formosa.
- (v.) *Sciurus melanogaster*, Thos., from Si-oban, Sipora.

Before describing each race separately, it will perhaps be advisable to consider the chief specific differences:—*Sc. erythræus*, from India, is distinguished from all the other species by the absence of the fulvous tips to the hairs of the tail. Occasionally, in some of the other species, these tips, being very much worn, may not be conspicuous, but, as a rule, the Indian forms can by that character be immediately recognized. *Sciurus melanogaster*, with its black underparts, and *Sc. Styani*, with pale yellow underparts, are both easily distinguishable, while *Sc. castaneiventris* may be known by its smaller size and the vinous tint of the underparts. *Sc. thaiwanensis*, from Formosa, may be recognized from *Sc. erythræus*, the only species which it in any way resembles, by the fulvous tips to the hairs of the tail, which are more conspicuous in this species than in any of the others.

*Sciurus erythræus typicus*, Pall.

*Sciurus erythræus*, Pallas, Glires, p. 377 (1778); Gray, List Mamm. B. M. p. 142 (1843); Blyth, J. A. S. B. xxiv. p. 473.

General colour above dark olive-brown, speckled with fulvous, each hair being dark at its base and having three or four fulvous annulations. Colour of underparts deep chestnut. Outside of limbs and head like the back, ears and tail like the underparts. The hairs of the tail are annulated like those of the back, but end in a long red tip, which, especially towards the end, entirely covers the annulations.

*Hab.* Assam.

There has been some doubt regarding which particular race Pallas's name should be applied to; but as he distinctly states that the tail is of the same colour as the underparts, there can, I think, be little doubt that the Assam variety with the red tail is the one meant.

*Sciurus erythræus bhutanensis*, subsp. n.

*Macroxus erythrogaster*, Blyth, Gray, Ann. & Mag. Nat. Hist. xx. (1867) p. 282.

*Sciurus erythræus*, Blyth, J. A. S. B. xxiv. (1856) p. 473.

Closely resembles the foregoing, but the whole of the forehead is similar in colour to the underparts, while the hairs of the tail have short black ends, so that the tail is similar in colour to the back, with a black tip.

*Hab.* Bhutan.

*Type*, B.M. 43. 8. 18. 6. East India collection.

Gray (*loc. cit.*), in stating that Blyth's type of *erythrogaster* is from Bhutan and in the British Museum, refers

without doubt to the specimen which has been chosen as the type of this species; he was, however, clearly mistaken, for Blyth, in the original description, gives Manipur as the type-locality, and according to Mr. W. Sclater\* the type is at present in Calcutta.

*Sciurus erythræus erythrogaster*, Blyth.

*Sciurus erythrogaster*, Blyth, J. A. S. B. xi. (1842) p. 970; *id. op. cit.* xxiv. (1856) p. 473.

*Sciurus rufiventer*, Blyth, J. A. S. B. xvi. (1847) p. 871.

In this race, of which there is a fine series in the Museum, one may distinguish two distinct pelages.

In its *summer pelage* the general colour above is light yellowish grey, with an inclination to a warmer and browner tinge on the back, each hair being, as before, dark brown, with three or four annulations, and the general colour being caused by the predominance of these last. Ears yellowish; outer side of feet and tail as the back, the hairs at the tip of the latter being black to their bases, thus forming a black tip. Underparts as in preceding species.

In its *winter pelage* it is somewhat similar, except that the black ends to the hairs of the tail so predominate as to make the tail black, those hairs towards the tip being entirely devoid of annulations. A similar change, though not so complete, has taken place on the back, so that the general colour is of a dark steel-grey, minutely but profusely speckled with fulvous. Underparts as in summer, but, if anything, of a rather darker tint.

*Hab.* Manipur.

There is in the Museum a specimen from Assam which certainly agrees with Anderson's original description of *Sc. Gordoni*, var. *intermedia* †; at first sight it closely resembles the present species in its summer pelage, but it possesses, however, the distinctive characters of *Sc. castaneoventris* from China, *Sc. castaneoventris Gordoni*, Anders., from Burma, being its nearest ally. It may be distinguished from the present species by the ears being similar in colour to the rest of the upper parts and by the median grizzled line below. Anderson further states that the hairs of the tail have fulvous ends and that the tail has no distinctive black subapical tip. These last characters, though not very well marked in the British Museum specimen, bring the race into the *Sc. castaneoventris* group.

\* Cat. Mamm. Calc. Mus. p. 17 (1891).

† Synonym of *Sc. griseopectus*, Blyth (nec Gray), see later on.



*Sciurus erythræus punctatissimus*, Gray.

*Sciurus punctatissimus*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. (1867) p. 283.

Very similar to the *winter* pelage of *erythrogaster*, but the fulvous annulations much more minute, so that the general appearance is that of a black squirrel minutely speckled with fulvous. Underparts uniform deep chestnut. Tail black. Ears and feet like the upper parts.

*Hab.* Cachar Hills.

*Type*, B.M. 55. 12. 24. 108.

*Sciurus erythræus Sladeni*, Anders.

*Sciurus Sladeni*, Anders. Proc. Zool. Soc. Lond. 1871, p. 139; Blyth, J. A. S. B. xlv. (1875) extr. no. p. 37; Anders. Zool. Res. (1880) p. 242.

This form, of which there are no specimens in the Museum, is evidently nearly related to the typical *erythræus* in having the red tip to the tail; it is, however, quite distinct from all the other forms, and may be distinguished by its chestnut feet.

*Hab.* Thigyain, Upper Burma.

*Sciurus castaneiventris typicus*.

*Sciurus castaneiventris*, Gray, Ann. & Mag. Nat. Hist. x. (1842) p. 263; Swinhoe, P. Z. S. 1870, p. 623.

General colour above brownish, each hair being of a greyish-brown, with three or four annulations of a lighter colour. Underparts vinaceous (rufous vinaceous of Ridgway), the colour being uniform and not broken by any median band. Tail like the back, each hair terminating in a fulvous end most conspicuous at the tip and sides of the tail.

*Hab.* The exact locality of the type is unknown, but all the other specimens in the Museum are from various places in the province of Fokien.

*Type*, B.M. 72 a. China (*J. R. Reeves*).

This species may always be distinguished from the foregoing by its smaller size, the fulvous ends to the hairs of the tail, and the vinaceous tint of the underparts.

*Sciurus castaneiventris ningpoensis*, subsp. n.

This is a hill-form which is at present known only from the neighbourhood of Ningpo.

It is distinguished by its much greyer coloration, caused by the annulations of the hairs being pale buff instead of fulvous or ruddy brown. Feet and limbs grey. Underparts uniform vinous.

*Hab.* Hills near Ningpo.

*Type*, B.M. 86. 10. 28. 3. Hills 30 miles from Ningpo, March 1884. Presented by Mr. F. W. Styan.

*Sciurus castaneiventris Gordonii*, Anders.

*Sciurus Gordonii*, Anders. P. Z. S. 1871, p. 140; Blyth, J. A. S. B. xlv. (1875) extr. no. p. 37.

This form differs from the typical *Sc. castaneiventris* by the presence of a median grizzled line running throughout the whole length of the underparts and by the vinaceous colour of the same being somewhat restricted on the flanks, thus forming two broad stripes.

*Hab.* Upper Burma.

*Sciurus castaneiventris griseopectus*, Blyth.

*Sciurus griseopectus*, Blyth (nec Gray), J. A. S. B. xvi. (1847) p. 873.  
*Sciurus Gordonii*, var. *intermedia*, Anders. Zool. Res. (1879) p. 241.

This form is represented in the Museum by a single specimen only. It differs from *Sc. Gordonii* in the mesial grizzled line not being so broad or so well defined, and in the rufous portion of the underparts being as broad as in the typical *Sc. castaneiventris*, but darker and richer in colour.

*Hab.* Assam.

My reasons for the inclusion of this form among the *Sc. castaneiventris* group have already been given, but it may be mentioned that the figure accompanying the original description is inaccurate in two important particulars, namely, the yellow ears and the black tip to the tail. With regard to the former, Blyth in his original description makes no mention of their colour, but he distinctly refers to the fulvous tips to the hairs of the tail.

Lest my divisions into species and subspecies may appear to some rather arbitrary, it will perhaps make it clearer if I point out that in Upper Burma and Assam we have two forms occurring in the same locality—namely, *Sc. Gordonii* and *Sc. Sladeni* in the former, and *Sc. erythræus* and *Sc. griseopectus* in the latter; it is therefore unlikely, though from the vagueness of the data not absolutely impossible, that these should all be geographical forms of one species, and this is further borne out, sufficiently to my mind to prove the

existence of two species, by the evident affinity of *Sc. Gordoni* to *Sc. griseopectus* and *Sc. Sladeni* to *Sc. erythræus*, as well as the fact that the distinctive characters of the former are those of a widely distributed Chinese species. Mr. W. Sclater\* mentions the type of *griseopectus* as being in the Calcutta Museum and coming from China. This locality has doubtless been placed on the specimen from its obvious affinity to the Chinese *Sc. castaneiventris*; but Blyth was himself ignorant of the exact locality, and as the specimen in the Museum agrees with his original description, we are, I think, justified, in default of further material, in assuming Assam to be its true habitat.

*Sciurus Styani*, Thos.

*Macroxus griseopectus*, Gray, Ann. & Mag. Nat. Hist. ser. 3, xx. (1867) p. 282 (nec Blyth).

*Sciurus Styani*, Thos. Ann. & Mag. Nat. Hist. ser. 6, xiii. (1894) p. 363; de Winton, P. Z. S. 1899, p. 578.

Closely resembles *Sc. castaneiventris*, but may be distinguished by the very pale colour of the underparts, which are sometimes nearly white.

*Hab.* Yangtze Valley.

*Type*, B.M. 86. 10 28. 5. Between Shanghai and Hangchow, Dec. 1885 (*F. W. Styani*).

Mr. de Winton has asked me to correct a note by Mr. Styani in his paper, quoted above, stating that probably *Sc. Styani* was identical with Gray's *M. chinensis*. The skull of Gray's type of *chinensis* has since been removed and it is evident that *M. chinensis*, which is a much smaller animal, has no connexion with the present group, but is allied to *Sc. lokriah*. The exact locality of Gray's type is also very vague, as Mr. Reeves, who procured it, collected over a large extent of country in India as well as in China.

*Sciurus taiwanensis*, sp. n. (typical form).

Colour the same throughout and resembling *Sc. erythræus erythrogaster* (summer pelage), but slightly darker, each hair having two or three fulvous annulations and varying in colour from very dark brown on the back to greyish on the underparts. No red on the underparts, except, in some specimens, a tendency to a reddish patch at the base of the limbs. The outer margin of the ears is slightly lighter than the rest of the body. Tail grizzled for the first half of its length, then black, each hair having a long yellowish tip.

\* W. Sclater, Cat. Mamm. Mus. Calc. (1891) p. 17.

Dimensions (in flesh) :—Head and body 9, tail 8 inches.

*Hab.* South Formosa.

*Type* ♂ ad., B.M. 94. 11. 22. 5. Baksa, Formosa, 20th Oct., 1893. Collected by Mr. P. A. Holst.

*Sciurus taiwanensis centralis*, subsp. n.

Similar to the last, but having a narrow stripe of chestnut running from the inner side of each fore limb to the inner side of each corresponding hind limb.

*Hab.* Lak-ku-li, Formosa.

*Type* ♀ ad., B.M. 94. 11. 22. 4. Lak-ku-li, Formosa, 29th June, 1894. Collected by Mr. P. A. Holst.

This is evidently a hill-form inhabiting the Central Mountains.

*Sciurus taiwanensis Roberti*, subsp. n.

*Sciurus erythræus*, Swinhoe, P. Z. S. 1862, p. 357.

Similar to *taiwanensis typicus*, but having the underparts of a rich deep chestnut and the general colour of the back darker and ruddier.

*Hab.* N.W. Formosa.

*Type*, B.M. 62. 12. 24. 13. N.W. Formosa (*Robert Swinhoe*).

*Sciurus melanogaster*, Thos.

*Sciurus melanogaster*, Thos. Ann. Mus. Genov. (2) xiv. p. 668 (1895).

A very dark species, above dark grizzled as in the preceding species; below very dark brown, interspersed with a few longer lightish hairs. Ears and feet sooty brown. Tail uniformly grizzled to its end. No fulvous tips to the hairs.

Dimensions (in flesh) :—Head and body 200, tail 17·8, hind foot 47, ear 17 mm.

*Hab.* Si-oban, Sipora.

*Co-type* ♀, B.M. 95. 1. 9. 11. Si-oban, Sipora, July 1894. Presented by Dr. Modigliani.

*Key to the Species.*

A. Underparts deep chestnut.

*a*<sup>1</sup>. Tail-hairs with no fulvous tips.

*a*<sup>2</sup>. Tail with *red* tip.

*a*<sup>3</sup>. Feet dark ..... *Sc. erythræus typicus*.

*b*<sup>3</sup>. Feet chestnut ..... *Sc. e. Sladeni*.

*b*<sup>2</sup>. Tail with *black* tip.

*a*<sup>3</sup>. Forehead rufous ..... *Sc. e. bhutanensis*.

*b*<sup>3</sup>. Forehead rufous ..... *Sc. e. erythogaster*

(summer).

- c<sup>2</sup>. Tail black.  
 e<sup>3</sup>. Annulations on hairs of back broad. *Sc. e. erythogaster* (winter).  
     *d*<sup>3</sup>. Annulations on hairs of back narrow. *Sc. e. punctatissimus*.  
 b<sup>1</sup>. Tail-hairs with fulvous tips.  
     a<sup>2</sup>. Underparts uniformly coloured . . . . *Sc. thaiwanensis Roberti*.  
     b<sup>2</sup>. Underparts with grizzled median line . . . . . *Sc. t. centralis*.  
 B. Underparts same colour as the back . . . . *Sc. t. typicus*.  
 C. Underparts vinaceous (vinaceous rufous, *Ridgway*).  
     a<sup>1</sup>. Underparts uniformly coloured.  
     a<sup>2</sup>. Back brownish . . . . . *Sc. castaneiventris typicus*.  
     b<sup>2</sup>. Back greyish . . . . . *Sc. c. ningpoensis*.  
     b<sup>1</sup>. Underparts with grizzled median line.  
     a<sup>2</sup>. Rufous area narrow . . . . . *Sc. c. Gordoni*.  
     b<sup>2</sup>. Rufous area broad . . . . . *Sc. c. griseopectus*.  
 D. Underparts yellow . . . . . *Sc. Styani*.  
 E. Underparts black . . . . . *Sc. melanogaster*.

XX.—On the Squirrels of the *Sciurus Prevostii* Group.  
 By J. L. BONHOTE, B.A.

THIS group of squirrels, like the other groups with which I have already dealt, shows clearly that, although a certain amount of variation may be found in individuals from the same locality, yet when a large series comes to be examined there is no doubt as to the locality from which any particular individual may have come, and the differences, although in some instances slight, are in all cases constant. From the fact that the various races are geographical, it necessarily follows that there must be intermediate forms, and some of the races about to be described show this intergradation in a very marked degree.

For example *Sciurus Caroli*, described in this paper, is a very constant race and markedly distinct from *Sciurus Caroli griseicauda*, which, on the other hand, although constant in its essential characters, shows a wide range of individual variation.

Another point to be noted in regard to this paper is the case of *Sciurus atricapillus* from S.W. Borneo. There are no specimens in the Museum from that locality, so that one is unable to judge whether the differences between *Sc. atricapillus* and *Sc. Caroli* should entitle them to rank as species or subspecies. I have therefore described the latter as a new species, though the advent of further material may prove it to be only a subspecies of *Sc. atricapillus*.

The same remarks hold good with regard to *Sc. baluensis* from Borneo and *Sc. erythromelas* and *Sc. Schlegeli* from Celebes. I am inclined to believe that further investigation will prove them to be races of one and the same species, but from lack of sufficient material and data I have thought it best, considering the distinctness as a rule of Bornean and Celebean species, to keep them separate.

The next point of note is the question of the exact locality of *Sc. redimitus*. The original describer states that it was collected in the East Indies; Temminck imagines it to have come from S. Borneo; while Schlegel, correcting the last-named author, states that it came from Sumatra and that he removed it from the original spirit in which it was preserved. It is impossible to say which, if any, of these statements is correct; from the original description it seems to agree most nearly with the race from Selangore, but in the face of Schlegel's statement that it came from Sumatra it seems best to leave the matter open for the present.

Owing to lack of material, I have omitted descriptions of the skulls, although from those examined there seems to be very little, if any, variation among them.

We have thus seven species in this group:—

- (1) *Sciurus Prevostii*, from the Malay Peninsula, Sumatra, and Borneo.
- (2) *Sciurus atricapillus*, from S.W. Borneo.
- (3) *Sciurus Caroli*, from Sarawak and the Baram district, Borneo.
- (4) *Sciurus baluensis*, from N.W. Borneo and the Baram district.
- (5) & (6) *Sciurus erythromelas* and *Sc. Schlegeli*, from Celebes.
- (7) *Sciurus rufoniger*, from Borneo.

Of *Sciurus Prevostii* ten (or probably only eight) races may be distinguished:—

- (1) *Sciurus Prevostii typicus*, from Malacca and the Malay Peninsula.
- (2) *Sciurus Prevostii Humei*, from Selangore.
- (3) *Sciurus Prevostii sarawakensis*, from Sarawak.
- (4) *Sciurus Prevostii kuchingensis*, from Kuching, S.W. Sarawak.
- (5) *Sciurus Prevostii navigator*, from Sirhassen Island.
- (6) *Sciurus Prevostii bangkanus*, from the Island of Bangka.

- (7) *Sciurus Prevostii borneoensis*, from Pontianak, S.W. Borneo.  
 (8) *Sciurus Prevostii redimitus*, locality unknown.  
 (9) *Sciurus Prevostii Rafflesii*, from Sumatra.  
 (10) *Sciurus Prevostii rufogaster*, from China (doubtful).

With regard to the last two forms, there is not sufficient material to judge whether they be distinct or not. The types, which are the only specimens I have had an opportunity of examining, seem to me identical, and it is quite probable that they both came from the same place, as the exact locality of *rufogaster* is very doubtful.

In addition to the forms mentioned above, Mr. G. Miller, Jr., has recently described \* two other insular forms, viz. :—

*Sciurus mimellus*, from Pulo Wai, Tambelan Island.

*Sciurus mimiculus*, from Ste. Barbe Island.

They are distinguished from *Sc. Prevostii typicus* by the narrowness of the white band, especially on the thighs, and, as might be expected, are most nearly allied to *Sc. P. navigator* of this paper.

*Sc. mimiculus* differs from *Sc. mimellus* only in its smaller size.

*Sciurus Prevostii typicus*, Desm.

*Sciurus Prevostii*, Desm. Mamm. 1822, p. 335; Schlegel, Nederland. Tijdschr. vol. i. 1863, p. 24, pl. i. fig. 1; Anderson, Zool. Res. Yunnan †, 1878, p. 269; Flower, P. Z. S. 1900, p. 358.

General colour above deep black, bordered on either side from the tip of the nose to the outer side of the limbs by a broad white stripe, which has a tendency to be slightly grizzled on the cheeks. The whole of the underparts, including the outer side of the fore limbs, deep chestnut. There is a short black stripe, always present, but of varying width and intensity, running between the thighs and the shoulders immediately beneath the white lateral stripe. Tail uniformly black throughout, frequently bleaching to a light brown.

Dimensions (from skin):—Head and body 250 millim., tail 270, hind foot (s. u.) 58.

*Hab.* Malay Peninsula; Singapore, Malacca, Penang.

\* Proc. Wash. Ac. Sc. vol. ii. p. 218 (1900).

† A full synonymy for the *whole* group will be found in Dr. Anderson's work quoted above.

*Sciurus Prevostii Humei*, subsp. n.

*Sciurus Prevostii*, Desm., Thos. P. Z. S. 1886, p. 76.

Differs from the preceding form in the red of the underparts covering the whole of the fore limbs and spreading upwards over the shoulders till it meets the black of the back. The cheeks are grizzled, but behind and below the ear is a pure white patch. The hind feet are of a more brilliant and purer chestnut than in *S. P. typicus*, and the black sublateral stripe is not always present.

Dimensions similar to the last.

*Hab.* Klang, Selangor.

*Type*, B.M. 85. 8. 1. 230. Collected 4th April, 1879, by Mr. W. Davison.

*Sciurus Prevostii sarawakensis*, Gray.

*Macroxus sarawakensis*, Gray, Ann. & Mag. Nat. Hist. xx. 1867, p. 277.

This race, of which only two specimens are known, is very distinct from the preceding forms. One of the chief features (common to this and the next) is the tail, the hairs of which have long light fulvous tips, which, though sometimes worn, are always to be seen. The black of the back is somewhat restricted; it narrows down to a stripe over the shoulders, and, broadening out over the back, narrows again over the thighs to a stripe about the width of the tail. The lateral stripe, which is narrow and of a dirty white between the limbs, broadens out to cover the whole of the thighs, where it is of a light fulvous, each hair being black at its base. The whole of the underparts, shoulders, sides of neck, face, and limbs are of a deep chestnut, slightly tinged with fulvous over the shoulders, and with a tendency to being grizzled on the cheeks. There is no sign of the sublateral black stripe.

Dimensions as in *Sc. Prevostii typicus*.

*Hab.* Sarawak.

*Type* ♀, B.M. 59. 9. 19. 5. Collected by Mr. A. R. Wallace.

A second specimen was collected by Mr. Charles Hose on the River Batang Lupar, fifty miles from the coast, in S.W. Sarawak, August 1892.

*Sciurus Prevostii kuchingensis*, subsp. n.

Very similar to *Sciurus Prevostii sarawakensis*, but differs in the lateral stripe being pure white, in having a much larger extent of black on the neck and back, and in the fulvous tips to the hairs of the thighs being small, so that the



thighs have a greyish grizzled appearance; the shoulders, sides of the neck, and cheeks are also grizzled, although in some cases they are suffused with rufous. Tail with broad fulvous tips to all the hairs except those forming the end.

Dimensions as in *Sc. Prevostii typicus*.

*Hab.* Kuching, Sarawak.

*Type* ♀, B.M. 99. 12. 9. 47. Collected 15th Sept., 1896, by Mr. Charles Hose.

*Sciurus Prevostii navigator*, subsp. n.

Specimens from the island of Sirhassen form a very distinct race. They are much smaller in size, the chestnut of the underparts is far brighter and more orange in tint. The lateral line, which starts from the shoulders, is narrow, clear, and well marked, and spreads out over the thighs as in *Sc. P. sarawakensis*. The shoulders are of a light fulvous, which becomes darker and grizzled on the cheeks and sides of the head. The tail is pure black, and its hairs show no signs of fulvous tips.

Dimensions (from skin):—Head and body 235 millim., tail 225, hind foot 47.

*Hab.* Sirhassen Island.

*Type*, B.M. 94. 9. 28. 14. Collected Sept. 22, 1893, by Mr. A. Everett.

*Sciurus Prevostii bangkanus*, Schlegel.

*Sciurus Prevostii bangkanus*, Schlegel, *op. cit.* p. 26, pl. i. fig. 2.

Most nearly resembles *Sc. P. Humei* from Klang, but may be distinguished by the cheeks and sides of the neck being iron-grey instead of white.

Dimensions as in *Sc. P. typicus*.

*Hab.* Island of Bangka.

*Sciurus Prevostii borneoensis* \* (Müller & Schlegel).

*Sciurus Prevostii*, var *borneoensis*, Müll. et Sch., Verhand. over de Nat. Gesch. Overz. Bezitt., Zool. p. 86 (1839-44).

*Sciurus Prevostii borneoensis*, Schlegel, *op. cit.* p. 26, pl. i. fig. 3.

This form, as one might expect, is most closely allied to *Sc. P. kuchingensis* from Kuching, which is, in fact, not very far north of Pontianak. It is distinguished by the fact that the black of the back is not sharply defined from the lateral

\* This name antedates that given by Gray to a Bornean form of *S. hippurus* (Ann. & Mag. Nat. Hist. xx. 1867, p. 283). For that I would suggest the name of *S. hippurus Grayi*.

stripe as in all the other races, but the hairs of the back as they approach the stripe are more or less broadly tipped with fulvous, so that the sides become grizzled like the thighs.

Dimensions as in *Sc. P. typicus*.

*Hab.* Pontianak, S.W. Borneo.

*Sciurus Prevostii Rafflesi*, Vigors & Horsf.

*Sciurus Rafflesi*, Vigors & Horsf. Zool. Journ. no. xii. 1828, vol. iv. pl. iv. p. 113; Temm. Esq. Zool. Guin. p. 242 (1853).

*Sciurus rufogularis*, Gray, Ann. & Mag. Nat. Hist. vol. x. 1842, p. 263.

*Sciurus Prevostii sumatranus*, Schlegel, *op. cit.* p. 25.

A very distinct and easily recognizable form. The whole of the upper parts and tail are of a deep black. The white lateral stripe, which is broad and well defined, starts *behind* the shoulders and spreads out over the outer side of the hind limbs. The underparts, including the shoulders, fore limbs, inner side of hind limbs, and feet, are of a very deep chestnut. The cheeks and sides of the neck are grizzled iron-grey; a patch on the side of the nose pure white.

Dimensions as in *Sc. P. typicus*.

*Hab.* Sumatra.

*Co-type*, B.M. 84. 6. 3. 8. Collected by Sir T. S. Raffles, formerly in the Zoological Society's Museum. Received from the late Dr. Crisp's collection.

I have united under this species *Sc. rufogularis* of Gray, which was stated to have come from China, although it most probably did not. It differs from *Sc. P. Rafflesi* only in size, and the other differences mentioned by Gray do not seem to hold good.

*Sciurus Prevostii redimitus*, Boon Mesch.

*Sciurus redimitus*, Boon Mesch, Nieu. Verhandl. Nederl. Inst. Amsterd. 1829, vol. ii. p. 243, pl.

This form seems to be very nearly allied to *Sc. Prevostii Humei*, differing chiefly in being lighter in colour, and this might possibly be due either to bleaching or to the spirit in which it was preserved. There seems, however, to be great doubt as to its locality; and in view of the fact that Schlegel states positively that it came from Sumatra, it seems best to leave it as a separate race for the present till further information is forthcoming.

The next species with which we have to deal is

*Sciurus atricapillus*, Schlegel.

*Sciurus atricapillus*, Schlegel, *op. cit.* p. 27, pl. ii. fig. 1.

*Sciurus redimitus*, Boon Mesch, Temm. Esq. Zool. Guin. p. 245 (partim) (1853).

In this species, according to the describer, the underparts and inner sides of limbs alone are chestnut. The tail is black, shading to rufous-brown. The white lateral stripe is narrower and the sublateral black stripe much broader than in *Sc. Prevostii typicus*. The top of the muzzle and feet are black, the remainder, including all the upper parts, is covered with black hairs annulated with fulvous, which is rather paler on the thighs, cheeks, and sides of the neck.

*Hab.* Kapouas River, east of Pontianak, Borneo.

The next is a species in which we get a highland and a lowland form, the limit being roughly at 1000 feet, and neither of these appears to have been hitherto described. They come from the Baram district of Sarawak, and the large series in the Museum has been almost entirely collected by Mr. Charles Hose. For the lowland form I propose the name

*Sciurus Caroli*, sp. n.

*Sciurus Prevostii*, Desm., Hose, Mamm. Borneo, 1893, p. 45 (partim).

Top of the head, neck, and shoulders dirty fulvous white, each hair being dark at its base, with a broad fulvous tip. Remainder of back narrowing down towards the root of the tail dingy black, each hair being black, with two narrow fulvous annulations. Lateral stripe from behind the shoulders and the whole of the outer side of the thighs and hind limbs white. Underparts, feet, sides of neck, cheeks, face, and rim round eye pure chestnut, also the ears, although these latter show a tendency to become grizzled. Tail broadly annulated with black and pale fulvous. Sublateral black stripe very faint or absent.

Dimensions (from skin):—Head and body 275 millim., tail 250, hind foot 55.

*Hab.* Marudi River, Baram district.

*Type* ♀, B.M. 99. 12. 9. 59. 26th May, 1898. Collected by and named in honour of Mr. Charles Hose.

*Ann. & Mag. N. Hist.* Ser. 7. Vol. vii. 13

In some specimens there is a tendency for the shoulders to become tinged with rufous. I have examined specimens of this squirrel from the Miri River and from the lower slopes of Mount Dulit.

*Sciurus Caroli griseicauda*, subsp. n.

*Sciurus Prevostii*, Desm., Hose, *loc. cit.* p. 45 (partim).

The whole of the upper parts, including the feet, crown of head, sides of face and neck, and tail, of a uniform grizzled greyish, darker on the fore limbs and slightly lighter on the sides of the neck and thighs, occasionally white on the latter, the sides of the face more or less suffused with rufous. The lateral white line narrow and starting well behind the shoulder, but widening out slightly on reaching the thighs. The sublateral black stripe *always broad and well marked*. Underparts, inner sides of limbs, and a ring round the eye chestnut, as in the preceding form; the insides of the ears are also slightly suffused with the same colour.

Dimensions as in *Sciurus Caroli*.

*Hab.* Mount Kalulong, Baram district, alt. 2000 feet.

*Type* ♂, B.M. 93. 6. 1. 5. February. Presented by Mr. Charles Hose.

This squirrel, which shows a wide limit of variation, with a great tendency towards the preceding form, may nevertheless always be readily distinguished by the very broad and well-marked black sublateral stripe, which in *Sc. Caroli typicus* is generally absent, but if present is very faintly developed. It appears widely distributed in the Baram district, specimens having been received from most of the mountains, including Mount Dulit, Batu Song, Niah, Bakong.

*Sciurus baluensis*, sp. n.

Whole of the upper parts, including the sides, neck and face, and outer sides of the limbs and feet, uniform grizzled brownish olive, slightly darker along the median line, the top of the nose, feet, and sides of the face being more or less suffused with chestnut, each hair being dark brown with one or two fulvous annulations. The lateral light stripe is short, narrow, and light yellow in colour, and loses itself before reaching the thighs. The sublateral black stripe is broad and well marked and of equal length with the lighter stripe. The remainder of the underparts, muzzle, and a ring round the eye chestnut. Tail deep black, with no sign of annulations.

Dimensions (from skin):—Head and body 275 millim., tail 280, hind foot 55.

*Hab.* Mount Kina Balu, Borneo, alt. 1000 feet.

*Type* ♂, B.M. 95. 10. 4. 11. Collected March 1887 by Mr. J. Whitehead. Presented by Mr. Oldfield Thomas.

There are also specimens from Mount Dulit up to 5000 feet in no way differing from the above.

I am somewhat doubtful as to the specific distinctness of this form from *Sc. erythromelas* of Schlegel from Celebes; but in view of the distinctness of the Bornean fauna from that of Celebes, it seemed best to consider it specifically distinct until an opportunity occurs of comparing it with Celebean specimens.

*Sciurus baluensis suffusus*, subsp. n.

Considerably smaller than the previous form. The whole of the upper parts as in *Sc. baluensis*, but the colour absolutely uniform throughout and without any rufous on the feet or top of the nose. The sides of the face and a ring round the eye are pure chestnut, but the muzzle is paler. The tail is similar in colour to the back. The presence of the light lateral stripe is only faintly indicated by a lighter tinge about the centre of each side, and the sublateral black stripe, although distinct, is very short.

Dimensions (from skin):—Head and body 200 millim., tail 185, hind foot 43.

*Hab.* Tutong River, N.W. Borneo.

*Type*, B.M. 98. 9. 28. 7. Collected by Dr. Waterstradt.

*Sciurus erythromelas*, Temm.

*Sciurus erythromelas*, Temm. Esq. Zool. Guin. p. 248 (partim) (1853); Schlegel, *op. cit.* p. 28.

Upper parts lustrous black, slightly suffused with rufous on the cheeks, sides of the neck, shoulders, and outer side of the thighs. The underparts, including the feet and inner sides of the limbs, deep chestnut, the feet, however, possessing black hairs as well. The tail has a reddish-brown hue, and the light annulations to the hairs of the sides form themselves into a faint lateral stripe. Muzzle whitish.

Dimensions as in *Sc. atricapillus*.

*Hab.* Menado, N.W. Celebes.

This description and that which follows have been taken from Schlegel, as I have had no specimens for examination.

*Sciurus Schlegeli*, Gray.

*Sciurus erythrogeus*, Schlegel, *op. cit.* p. 29 (nec Waterhouse).

*Sciurus Schlegeli*, Gray, *Ann. & Mag. Nat. Hist.* xx. 1867, p. 278.

The hairs of the upper parts black, with fulvous annulations in such a manner that the general colour is black on the head, neck, back, and feet, the light annulations being most marked on the sides, where they form a faint stripe, which is bordered by a distinct sublateral black stripe. The underparts and the sides of the face chestnut.

Dimensions:—Head and body 200 millim., tail 225.

*Hab.* Kenia, N. Celebes.

*Sciurus rufoniger*, Gray.

*Sciurus rufonigra*, Gray, *Ann. & Mag. Nat. Hist.* x. 1842, p. 263; *List Mamm. B. M.* 1843, p. 142 (nec Puch.).

*Sciurus rufoniger*, Gray, *Ann. & Mag. Nat. Hist.* xx. 1867, p. 278.

This species, which is known only from the type, has the whole of the head, back, tail, and outer sides of limbs and feet rich black, with a very faint but distinct pale tinge, forming a light lateral stripe, which spreads out over the thighs. Underparts and inner sides of limbs rich chestnut.

Dimensions apparently as in the larger forms of this group.

*Hab.* Unknown.

*Type*, B.M. 38. 3. 13. 29.

*Sciurus rufoniger pluto*, Gray.

*Macroxus pluto*, Gray, *Ann. & Mag. Nat. Hist.* xx. 1867, p. 283.

Whole of head, upper parts, outer sides of limbs, feet, and tail rich glossy black. The remainder dark chestnut. In some individuals there is a faint but clear short white lateral stripe.

Dimensions:—Head and body 200 millim., tail 220, hind foot 50.

*Hab.* Sarawak, Borneo.

*Type*, B.M. 56. 9. 19. 6.

This form seems to be generally distributed in Borneo and some of the neighbouring islands; there are also specimens from Sumatra.

*Key to the Group.*

A. Hairs on the back not annulated.

*a*<sup>1</sup>. Whitish lateral stripe present. Face and cheeks not black.

- a*<sup>2</sup>. White stripe unbroken from tip of nose to heel of hind foot . . . . . *Sc. Prevostii typicus*.
- b*<sup>2</sup>. White stripe broken.
- a*<sup>3</sup>. Hairs of tail with no fulvous tips.
- a*<sup>4</sup>. Light part of thigh not grizzled.
- a*<sup>5</sup>. Shoulders fulvous.
- a*<sup>6</sup>. Sides of face and neck iron-grey . . . . . *Sc. P. bangkanus*.
- b*<sup>6</sup>. Sides of face and neck white. } *Sc. P. Humer.*  
} *Sc. P. redimitus*.
- b*<sup>5</sup>. Shoulders chestnut.
- c*<sup>6</sup>. Sides of face and ears iron-grey . . . . . *Sc. P. Rafflesii*.
- b*<sup>4</sup>. Light part of thigh slightly grizzled.
- c*<sup>5</sup>. Face and shoulders fulvous. Smaller . . . . . *Sc. P. navigator*.
- b*<sup>3</sup>. Hairs of tail with fulvous tips.
- a*<sup>4</sup>. Light part of thigh not grizzled. *Sc. P. sarawakensis*.
- b*<sup>4</sup>. Light part of thigh grizzled.
- a*<sup>5</sup>. Sides of body above the white lateral stripe grizzled . . . . . *Sc. P. borneoensis*.
- b*<sup>5</sup>. Sides of body above the white lateral stripe not grizzled . . . . . *Sc. P. kuchingensis*.
- b*<sup>1</sup>. Whitish lateral stripe, if present, very faint. Face and cheeks black.
- a*<sup>2</sup>. Lateral stripe very faint, but spreading over thighs . . . . . *Sc. rufoniger typicus*.
- b*<sup>2</sup>. Lateral stripe absent, or sometimes very faint and short, never on thighs . . . . . *Sc. rufoniger pluto*.
- B. Hairs on the back annulated.**
- a*<sup>1</sup>. Lateral light stripe present.
- a*<sup>2</sup>. Upper part of thighs lighter than back.
- a*<sup>3</sup>. Feet rich chestnut . . . . . *Sc. Caroli typicus*.
- b*<sup>3</sup>. Feet grizzled greyish.
- a*<sup>4</sup>. Eye surrounded with rufous ring . . . . . *Sc. C. griseicauda*.
- b*<sup>4</sup>. Eye not surrounded with rufous ring . . . . . *Sc. atricapillus*.
- b*<sup>2</sup>. Upper part of thighs not lighter than back.
- a*<sup>3</sup>. Larger, length 275 mm. Lateral light stripe pale yellow . . . . . *Sc. baluensis typicus*.
- b*<sup>3</sup>. Smaller, length 200 mm. Lateral light stripe nearly absent.
- a*<sup>4</sup>. Feet grizzled . . . . . *Sc. b. suffusus*.
- b*<sup>4</sup>. Feet black . . . . . *Sc. Schlegeli*.
- b*<sup>1</sup>. Lateral light stripe absent . . . . . *Sc. erythromelas*.

XXI.—*New Mammals from Peru and Bolivia, with a List of those recorded from the Inambari River, Upper Madre de Dios.* By OLDFIELD THOMAS.

TWO further consignments have recently been received from that indefatigable and most successful collector Mr. Perry O. Simons, obtained in South-eastern Peru and the adjoining parts of Bolivia. Among other places, he was able to visit the Inambari River, whence a collection was recently sent to the New York Museum and reported on by Dr. J. A. Allen\*. By adding Mr. Simons's species and one or two of Mr. Kalinowski's to those recorded by Dr. Allen, I am able to give a complete list of the mammals as yet known to inhabit the district.

To commence with, the following new species have to be described:—

*Cebus fatuellus peruanus*, subsp. n.

Like *C. fatuellus*, but with the "horns" scarcely developed, all the coronal hairs being of nearly equal length and standing vertically upright, with the black cap scarcely reaching back on to the neck, and with the forearms of quite the same colour as the body, instead of having a yellowish patch on them.

Dimensions of the type (as taken by the collector):—

Head and body 390 millim.; tail 385.

Skull: greatest length 91; basal length 62.

*Hab.* Marcapata, Huaynapata, Inambari Valley, S.E. Peru.

*Type.* Female. B.M. O. 11. 5. 2. Collected 23rd July, 1897, by Mr. J. Kalinowski. Two specimens examined.

I have taken as representing the true *C. fatuellus* an excellent specimen in the Museum from Tolima, Colombia, that being the country selected by Schlegel as the typical locality for the species.

In connexion with these Peruvian *Cebis*, it may be noted that at Idma, Sta. Ana, also in the Province of Cuzco, Mr. Kalinowski obtained four specimens of a *Cebus* which entirely agrees with Gray's *C. pallidus*, first † said by him to be the same as *C. elegans*, Geoff., but later ‡ described as a species. The co-types were bleached, and the following is a brief description of the fresh specimens:—

General colour pale brown. Head-markings approxi-

\* Bull. Am. Mus. N. H. xiii. p. 219 (1900).

† P. Z. S. 1865, p. 826.

‡ Cat. Monkeys, p. 49 (1870).



mately as figured by Spix in his *C. macrocephalus* \*. Chest and throat yellow. Forearms and legs blackish; fingers and toes white.

From other evidence it is clear that Mr. Bridges did some collecting in South-eastern Peru, so that species described as from "Bolivia—Bridges" may in some cases, as in that of *Otenomys opinus nigriceps* †, be really Peruvian in origin.

*Cebus flavescens cuscinus*, subsp. n.

Closely allied to *C. flavescens*, Gray, but with a large brown coronal patch.

Fur of face much longer than in most *Cebi*, there being no peripheral short-haired portion. Hairs on forehead and cheeks smoothly directed backward, those on the crown upright or slightly reversed, though not forming any marked crest or horns. General colour of back pale brown, with a suffusion of rufous. Each hair is pale slaty at base, with a dull pale red intermediate portion and a brown tip; posteriorly on the rump the rufous increases in depth and intensity, passing gradually on to the rich rufous of the hind limbs. Throat and chest whitish; belly (the hairs of which are reversed forwards) bright orange-rufous, continuous with the rufous legs. Hairs of forehead and cheeks pale glossy yellowish, the tips of the hairs browner. Square patch covering crown (about 2 inches broad and rather more in length) dark chocolate-brown, the bases of the hairs pale brown. Ears well clothed with shining yellowish hairs. Fore limbs pale brown above, passing into rufous on the forearm and whitish on the fingers; their inner sides bright rufous to the wrists. Hind limbs rich rufous both on their outer and inner sides, the toes dull whitish. Tail bushy, the bases of the hairs proximally rufous, terminally white, the tips of the hairs inconspicuously brown.

Altogether the colouring of the body and limbs is not unlike that of the monkey figured by F. Cuvier as the "Sajou à pieds dorés" ‡, although the head is so entirely different.

Skull small and delicate.

Dimensions of the type (as taken by the collector in the flesh):—

Head and body 340 millim.; tail 390; hind foot 250; ear 35.

\* Sim. & Vesp. Bras. pl. i. (1823).

† Thos. Ann. & Mag. Nat. Hist. (7) vi. p. 384 (1900).

‡ H. N. Mamm. (fol.) iii. pl. lxix.

Skull: greatest length 93.5; basal length 61; zygomatic breadth 61; breadth of brain-case 51; combined length of lower cheek-teeth 25.

*Hab.* Callanga, Cuzco, Peru. Alt. 1500 m.

*Type.* Old female. B.M. no. 98. 11. 6. 1. Collected 21st April, 1898, by Herr Otto Garlepp.

This monkey differs from the true *C. flavescens*, Gray, by its prominent brown crown-patch, the head of that animal being quite uniform in colour. The exact history of Gray's type has not been preserved, but there seems to be some evidence that it may have been obtained by Wallace on the Rio Negro. This, however, remains to be verified by the capture of further specimens.

*Galera* \* *barbara brunnea*, subsp. n.

Dull chocolate-brown all over, the head and nape scarcely lighter than the back, though the nape has something of the usual yellowish suffusion. A small yellow neck-spot present. Limbs slightly darker, but not black. Tail coarsely mixed brown and yellow, some of its hairs all brown, some yellow basally and brown terminally, and many (especially for the proximal half below) all yellow.

Size and cranial characters apparently as in typical *G. barbara*.

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

Head and body 700 millim.; tail 420; hind foot, s. u. 108, c. u. 116; ear 41.

Basilar length of skull 109.

\* Since writing my paper on the subspecies of the Tayra (Ann. & Mag. Nat. Hist. (7) v. p. 145, 1900) my attention has been drawn by Dr. Forsyth Major to the importance of the characters which distinguish that animal from the smaller forms, and the consequent advisability of recognizing Gray's genus *Galera*.

Dr. Nehring also has admitted the genera *Galera* and *Galictis* as distinct in his paper on the group in 1886.

In this same paper he speaks of a "*varietas peruana*," von Tschudi; but I fail to find any such name used by the author of the 'Fauna Peruana.' If it is intended by Dr. Nehring as a new name, I venture to think that it would have been clearer had he said so. However, as said above, I cannot see from Tschudi's description that his animal differs from the ordinary form of *G. barbara*.

A similarly ambiguous name is introduced by Dr. Nehring in the simple statement that "besides the typical form of *G. vittata*, a smaller variety, *chilensis*, should probably be distinguished." But more than a century earlier Molina had given to the Chilean Grison the name of "*Mustela quiqui*"<sup>a</sup>.

<sup>a</sup> Sagg. S. N. Chili, p. 292 (1782).

*Hab.* Mapiri, Upper Beni River, W. Bolivia. Alt. 800 m.

*Type.* Male. B.M. no. 1. 1. 1. 57. Original number 1197. Collected 27th August, 1900, by Mr. P. O. Simons. One specimen.

Native name "Taware" (*P. O. S.*).

This subspecies of the *Tayra* is characterized by its general brown colour, all the other forms—including the one described by Tschudi from Peru, on which Dr. Nehring's "*peruana*" is presumably based—being either black, or, if at all brownish, at least with a wholly black tail.

*Rhipidomys phæotis*, sp. n.

A rather small reddish species allied to *R. microtis*, Thos.

Size about as in *R. microtis* and *fulviventor*. Fur close and fine; hairs of back about 8 millim. in length. General colour above fulvous, lined with black on the back, clearer rufous on the sides. Face more greyish. Under surface white throughout, or the extreme bases of the hairs slaty; line of demarcation on sides well defined. Ears of medium size, blackish brown, contrasting markedly with the general colour of the head. Front of fore limbs and metacarpals like back, fingers white; outer side of hind limbs fulvous, darkening to brown on the distal part of the metatarsus, toes white. Tail well-haired, pencilled, uniformly blackish brown.

Skull in size and general appearance not unlike that of *R. fulviventor*, but with a broader interorbital region. Palatal foramina shorter than in either of the allied species, not reaching back to the level of the front of *m.*<sup>1</sup>

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

Head and body 112 millim.; tail broken; hind foot, s. u. 23·5, c. u. 25; ear 18. The tail of the second specimen, of about the same general size, is 115 millim. in length.

Skull: greatest length 30·2; basilar length 23·5; greatest breadth 16·3; nasals, length 9·8; interorbital breadth 5·3; breadth of brain-case 14; interparietal 4·4 × 11·2; diastema 8; length of palate from henselion 12·5; palatal foramina 5; length of upper molar series 4·2.

*Hab.* Segrario, 13° 5' S., 70° 5' W., Upper Inambari, S.E. Peru. Alt. 1000 m.

*Type.* Male. B.M. no. 1. 1. 1. 23. Original number 1146. Collected 23rd July, 1900, by Mr. P. O. Simons. Two specimens.

This species seems to be most nearly allied to *R. microtis*,

Thos., but differs by its larger and darker-coloured ears, smaller palatal foramina, and smaller molars.

*Eligmodontia ducilla*, sp. n.

An *Eligmodontia* of the short-tailed group, with a striking superficial resemblance to *Phyllotis sublimis*, though smaller and with shorter fur.

Size small, about as in *E. lepida*, *laucha*, &c. Fur very soft, fairly long; hairs of back about 8 millim. in length. General colour above pale greyish fawn, finely grizzled with brown; nearly uniform in tone from head to rump, but the centre of the back rather darker. Sides of nose and an indistinct line running along the flanks edging the belly-colour pale sandy fawn. Under surface white, not sharply defined laterally, the hairs grey basally, white terminally. Ears of medium length, pale brown; a whitish spot on the head behind them, as in other species of the group. Hands and feet white above; soles hairy posteriorly. Tail less than half the length of the head and body, well clothed with hairs, sandy white above, clear white below.

Skull with the nasals and premaxillary processes of equal extension backwards; interorbital space narrow, more parallel-sided than in *E. laucha*; interparietal broad, strap-like, narrow antero-posteriorly, its lateral parts as broad as the centre; palatal foramina long, extending to the second lamina of *m.*<sup>1</sup>. Teeth of the complicated brachyodont character found in *E. laucha* and its allies, very different to those of *Phyllotis*, which are of a more simple, though semi-hypsodont and zigzag, pattern.

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

Head and body 73 millim.; tail 30; hind foot, s. u. 17, c. u. 18; ear 17.

Skull: greatest length 21·7; basilar length 18·5; greatest breadth 12; nasals, length 8; interorbital breadth 3·5; breadth of brain-case 10·4; diastema 5·1; palate from hensenelion 9·8; palatal foramina 5; length of upper molar series 3·7.

*Hab.* San Anton, Lake Titicaca, S.E. Peru. Alt. 3800 m.

*Type.* Female. B.M. no. 1. 1. 1. Original number 1118. Collected 28th June, 1900, by Mr. P. O. Simons.

This pretty little mouse is most nearly allied to *E. lepida* and *sorella*, but may be readily distinguished from both by its much paler and more fawny colour. Its superficial resemblance to *Phyllotis sublimis* is so great that at first sight it might be taken for a smaller shorter-haired subspecies of that animal.

*Oxymycterus iris*, sp. n.

Size rather less than in *O. inca*, Thos. General colour rufous, heavily lined with black, especially along the middle of the back, so that the dorsal area is noticeably darker than the sides, which are a clearer fulvous rufous. Black tips of dorsal hairs with a distinct greenish iridescence. Head browner. Under surface ochraceous rufous, not sharply defined laterally from the rufous of the sides; chin whitish. Ears, upper surface of hands and feet, and whole of tail black, or a few whitish hairs on the terminal part of the tail below.

Skull, as compared to that of *O. inca*, with the nasals more pointed and less trumpet-shaped anteriorly and more rounded posteriorly. Brain-case slightly broader and shorter and without any indications of rudimentary postorbital processes. Back of palate level with middle of *m*.<sup>3</sup>. Incisors narrower and weaker than in *O. inca*.

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

Head and body 160 millim.; tail 102; hind foot, s. u. 30, c. u. 33; ear 22.

Skull: greatest length 37; basilar length 29; breadth of nasal opening 3.5; nasals 14.5 × 4.5; interorbital breadth 6.5; breadth of brain-case 15; palate length from henselion 14.5; diastema 9.7; palatal foramina 8.1 × 3.4; length of upper molar series 5.7.

*Hab.* San Ernesto, near Mapiri, Upper Beni River. Alt. 1000 m.

*Type.* Male. B.M. no. 1. 1. 1. 76. Original number 1218. Collected 5th September, 1900, by Mr. P. O. Simons. Eleven specimens examined, three from San Ernesto and the others from Mapiri itself.

From Dr. Allen's *O. juliacæ* this species differs by having its underside coloured exactly as in *O. inca*. The latter again differs by having its rufous darker and more chestnut in tone and spread more uniformly over the body, so that the back is little darker than the sides; nor is there any iridescence in the dorsal hairs. The cranial differences have already been referred to.

*Oxymycterus minus*, sp. n.

A member of the group of small *Akodon*-like *Oxymycteri*, the nearest ally being *O. bogotensis*, Thos.

General appearance that of the common small *Akodons*, in colour intermediate between *A. caliginosus* and *A. boliviensis*.

Eyes apparently very small. Fur very fine, long and silky; hairs of the back 11–12 millim. in length. General colour above very finely speckled dark olivaceous grey, very uniform in tone all over. Top of muzzle rather blacker. Head like back, but the speckling rather coarser. Ears short, well-haired, blackish brown. Sides scarcely paler than back. Under surface brownish grey, the bases of the hairs plumbeous, their tips dull greyish; no line of demarcation on sides. Upper surface of hands and feet brown. Tail about the length of the head and body, very finely scaled, thinly haired, uniform dark brown throughout.

Skull very thin and papery, the surfaces smoothly rounded and without ridges; muzzle narrow, evenly tapering, not trumpet-shaped anteriorly; interorbital broad, smoothly rounded; interparietal minute; palatal foramina long, reaching nearly to the middle of *m*.<sup>1</sup>.

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

Head and body 92 millim.; tail 96; hind foot (s. u.) 22; ear 17.

Skull: greatest length 27; basilar length 20·5; zygomatic breadth 13·5; length of nasals 11; interorbital breadth 5·7; breadth of brain-case 13; diastema 7·2; palate from henselion 11·6; palatal foramina 5·8 × 2·1; length of upper molar series 4·7.

*Hab.* Limbane, Dept. Puno. Alt. 2600 m.

*Type.* Female. B.M. no. 1. 1. 48. Original number 1126. Collected 6th July, 1900, by Mr. P. O. Simons. Four specimens examined.

No one would take this remarkable little animal for anything but an *Akodon* without examining the skull; but the cranial characters show it to be a member of the group of *Oxymycteri* which contains *O. bogotensis*, Thos.\*, and *O. lanosus*, Thos.†, from both of which it may be readily distinguished by its colour and proportions.

#### *Akodon pulcherrimus* and its subspecies.

Of the beautiful mouse discovered by Mr. Kalinowski at Puno, and described by me in 1897 ‡ under the above name, Mr. Simons has sent a number of examples from different localities in South-eastern Peru—Sumbay, Caylloma, Crucero, and the Inambari River; and Mr. Bernard Hunt has also

\* *Acodon bogotensis*, Thos. Ann. & Mag. Nat. Hist. (6) xvi. p. 369 (1895).

† Ann. & Mag. Nat. Hist. (6) xx. p. 218 (1897).

‡ *Ann. cit.* p. 549 (1897).

contributed some additional specimens from Caylloma. These localities show that the species ranges over a quadrangular area some 200 miles each way between about  $69^{\circ}$  and  $72^{\circ}$  W. and  $13^{\circ}$  and  $16^{\circ}$  S.

But the specimens from the different localities are not all identical, falling into four fairly separable subspecies, those from Sumbay being apparently typical, while each of the other places above mentioned has its own local form.

All are, however, so alike in general characters and agree so closely with the original description that there is no need for a detailed account of each, the differential characters and the dimensions being alone given.

### 1. *Akodon pulcherrimus* (typical).

Back fuscous brown, not darkening laterally, the sides if anything paler than the back. White ear-patch large, extending backward beyond the ears when these (dry) are folded back, continuous below with the white of the under surface, or, rarely, with a faint darker wash separating the two.

*Hab.* Puno (*Kalinowski*); Sumbay, near Arequipa (*Simons*).  
Alt. 4000 m.

Average measurements of five specimens from Sumbay :—

Head and body 89·8 millim.; tail 72·8; hind foot (s. u.) 23; ear 19.

### 2. *Akodon pulcherrimus cayllomæ*, subsp. n.

Like the typical form as to general colour and ear-patch, but the sides darkening instead of lightening as they approach the white of the belly, so that an indistinct blackish line is formed edging the clear white of the belly.

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

Head and body 94 millim.; tail 82; hind foot 23; ear 20.

Average measurements of four adults: Head and body 91·7; tail 75·2; hind foot (s. u.) 22·2; ear 19·5.

*Hab.* Caylloma. Alt. 4300 m.

*Type.* Female. B.M. no. 0. 10. 1. 74. Collected 14th June, 1900, by Mr. P. O. Simons. Six specimens examined, of which Mr. Simons obtained four and Mr. Hunt two.

Two young specimens show the dark lateral marks particularly well.

### 3. *Akodon pulcherrimus inambarii*, subsp. n.

Like the typical form as to colour, but the light ear-patch is so much reduced that the laid-back ears surpass it poste-

riorly, and laterally there is a broad band of the general dark colour connecting the cheeks and flanks and dividing it from the white belly-colour.

Dimensions of the type:—

Head and body 110 millim.; tail 80; hind foot, s. u. 24, c. u. 26·5; ear 23.

*Hab.* Limbane, on the Inambari River, Upper Madre de Dios. Alt. 3400 m.

*Type.* Female. B.M. no. 1. 1. 1. 41. Original number 1150. Collected 26th July, 1900, by Mr. P. O. Simons. One specimen only.

#### 4. *Akodon pulcherrimus cruceri*, subsp. n.

General colour olivaceous, the rufous tone disappearing from the brown and leaving an olivaceous not unlike that of *Akodon longipilis* or *macronyx*. Auricular patch small, surpassed by the ears and more or less separated from the white of the throat.

Dimensions of the type:—

Head and body 100 millim.; tail 87; hind foot, s. u. 23, c. u. 25·5; ear 22.

Average measurements of four adults: Head and body 98; tail 79; hind foot 23; ear 21·5.

*Hab.* Crucero, on the pass between Puno and the Upper Inambari. Alt. 4550 m.

*Type.* Female. B.M. no. 1. 1. 1. 45. Original number 1167. Collected 29th July, 1900, by Mr. P. O. Simons. Four specimens examined.

In general appearance, owing to its different dorsal colour, this race seems the most distinct of all.

#### *List of the Mammals as yet known from the Inambari River.*

Dr. Allen's recent paper (*l. c.*) gives an account of some mammals collected by Mr. H. H. Keays, nominally at "Juliaca, in South-eastern Peru, a little to the westward of Lake Titicaca"; but it is clear, both by the latitude and longitude given (13° 30' S., 70° W.) and by the species represented, all of which are Amazonian and not Titicacan, that the collection is from the Rio Inambari, where, as a matter of fact—at Santo Domingo—Mr. Simons found Mr. Keays at work. There may be another Juliaca on the Inambari, or, more probably, Mr. Keay's letters and collections came *viâ* Juliaca, Titicaca, and that thus the mistake arose.



Previously a few specimens had been obtained by Mr. J. Kalinowski at Marcapata, lower down the Inambari, and by including these, the species recorded by Dr. Allen in Mr. Keays's collection (omitting the *Lagidium*), and those now received from Mr. Simons, the number of Inambari mammals is raised from eighteen to twenty-seven.

*Lagothrix* sp. (probably *L. Humboldti*).

A number of skulls. Marcapata. J. Kalinowski.

*Cebus fatuellus peruanus*, Thos.

Marcapata. Kalinowski (as above).

*Alouatta nigra*, Geoff.

*Myotis* sp.

*Nyctinomus* sp.

*Saccopteryx* sp.

Rio Inambari. Simons.

*Nasua montana*, Tschudi.

♂ ♀, Limbane. Simons.

These are the first specimens assignable to this rare species that the Museum has received. Though from the same locality, they differ remarkably from each other in their general colour, one being comparatively rufous and the other more or less straw-coloured.

The species appears to replace in the Peruvian Andes the peculiar small-toothed *N. olivacea*, Gray, of the highlands of Ecuador, Colombia, and Venezuela. It is probably Dr. Allen's "*Nasua nasua*, L."

*Sciurus aestuans cuscinus*, Thos.

♀ ♀, Rio Inambari, 16th and 19th July.

These specimens quite agree with the type, except that their feet are rather less yellow. In a nice series sent by Mr. Simons from Mapiri, however, there is considerable variation both in the colour of the feet and of the belly, the latter part being almost white in some specimens.

*Rhipidomys phœotis*, Thos.

Segrario. Simons (as above).

*Oryzomys nitidus*, Thos.

R. Inambari. Simons.

The study of a very interesting series obtained by Mr. Simons on the Perené has convinced me that the rufous rat which in 1884 \* I called "*Hesperomys laticeps*, var. *nitidus*," is only an exceptionally rufous form, neither species nor subspecies, but merely a variation of that to which I then gave the name of *H. laticeps*. The specimens called *nitidus* had all been in spirit, and this often tends to turn fulvous into red. Now the Perené series, all adult, vary from a dark smoky *Mus musculus*-like grey to a rich fulvous, at least along the flanks, the dorsal area being still dark. The fulvous specimens tend to have lighter tails below than the grey ones, but the two forms intergrade completely. No doubt the Andean rats will prove distinct from the true *laticeps*, but all, whether brown or rufous, must bear the name of *nitidus*.

Specimens of this species, generally in the grey phase, have been obtained by various collectors all along the Andean slopes from Ecuador into Bolivia.

*Oryzomys Keaysi*, All.

♂, Rio Inambari.

♀, Limbane.

These specimens differ considerably from each other, but only within the limits shown by a series of the closely allied *O. Childi* of Bogotá, where there is much variation in size, and the belly may be anything from a sharply defined whitish to a rich buffy continuous with the rufous of the sides.

Such variation is very unusual among American Muridæ, and in the face of it I think it by no means impossible that *O. albigularis*, Tomes, *O. Childi*, Thos., *O. meridensis*, Thos., and the present animal, which are undoubtedly all very closely allied to each other, may hereafter have to be amalgamated. Probably I should not myself have given a special name to the Inambari form.

*Oryzomys obtusirostris*, All.

♂ ♂ ♂ ♀, Segrario, 13° 30' S., 70° 5' W.

♂, Limbane.

The different forms of the *longicaudatus-Stolzmanni* group are exceedingly difficult to differentiate, but I use the name Dr. Allen has applied to the Inambari race.

\* P. Z. S. 1884, p. 452, pl. xlii. fig. 1.

*Nectomys Garleppii*, Thos.

*Neacomys spinosus*, Thos.

Dr. Allen's Inambari record for this species was quite to be expected, as Mr. Simons has found it both on the Perené and at Mapiri, on the Beni.

*Ichthyomys Stolzmanni*, Thos.

Marcapata. J. Kalinowski.

*Oxymycterus juliacæ*, All.

Skeleton ♀, Rio Inambari. Simons.

It is unfortunate that Mr. Simons did not obtain a skin of this species for comparison with *O. inca* and *iris*; but the skull, which is barely adult, is not exactly like that of either.

*Oxymycterus apicalis*, Allen.

One specimen. Santo Domingo, 13° 5' S. and 70° W. 1800 m. 21st July. Topotype.

This most remarkable rat is so unlike any previously known species of *Oxymycterus* that until its skull was cleaned I could not believe that it had been correctly placed in that genus; but its cranial characters confirm Dr. Allen's judgment in the matter.

It was at Santo Domingo that Mr. Simons found Mr. Keays in residence, so I presume that it was there he collected the specimens described by Dr. Allen.

*Oxymycterus mimus*, Thos.

Limbane. Simons (as above).

*Akodon caliginosus*, Tomes.

Marcapata. Kalinowski.

Santo Domingo. Simons.

Also sent by Mr. Simons from Mapiri, across the frontier in Bolivia.

*Akodon boliviensis*, Meyen.

Limbane. Simons.

This is the common olive *Akodon* of all the highlands of S. Peru.

The type locality is not in Bolivia, but near Mount Misti, Dept. Arequipa. My *A. mollis* is its lowland representative, and may perhaps pass into it.

*Akodon pulcherrimus inambarii*, Thos.

Limbane. Simons (as above).

*Dactylomys peruanus*, All.

*Proechimys Simonsi*, Thos.

*Dasyprocta variegata*, Tschudi.

♂ ♀, Marcapata. J. Kalinowski.

This Aguti seems to grade northwards into *D. isthmica*, intermediate specimens occurring along the Andes of Ecuador. Examples from the Santa Marta Mountains, representing *D. colombiana*, Bangs, are also very similar to Peruvian skins.

*Didelphis pernigra*, Allen.

♂, Marcapata. J. Kalinowski.

♀, Limbane. Simons.

*Marmosa Keaysi*, Allen.

*Chironectes minimus*, Zimm.

XXII.—*A new Free-tail Bat from the Lower Amazons.*  
By OLDFIELD THOMAS.

*Promops Trumbulli*, sp. n.

Closely allied to *P. perotis*, Wied, but with smaller ears, smaller tragus, and much smaller and lighter teeth.

Ears more moderate than in *P. perotis*, united at their anterior bases, hairy in the same parts as in *P. perotis*, but not so thickly; keel less broadly flattened externally; tragus quadrangular, nearly or quite as broad as high, about 2 millim. in each dimension, so far as can be made out on the skin.

General colour above more "hair-brown" than the rufous-brown of *P. perotis*. Under surface whitish brown, paler along the middle line; the long hairs on the throat whitish grey; face and chin blackish brown.

Skull similar to that of *P. perotis* except for its generally lighter build, and this may be partly due to immaturity.

Teeth in shape similar on the whole to those of the allied

species, except that there is a marked notch at the centre of the inner basal cingulum of the upper canines, visible in the buccal aspect of the teeth. The very considerable difference in the actual size of the teeth is shown in the following table:—

	<i>P. perotis.</i> mm.	<i>P. Trumbulli.</i> mm.
Upper incisors, combined breadth at base ..	3·8	3·3
Upper canine, length from cingulum anteriorly .....	5·3	4·0
Upper canine, greatest diameter at base, horizontally .....	3·9	2·8
Large premolar and first two molars, combined length .....	8·5	6·8
Lower canine, height from cingulum externally .....	5·4	4·0
First lower premolar, transverse diameter..	2·2	1·5
First lower molar, transverse diameter ....	2·5	1·9

Specimens of *P. perotis* from Bolivia (*Bridges*) and Lagoa Santa (*Reinhardt*) have teeth agreeing closely in size with those of the example measured, which came from Cordova (*White*).

Forearm of the type (the epiphyses not yet fully united) 73 millim.

*Hab.* Para.

*Type.* Skin. B.M. no. 99. 11. 2. 1. Collected 7th June, 1898, and presented by J. Trumbull, Esq.

XXIII.—*Notice of a Species of Paludestrina new to the British Fauna.* By EDGAR A. SMITH.

IN October last year Mr. Lionel P. Adams sent for my inspection a number of specimens of a very small species of *Paludestrina* which had been obtained in the canal at Dukinfield, Cheshire.

Three weeks later other specimens were forwarded to me by Mr. F. Taylor, of Oldham, who informed me that he was the first to discover the presence of this shell at the above locality.

It is certainly quite distinct from the other British species and at present has not been identified with any foreign form. It has been suggested by Mr. Adams and others that possibly it may be an introduction from North America, having been

brought over in the same manner as *Planorbis dilatatus* and *Physa heterostropha*.

*P. Brownii*, Petterd, from Tasmania, more closely resembles this species than any other with which I am acquainted, and it is curious that the other species of *Paludestrina* (*P. Jenkinsi*), added of recent years to the British fauna, should also have an extremely close Tasmanian representative in *P. Legrandiana* of Brazier.

The present species may be thus described:—

*Paludestrina Taylora*.

Animal with the foot pale beneath, oblong, rounded behind, somewhat auriculate anteriorly, with the front edge straightish or even slightly sinuated. Proboscis cleft beneath in front, blackish above and at the sides, pale at the end; body also blackish at the upper part of the sides. Tentacles moderately long, scarcely tapering, rather obtuse at the tips, semitransparent, with a dark streak on one or both sides; eyes coal-black, large, slightly prominent at outer base of tentacles, with a sulphur-coloured spot above each.

Shell subcylindrical, turreted, umbilicated, brownish or olive horn-colour, obscured by a blackish earthy deposit; whorls four in number, very convex, separated by a deep suture, clean specimens exhibiting fine lines of growth; aperture broadly ovate, a little narrowed above; peristome continuous, outer margin simple, columellar edge slightly thickened and faintly reflexed.

Length  $2\frac{1}{2}$ –3 millim., diam.  $1\frac{1}{3}$ .

Operculum paucispiral, thin, horny, slightly concave exteriorly.

The sulphur spots above the eyes are a very striking feature in this mollusc, and under the microscope have a granular and even almost luminous aspect. The small size, besides the other characters mentioned, readily distinguish this from the other British species. I have much pleasure in associating with this form the name of its discoverer.

XXIV.—*New South-American Sciuri, Heteromys, Cavia, and Caluromys.* By OLDFIELD THOMAS.

*Sciurus griseogena meridensis*, subsp. n.

Precisely similar in size and general colour to the typical form, but the fur very much longer (hairs of back about

20 millim. in length), the belly-hairs plumbeous basally below their vivid fulvous-rufous tips, the separation of the belly from the body-colour less sharply defined, and the ears edged with bright rufous. Patch behind base of ears dull yellowish.

Dimensions of the type (measured in skin):—

Head and body 220 millim.; tail 220; hind foot, s. u. 48, c. u. 52; ear 20.

Skull: greatest length 52; basilar length 39; greatest breadth 30.5; nasals  $16 \times 7.3$ ; interorbital breadth 15.4; palate from henselion 23; diastema 13; length of upper tooth-row (crowns) 8.7.

*Hab.* Escorial, Sierra de Merida. Alt. 2500 m.

*Type.* Male. B.M. no. 98. 7. 1. 33. Collected 16th November, 1896, by S. Briceño.

This is evidently simply a highland form of *S. griseogena*, of which the type came from "Venezuela."

*Sciurus (Microsciurus) otinus*, sp. n.

Similar to *S. (M.) isthmius*, Nels., in all respects externally, except that the ears, instead of being like the crown (or rather more ferruginous) on both surfaces, are internally blackish towards their edges, and externally are white, contrasting markedly with the general colour. Their extreme edge, however, is black, the white hairs having fine black tips. Orbital rings scarcely perceptible. Caudal hairs ringed with black and pale yellow, their tips yellowish white.

Nasals of about the same length as in *S. isthmius*, but their posterior edge, instead of forming a round-angled **W**, is shaped like an open inverted **V— $\Lambda$** —the lines of the  **$\Lambda$**  being continuous behind with those bounding the premaxillary processes posteriorly. Incisors of the usual size.

Dimensions of the type (in skin):—

Head and body 130 millim.; tail (c.) 112; hind foot, s. u. 33, c. u. 36; ear 13.

Skull: tip of nasals to front of interparietal 33.3; zygomatic breadth 22.7; nasals 10 (diagonally)  $\times 5.1$ ; interorbital breadth 13.3; diastema (to *p.*<sup>4</sup>) 8.9; palate from henselion 14.2; combined length of large premolar and three molars 5.1.

*Hab.* Medellin, Colombia.

*Type.* Female. B.M. no. 76. 8. 8. 6. Collected by Mr. J. K. Salmon. Two specimens examined.

In the second specimen the ears are not so markedly white as in the type, but the cranial characters are quite similar.

*S. (M.) similis*, Nels.\*, from Cali, Colombia, of which the Museum possesses a skull, differs by its unusually slender incisors, these being only 1·4 millim. in depth as against 2·0. *S. chrysurus*, Puch.†, the only other allied species, may be distinguished by its golden or ferruginous tail.

*Heteromys australis*, sp. n.

A large dark species, with naked soles, allied to *H. melanoleucus*.

Fur close and crisp, rather short, spines about 8 millim. long by 0·5 millim. broad. General colour dark smoky grey, as in the allied species, the hairs of the back finely tipped with yellowish, the spines greyish white with black tips. Ears short, practically naked, black, finely edged with white. A tuft of stiff hairs just in front of the ears black, but in some cases white. Muzzle, throat, pouches inside and out, belly, and inner sides of limbs white. Lower part of forearms indistinctly slaty greyish all round, which colour runs on to the median part of the metacarpals, the remainder and the digits white. Posteriorly also the metatarsus is indistinctly brown, the toes being white. Tail thinly hairy, the rings of scales showing through, brown above, white below, the two colours not sharply defined.

Skull stoutly built, broad in proportion to its length; its detailed characters apparently much as in the allied species.

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

Head and body 135 millim.; tail 137; hind foot, s. u. 30, c. u. 33; ear 15.

Skull: greatest length 35; basilar length 24·5; zygomatic breadth 17; length of nasals 14·2; interorbital breadth 9·2; interparietal 4·7 × 9·5; length of palate from henselion 14·2; diastema 9; length of upper molar series (crowns) 4·5.

*Hab.* St. Javier, Lower Cachabi River, N. Ecuador. Alt. 20 m.

*Type.* Female. Original number 64. Collected 23rd June, 1900, by G. Flemming and R. Miketta. Fourteen specimens examined.

This is by far the most southern record for the genus *Heteromys*, and is the first discovery of any member of the genus to the west of the Andean chain. The species is allied to the dark naked-footed species *H. longicaudatus*, *anomalous*, *melanoleucus*, &c., but seems to be different from any of them. Among other characteristics its partially dark metapodials would alone distinguish it, as the other members of the group have these parts wholly white.

\* Bull. Am. Mus. N. H. xii. p. 78 (1899).

† 'Revue Zoologique,' 1845, p. 337.



*Cavia boliviensis littoralis*, subsp. n.

Fur short, hairs of back only about 17 millim. in length (apart from the fine elongated points). General colour above similar on the whole to the more northern subspecies, but more finely speckled and also less yellow than in most specimens of the typical form. Hairs of back indistinctly annulated to their bases, the paler slaty bases found in *C. b. leucoblephara* being replaced by alternate lighter and darker rings of grey; subterminal ring buffy, tips black. Rings round eyes lighter than head, but not conspicuously so. Belly dull buffy white, not sharply defined, the bases of the hairs grey. Upper surface of hands and feet buffy, becoming paler terminally.

Skull shaped as in the true *C. boliviensis*, but smaller, although this may be due to immaturity. Nasals narrower and ending opposite the ends of the premaxillary processes. Zygomatic less widely expanded anteriorly. Palatal foramina shorter and broader. Bullæ smaller. Incisors very narrow.

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

Head and body 199 millim.; hind foot, s. u. 35, c. u. 39; ear 18.

Skull: greatest length 47; basilar length 38.7; zygomatic breadth 28; nasals 15.6 × 6; interorbital breadth 9.8; interparietal 5.2 × 9; mastoid breadth 20.5; diastema 12.5; palatine foramina 4 × 2.3; length of palate from henselion 20; length of upper molar series 11; combined breadth of lower incisors 2.0.

*Hab.* Bahia Blanca, Argentina.

*Type.* Female. B.M. no. 0. 8. 5. 7. Collected 29th September, 1896, by Mr. W. Jex.

A considerable number of specimens of the true *C. boliviensis* have now been received from different localities round Lake Titicaca, collected by Messrs. Pentland, Garlepp, Kalinowski and Simons, and these, like the original series collected by Bridges, vary considerably in their general colour, the whiteness, brownness, or buffiness of their bellies, and even more strikingly in the shape of their nasals. However, none of them agree in the shortness of their fur, the fine speckling of the back, and the annulation of the bases of the dorsal hairs with the Cavy from Bahia Blanca. Specimens from the intermediate localities, representing *C. leucoblephara*, Burm., agree in these characters more with the Titicacan animal.

Owing to the difficulty in determining the age of Cavies, I am not sure as to the exact age of the specimen, but think it would have attained rather larger dimensions.

*Caluromys laniger pyrrhus*, subsp. n.

General colour of back rich rufous, not unlike that of some of the red *Marmosæ* of the *M. murina* group; a faint trace of the spinal white patch present. Face short-haired, grey, contrasting with the rufous nape and occiput, the median dark line strongly marked. Cheeks and under surface dull buffy white, the hairs almost entirely without slaty bases. Forearm pale greyish, becoming white terminally on the metacarpus. Legs duller grey, continuous with a large greyish patch on the outer side of the hips. Woolly part of tail passing from rufous proximally to brown terminally; extension of fur on upperside of tail only about an inch beyond that on lower side; naked part brown for about 3 inches, then white.

Dimensions of the type (measured in skin):—

Head and body 285 millim.; tail 400; hind foot (s. u.) 42; ear 28.

Skull: basal length 53; zygomatic breadth 34; inter-orbital breadth 10·5; breadth across postorbital processes 17·5; palate length 31; combined length of *mp.*<sup>1</sup>, *m.*<sup>1</sup>, and *m.*<sup>2</sup> (*m.*<sup>1-3</sup> of Catalogue) 8.

*Hab.* S.W. Colombia and N.W. Ecuador. Typical locality Rio Oscuro, near Cali, Cauca River, Colombia. Alt. 1000 m. Other specimens from S. Javier, Lower Rio Cachabi, N.W. Ecuador.

*Type.* Male. B.M. no. 99. 9. 6. 50. Original number 482. Collected June 1898 by Messrs. Batty, Parish, & Co.

Native name "Chucharata" at Cali, "Cucumbi" at S. Javier.

This form of the Woolly Philander differs by its bright rufous colour from the dark *C. l. cicur*, Bangs, of Sta. Marta, Bogotá, and the Oriente of Ecuador, on the one hand, and from the peculiar pale *guayanus* of S.W. Ecuador on the other. Its light forearms and hands also distinguish it from the former, as from the Amazonian *ochropus*, Wagn., and the Peruvian *ornatus*, Tschudi. Perhaps it is really most allied to the Central-American *derbianus*, Waterh., but differs by the reduction of the white dorsal patch to a mere trace, the more defined frontal stripe, and the much darker colour of the woolly part of the tail. The unusually slight difference in the extension of the upper and lower fur on the tail is also a well-marked character common to all the specimens examined.

The Ecuadorean specimens are like that from Colombia in every respect.

XXV.—*An Account of a Collection of Butterflies obtained by Lord Delamere, chiefly at Munisu, near Mount Kenya.* By ARTHUR G. BUTLER, Ph.D. &c.

MUNISU appears to be situated at an altitude of 4150 feet, and most of Lord Delamere's captures were obtained in that locality; but a few of the species were obtained in East Central Africa, on the Athi River.

The collection consists of seventy-nine species, none new to science, but three new to the Museum series, viz. *Monotrichtis kenia*, *Belenois margaritacea*, and *Pinacopteryx rubrobasalis*. The following species of special interest were also secured:—*Precis gurunana*, *P. Gregorii*, *Planema montana*, *Acraea uvui*, *Uranothauma nubifer*, *Mylothris rubricosta*, *Terias hapale* in both sexes, *Synchlœ distorta*, *Papilio echerioides*, *Pyrgus machacosa*, and *Cyclopides quadrisignata*.

#### Nymphalidæ.

##### 1. *Amauris albimaculata*, Butler.

A singularly deep-coloured male, the band on the secondaries being of a dark testaceous rather than clear ochreous tint, as in *A. Ansoergei*.

##### 2. *Tirumala Petiverana*, Doubl.

February 1900.

##### 3. *Limnas chrysippus*, var. *Klugii*, Butler.

##### 4. *Monotrichtis safitza*, Hewits.

Four males and one female of the wet phase and a male of the dry phase.

##### 5. *Monotrichtis kenia*, Rogenh.

A male of this species, which is new to the collection, was obtained in February 1900; it is evidently the Eastern representative of *M. auricruda*, from which it differs in its darker colour, superior size, and the white instead of buffish subapical belt on the primaries.

##### 6. *Neocenyra Gregorii*, Butler.

February 1900.

7. *Charaxes pollux*, Cramer.

8. *Charaxes Kirkii*, Butler.

This species seems to replace the Western *C. viola* in East Central and Northern Africa ; both sexes are easily distinguished.

9. *Charaxes cithæron*, Felder.

One perfect male, with unusually broad pale patch on secondaries.

10. *Charaxes varanes*, Cramer.

11. *Precis cloantha*, Cramer.

♂ ♀, Munisu ; ♂, Meara : 15th February, 1900.

12. *Precis aurorina*, Butler.

13. *Precis elgiva*, Hewits.

14. *Precis cebrene*, Trimen.

15. *Precis Westermanni*, Westw.

Three males of this Western form, which we have also from Monbuttu.

16. *Precis clelia*, Cramer.

A series obtained in February.

17. *Precis guruana*, Rogenh.

18. *Precis Gregorii*, Butler.

February 1900.

19. *Precis natalica*, Felder.

20. *Pyrameis abyssinica*, Felder.

Embi, 15th February, 1900.

21. *Hypolimnas misippus*, Linn.

A series of male specimens, 19th February, 1900.

22. *Hamanumida dædalus*, Fabr.

23. *Crenis Boisduvali*, Wallgr.  
February.
24. *Argynnis Hanningtoni*, Elwes.  
15th February, 1900.
25. *Atella phalantha*, Drury.  
A long series of both wet and dry phases.
26. *Neptis agatha*, Cramer.
27. *Neptidopsis ophione*, var. *velleda*, Mab.  
February.
28. *Eurytela hiarbas*, Drury.
29. *Byblia ilithyia*, var. *simplex*, Butler.  
A pair, Meara, 19th February, 1900.
30. *Byblia vulgaris*, Staud.
31. *Planema montana*, Butler.  
One female was captured in February.  
In his useful work on African Rhopalocera Prof. Aurivillius regards *P. montana* as a variety of *P. aganice*; but he separates *P. meruana*, and figures the female, as a distinct species. As a matter of fact, *P. meruana* is simply an absolute synonym of *P. montana*, of which *P. berthia* of Vuillot is the male. As to its being a variety of *P. aganice*, it might just as well be regarded as a variety of *P. gea* or almost any other *Planema*. On the face of it, the fact that an Englishman, German, and Frenchman all decided independently that it was perfectly distinct is a strong argument for its specific value.
32. *Acræa Johnstonei*, Godman.  
♀ (var. *flavescens*).
33. *Acræa cabira*, Hopff.
34. *Acræa alicia*, E. M. Sharpe.  
February.
35. *Acræa uvui*, H. G. Smith.

36. *Acræa serena*, Fabr.

♂, Embi, 15th February, 1900.

37. *Acræa lycia*, Fabr.

♂ (typical form), Munisu in February.

♀ (var. *daira*), Athi River.38. *Acræa cæcilia*, var., Fabr.

This form might be taken for *A. onerata*, excepting that the internervular folds are not blackened. I am afraid that eventually connecting-links will be discovered. The width of the border certainly varies considerably in this as in many species.

39. *Acræa natalica*, Boisd.**Lycænidaæ.**40. *Uranothauma nubifer*, Trimen.

It is rather surprising to find this southern species so far to the north; one would rather have expected to meet with *U. cordatus*.

41. *Polyommatus beticus*, Linn.

♂ ♂, Munisu and Embi, 15th February, 1900.

42. *Syntarucus telicanus*, Lang.

♂ ♂ ♀, Munisu; ♀, Athi River.

43. *Azanus ubaldus*, Cramer.

♂ ♂, Athi River (all much worn).

**Papilionidaæ.**44. *Mylothris rubricosta*, Mab.45. *Colias electra*, var. *edusa*, Fabr.

A pair taken at Embi on the 15th February.

46. *Terias brigitta*, Cramer.

♂ ♂, Munisu; ♀ ♀, Embi, 15th February, and Meara, 19th February.

The specimens are of the wet phase.

47. *Terias hapale*, Mabilie.

I find that I was too hasty in questioning Prof. Aurivillius's action with regard to this species; the males are pale lemon-yellow and without brand, the females white. Probably *T. messalina* is the nearest ally.

48. *Terias Marshalli*, Butler.49. *Terias Boisduvaliana*, Mabilie.

♂ ♂, Embi, 15th February, and Munisu.

Both examples belong to the dry phase (*T. aethiopica*). I am afraid that it will be difficult in future to decide as to whether a female belongs to *T. hapale* or *T. Boisduvaliana*, unless the two are taken together; I believe ours are now all correctly sorted, but I do not feel absolutely sure. As a rule, I think, the under surface of *T. Boisduvaliana* has more sharply defined (less blurred) markings than in *T. hapale*.

50. *Teracolus calais*, Cramer.51. *Teracolus eris*, Klug.52. *Teracolus incretus*, Butler.

A pair of the dry phase from Munisu.

53. *Teracolus auxo*, Lucas.

A pair of the dry phase from the Athi River in Central East Africa.

54. *Teracolus xanthus*, var. *metagone*, Holl.

♂ ♀, Athi River, Central East Africa.

This is a typical dry-season phase of the species.

55. *Teracolus pseudacaste*, Butler.

♂ ♂ ♀ ♀, Athi River, Central East Africa.

All the examples are of the dry-season phase.

56. *Catopsilia florella*, Fabr.

♂ ♂ ♀ ♀, Munisu; ♂ ♂, Embi, 15th February, 1900.

57. *Belenois zochalia*, Boisd.

♂ ♂, Embi, 15th February, 1900.

58. *Belenois severina*, var. *infida*, Butler.

59. *Belenois mesentina*, Cramer.

60. *Belenois margaritacea*, E. M. Sharpe.

February.

This is new to the Museum series. It differs a little from the figure in that the border of the secondaries is regularly dentate-sinuate internally, not enclosing spots of the ground-colour; this, however, is a likely variation to occur in a species of *Belenois*, and may represent a seasonal phase.

61. *Belenois Westwoodi*, Wallgr.

♂, Embi, 15th February, 1900.

62. *Synchloe Johnstoni*, Crowley.

♂ ♂, Embi, 15th February, and Munisu.

63. *Synchloe distorta*, Butler.

♀, Athi River, Central East Africa.

This is only the second example that I have seen.

64. *Pinacopteryx rubrobasalis*, Lanz.

♂ ♀ ♀, Munisu, in February.

How the describer of this species could possibly imagine it a variety or aberration of *P. pigea* (which shows no orange at the base of the primaries in the female) I cannot at all understand; its proper position is between *P. astarte* and *P. orbona* (of which I hold *P. larima*, Boisd., to be the female\*). The male, of which we previously possessed a rubbed example under my *P. vidua*, is of a similar character to *P. astarte*. Herr Lanz describes females of the wet phase with well-defined dark outer border to the primaries; in all our specimens this border is reduced on the outer margin to small spots which terminate the veins (dry phase).

\* Prof. Aurivillius identifies Boisduval's insect with "a very rubbed example of *thysa*, Hopffer"—a *Belenois*. I prefer an identification which does not require abrasion to make it answer.



65. *Pinacopteryx gerda*, H. G. Smith.

♂, Embi, 15th February; ♂♂ ♀, Mukusi in February.  
These also are all of the dry phase.

66. *Eronia leda*, Boisid.67. *Nychitona medusa*, Cramer.

February.

This species should have been placed after *Mylothris*; the specimen is rather interesting, the apical border of the primaries being continued to the second median branch, the black spot being also unusually large.

68. *Papilio similis*, Cramer.

February.

69. *Papilio demodocus*, Linn.

Munisu in February.

70. *Papilio nireus*, Linn.

February.

71. *Papilio brontes*, Godman.

♀, Embi, 15th February, 1900.

72. *Papilio echerioides*, Trimen.

February.

A slightly aberrant male example in which the spots composing the belt across the primaries are reduced in size.

**Hesperiidæ.**73. *Eretis lugens*, Rogenh.

Munisu and Embi, 15th February.

74. *Pyrgus machacosa*, Butler.

Three males; one from Embi, 15th February.

75. *Gomalia elma*, Trimen.76. *Cyclopides quadrisignata*, Butler.77. *Padraona zeno*, Trimen.78. *Gegenes Letterstedti*, Wallgr.79. *Rhopalocampta forestan*, Cramer.

March.

XXVI.—*Description of a new Gecko from the Niger Delta.*

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

*Hemidactylus Ansorgii.*

Head elongate, once and three fourths as long as broad, not very distinct from neck; snout obtusely pointed, longer than the distance between the eye and the ear-opening; forehead slightly concave; ear-opening vertically oval, more than half the diameter of the eye. Body and limbs rather slender. Digits moderately elongate, free, normally formed, the inner well developed; 5 lamellæ under the pollex, 8 under the fourth finger, 6 under the hallux, 11 under the fourth toe. Head covered with very small granules, which are larger on the snout; rostral four-sided, twice as broad as deep, with median cleft above; nostril pierced between the rostral, the first upper labial, and three nasals; 11 upper and 12 lower labials; symphysial triangular, twice as long as the adjacent labials; two pairs of chin-shields, the median pair forming a suture behind the symphysial. Upper surface of body covered with minute granules intermixed with small strongly keeled tubercles, forming 8 irregular longitudinal series; ventral scales quite as large as the dorsal tubercles, imbricate, smooth. No enlarged tubercles on the limbs. A short angular series of 9 præanal pores. Tail cylindrical, slender, covered above with small granules and transverse series of subconical tubercles, beneath with large, irregular, imbricate, smooth scales. Dark brown above, with some lighter spots; whitish beneath, finely speckled with brown.

	millim.
Total length .....	115
Head .....	16
Width of head .....	9
Body .....	39
Fore limb .....	19
Hind limb .....	25
Tail .....	60

A single specimen from Sapele Station, Niger Delta; presented to the British Museum by Dr. W. J. Ansorge.

XXVII.—*The Musk-Rat of Santa Lucia (Antilles).*

By C. I. FORSYTH MAJOR.

THE obvious inference that the musk-rats of the Antilles pertain to the Hesperomyiinae was first announced by the Secretary of the Zoological Society of London when registering a specimen from Santa Lucia amongst the additions

to the menagerie \*. Two years later Gosse remarks that the *Mus pilorides* of Desmarest, "found in the Caribbean Islands, has not the dentition of the Old-World rats, but resembles, in the structure of its molars, the South-American rats grouped by Mr. Waterhouse under the generic name of *Hesperomys*" †.

From the published description and figures it is impossible to make more than a guess as to which group of Hesperomyinæ the musk-rats may belong; Winge was therefore right in saying that their closer relationship is still unknown.

The examination of a specimen from Santa Lucia in the British Museum (no. 53. 12. 16. 4), presumably the one mentioned in the P. Z. S. for 1849, shows that we have to do with the genus *Oryzomys*. The same may be said of the Martinique musk-rat; one of the type specimens from Martinique, presented by Plée to the Paris Museum, has found its way to the Leyden Museum, and its skull was kindly lent to me by Dr. Jentink.

The detailed description, with figures, of these two skulls, together with the lower dentition of a third (extinct) species found by Prof. Gregory in a small ossiferous breccia of Barbuda, will be given in another place.

The following is the synonymy of the musk-rat from Martinique:—

*Oryzomys piloris* (Zimmerm.).

*Rat musqué (Piloris)*, C. de Rochefort, Hist. Nat. et Morale des Iles Antilles de l'Amérique, p. 124 (1658).

*Musk Cavy*, Pennant, Syn. of Quadr. p. 247. no. 183 (1771); 3rd ed. ii. p. 97 (1793).

*Cavia, Species obscura*, Erxleben, Syst. Regni Anim., Mammalia, p. 357 (1777).

*Castor Piloris*, Zimmermann, Zool. geogr. p. 509 (1777).

*Mus pilorides*, Desmarest, Dict. Sc. Nat. t. xliv. p. 483 (1826); Wagner, Schreiber's Säugethiere, Suppl. iii. p. 444 (1843).

*Mus Desmarestii*, Fischer, Syn. Mammalium, p. 316 (1829).

*Le Piloris*, F. Cuvier (E. Geoffroy & F. Cuvier), Hist. Nat. des Mammif. iv. pl. cclviii. (1830).

*Hesperomys (Megalomys) pilorides*, p. p., Trouessart, Le Naturaliste, no. 45, p. 5 (1881); Ann. Sc. Nat., Zool. xix. Art. no. 5, p. 13 (1885).

*Holochilus (Megalomys) pilorides*, p. p., Trouessart, Catal. Mamm. p. 520 (1897).

*Hab.* Martinique.

\* "*Mus (Hesperomys) pilorides*," Proc. Zool. Soc. London, 1849, p. 105.

† P. H. Gosse, 'A Naturalist's Sojourn in Jamaica,' pp. 449, 450 (1851).

For the specimen of Santa Lucia a new specific name is here proposed:—

*Oryzomys luciae*, sp. n.

*Mus* (*Hesperomys*) *pilorides*, Mitchell, Proc. Zool. Soc. London, 1849, p. 105.

*Hesperomys* (*Megalomys*) *pilorides*, p. p., Trouessart, *opp. citt.*

*Holochilus* (*Megalomys*) *pilorides*, p. p., Trouessart, *opp. citt.*

The Martinique specimens vary somewhat in their dimensions; all are of large size, the skull of the largest specimen, described by Trouessart, having a length of 70 millim.

The species of Santa Lucia is distinguished by its habitat, its smaller size, the conformation of the outer wall of the infraorbital foramen (the anterior margin of which is more convex forward than in *O. piloris*), and, lastly, by the coloration of the belly, which is white in *Oryzomys piloris* and nearly wholly brown, continuous with the upper colour, in *O. luciae*.

*Measurements of Skulls and Molar Series.*

	<i>O. luciae</i> (type). Brit. Mus. no. 53.12.6.4. mm.	<i>O. pilorides</i> . Leyden Mus. sp. a. mm.
Length: lower margin of for. magn. to front of incisors . . . . .	41	..
Length: upper part of for. magn. to tip of nasals . . . . .	48.8	62
Length: post. part of interparietal to tip of nasals . . . . .	..	61.5
Length of nasals in the middle line . . .	19.4	24
Palatal length from henselion . . . . .	12.8	..
Length of foramina incisiva . . . . .	8	9.2
Greatest breadth . . . . .	27	..
Breadth of brain-case on squamosals . . .	16	21
Breadth of interparietal . . . . .	10.5	11.5
Length of upper molar series . . . . .	7.5	9
Length of lower molar series . . . . .	8	9

XXVIII.—*Descriptions of Brazilian Coccidæ.*

By ADOLPH HEMPEL, S. Paulo, Brazil.

[Continued from p. 125.]

Subfamily *LECANIINÆ*.

Genus *LECANIUM*, Illiger.

*Lecanium brunfelsia*, Hempel.

Adult female flat, subcircular in outline, reddish brown, with a double longitudinal row of five or six black oval spots

on the dorsum and a lighter ring around the margin. Slightly asymmetrical.

Diameter 5 millim.; anal cleft 1.35 millim. long.

Boiled in a solution of KOH the dorsal derm remains thick and of a light brown colour. It is composed of about thirty-four irregular plates, consisting of a median dorsal area of twelve plates, around which the others are arranged in a single row, like the plates on the back of a turtle. The spaces between the plates are narrow and semitransparent. There is also a median longitudinal row of fifty to sixty small round pores.

Antennæ variable, of six joints, about .200 millim. long. Approximate formula: 3 6 (1 2) (4 5). Length of segments: (1) 31, (2) 31, (3) 71, (4) 18, (5) 18, (6) 38. Joint 3 sometimes has a false joint. All joints bear hairs. First pair of legs inserted near the antennæ. Second and third pair of legs close together, but widely separated from the first pair. Legs very short and somewhat deformed. The division between the tarsus and tibia is usually obliterated, and this segment is usually curved. Length of joints of first pair of legs: coxa 44, femur with trochanter 71, tibia, tarsus, and claw 88. All the digitules have expanded ends and extend beyond the tip of claw, those of the claw being unequal in size. Rostrum small, situated just caudad of the insertion of the first pair of legs. Rostral loop short, extending halfway to the second pair of legs. The first pair of spiracles are situated outside of the first pair of legs, the second pair outside of the second pair of legs, but closer to them. Anal plates small, with the outer angle but slightly rounded and the antero-lateral sides longer than the postero-lateral. Anal ring apparently with ten hairs. Around the lateral margin of the body there is a row of fine hairs placed widely apart. The stigmatal areas are characterized by a group of three club-shaped spines—two short and one long—and four small hairs. A few short hairs are scattered over the dorsal surface.

Male scale oval, rather flat, composed of very thin, white, glassy wax. The scale consists of one narrow dorsal plate and seven lateral plates. Length 2 millim.; width 1.5 millim.

*Larva* (newly hatched).—Elliptical, light yellow in colour, with small irregular dark brown eyes. Length .562 millim. The body ends in two plates, each terminated by a long conspicuous seta. The lateral margin is finely serrated; the abdomen bears several hairs on the margin, and each stigmatal area is characterized by one large club-shaped spine and two very small ones. Antennæ 6-jointed, joints 3 and 6 longest

and about equal in length. Legs long and slender; digitules of claw and tarsus very long.

*Hab.* Pilar, Alto da Serra, and S. Paulo, State of S. Paulo.

On the upperside of leaves of *Brunfelsia* sp. and *Laurus* sp.

The first specimens were collected and sent to the museum by Snr. Gustavo Edwall.

*Lecanium gracile*, Hempel.

Adult female asymmetrical, ovate, very flat, light yellowish brown in colour; 3.50 millim. long, 2.50 millim. wide, and .50 millim. high. Boiled in a solution of KOH it stains the liquid an amber colour. After boiling the dorsal derm remains hard and opaque. It resembles the preceding species, but the central portion of the derm is fused into one piece, while around the margin there is a row of about twenty sutures, indicating the division of the plates. A number of fine hairs are scattered over the surface. There is also an irregular longitudinal row of from eighteen to twenty-four small round pores between the cephalic portion and the anal plates.

Antennæ of six joints, variable in length, ranging from .301 millim. to .354 millim. All the joints bear hairs. Approximate formula: 3 (2 6) 1 4 5 or 3 2 6 1 4 5. Length of segments: (1) 40, (2) 49, (3) 102-144, (4) 24, (5) 26, (6) 51. Legs ordinary. Length of joints of first pair of legs: coxa 102, femur and trochanter 178, tibia 129, tarsus and claw 102. Digitules of claw large, with bulbous base and ends widely expanded, twice the length of claw. Tarsal digitules long, slender, with buttoned ends. Rostrum small, situated between the first pair of legs. Rostral loop short, extending halfway to the second pair of legs. Spiracles small, with a single row of about thirty-six small round spinnerets extending from the external openings to the margin of the body. Anal cleft .750 millim. long, with the sides contiguous. Anal ring apparently with ten hairs. Anal plates small, triangular, with the outer angle slightly rounded and the antero-lateral side longer than the postero-lateral. Around the margin of the body there is a double row of fine tuberculate hairs. The margin is slightly indented in the stigmatal areas, and there bears a cluster of one long curved blunt spine and two short ones.

*Larva* (just hatched).—Elliptical, orange in colour, about .450 millim. long. Antennæ of six joints; joints 3 and 6 are about equal in length. Rostral loop not coiled, short, not reaching to the anal plates. The body terminates in two long

setæ. The margin is serrated and bears a row of fine hairs. The stigmatal spines are in groups of three—two very short and one long. Legs ordinary; claw long, curved; digitules of claw large, with knobbed ends. Tarsal digitules filiform, long, with knobbed ends.

*Hab.* Santa Barbara or Villa Americana, State of S. Paulo. On the upperside of leaves of a plant of the order Sapindaceæ.

*Lecanium ornatum*, Hempel.

Adult female ovate, asymmetrical; dorsum not very convex, dark brown in colour, with a light marginal band. In the old specimens the dorsal derm is hard and bears about twenty-four radiating ridges around the margin and a few irregular ridges on the central portion. The entire derm is covered with a thin white powdery secretion. Size  $\frac{1}{4}$  millim. long,  $\frac{3}{8}$  millim. wide, and  $\frac{7}{16}$  millim. high. Anal cleft  $\frac{6}{16}$  millim. long; sides not contiguous.

Boiled in a solution of KOH it colours the liquid light brown. After boiling the derm becomes colourless in the younger specimens, but remains hard and brown in the older specimens. The derm has rows of peculiar round or oval groups of glands corresponding to the ridges. Thus the dorsum is divided into twenty-four marginal and twenty-two to twenty-four central areas. These groups of glands are both large and small, and each contained from ten to thirty of the small elliptical hyaline gland-spots. The ventral derm contains many large tubular glands and groups of simple round spinnerets, especially near the margin.

The antennæ are variable, usually of eight joints, although some individuals have antennæ of seven joints. All the joints bear hairs, but joints 3 and 4 are sometimes hairless. Length about  $\frac{3}{10}$  millim. Approximate formula: 3 1 2 (4 8) 5 6 7 or 3 1 (2 4 8) 5 6 7. Length of joints: (1) 53, (2) 42, (3) 62, (4) 43, (5) 36, (6) 27, (7) 20, (8) 45. Legs long; trochanter with one long terminal hair. Claw small; digitules of claw twice the length of claw, with the ends widely expanded. Tarsal digitules slender, with the ends slightly knobbed, not extending beyond the digitules of the claw. Length of joints of the first pair of legs: coxa 133, femur with trochanter 244, tibia 187, tarsus and claw 124. Rostrum small, situated between the first pair of legs. Stigmata very small. Anal ring with six large hairs. Anal plates small, the two together forming a square, both outer sides equal in length. The margin of the body is thickly set with a double row of long and short sharp hairs, each arising

from a tubercle. Some of these hairs are  $\cdot 133$  millim. long and very slender.

*Hab.* São Paulo. On the underside of leaves of the fruit-tree *Eugenia jaboticaba*.

Nearly all the specimens examined were parasitized.

*Lecanium durum*, Hempel.

Adult female very dark brown, irregular, sometimes asymmetrical, oval to oblong in outline, flat, posterior margin slightly notched, anterior end usually narrower and rounded. The upper surface is rough and uneven, with a median longitudinal ridge and a rectangular central area set off by slight ridges, the entire dorsum being covered with small patches of white wax. Length  $5\cdot 75$  millim., width  $3\cdot 50$  millim., height 1 millim. Anal cleft about  $\cdot 75$  millim. long, with contiguous sides. Removed from the bark it leaves a thin film of white wax. Boiled in a solution of KOH it colours the liquid light brown. The derm is thick and retains a deep brown colour, being very hard and full of irregular oval glands, each with a large hyaline spot, placed subcentrally.

Antennæ variable, of seven joints, about  $\cdot 450$  millim. long. Approximate formula: 4 3 2 7 (1 5 6). Average length of the joints: (1) 44, (2) 53, (3) 67, (4) 146, (5) 44, (6) 44, (7) 49. All the joints except joint 3 bear hairs. Joint 4 sometimes has one or more false joints. Legs ordinary. Length of joints of first pair of legs: coxa 111, trochanter and femur 204, tibia 146, tarsus and claw 160. The coxa bears a short spine on the proximal end. The claw is very slightly notched. Tarsal digitules long, slender, with buttoned ends. Digitules of claw shorter, unequal in size, with expanded ends. Rostrum small. Spiracles small, with many round spinnerets about the external orifices. Anal ring apparently with eight hairs. A few hairs, short spines, and tubular glands are scattered over the ventral surface. Around the lateral margin is a row of sharp spines; these are about as long as the distance separating them, but are more numerous near the anal cleft. The stigmatal areas contain three large spines each.

*Hab.* Ypirauga, State of S. Paulo. On the bark of *Baccharis dracunculifolia*.

*Lecanium glanulosum*, Hempel.

Female oval, flat, sometimes asymmetrical, the margin ornamented with twenty-eight to thirty triangular bits of wax, and the dorsum covered with small irregular scales of



grey wax, giving it an appearance like the skin of a small lizard. The derm is hard, rough, wrinkled and reticulated, dark reddish brown in colour, with a median longitudinal ridge and a large central rectangular area. There is a fine white fringe around the ventral margin. Removed from the bark it leaves a patch of white wax.

Length 4.50 millim.; width 3.50 millim.; height 1 millim. Anal cleft about 1.100 millim. long.

Boiled in a solution of KOH the derm remains brown, thick, and chitinous, with a thin transparent border. The entire dorsal derm is crowded with large flask-shaped glands, usually arranged in many irregular rosettes, with the opening near the edge. Over the glands there is a thin layer composed of minute square pieces.

Antennæ variable, of seven joints. Length .437-.448 millim. Approximate formula: 3 4 (1 2) 7 5 6. Average length of the joints: (1) 57, (2) 57, (3) 129, (4) 68, (5) 40, (6) 37, (7) 51. The antennæ are long and slender, nearly the same thickness throughout. All the joints except joint 3 bear hairs, joints 2, 4, and 7 each bearing one quite long one. Joint 4 sometimes has one or more false joints. Sometimes an individual will have an antenna with eight distinct joints. Legs short and slender. The outer edge of the tibia is slightly concave. Length of joints of first pair of legs: coxa 89, femur and trochanter 196, tibia 133, tarsus and claw 133. Digitules of tarsus long and slender, with expanded ends. Digitules of claw large, thick, unequal in size, with expanded ends, and extending beyond the tip of claw. Rostrum small, situated midway between the first and second pair of legs. Rostral loop extending to the last pair of legs. Anal ring apparently with ten hairs. Anal plates small, the outer angle rounded and the lateral sides equal in length. The ventral surface bears a few hairs and small tubular glands. Around the lateral margin there is a row of many small sharp conical spines. The stigmatal areas are marked by two or three short spines and one very long one.

*Hab.* Ypirauga, State of S. Paulo. On the twigs of a plant of the order Myrtaceæ.

#### *Lecanium zanthoxylum*, Hempel.

Adult female dark reddish brown, irregular, asymmetrical, oblong to subcircular in outline, flat, with a slight notch in the caudal margin. Margin of the body thin; dorsal derm reticulate, hard, rough, not shiny, the middle slightly elevated so as to form a longitudinal ridge; usually covered with

small patches of wax, giving the insect a rough grey appearance, like a scar or bud. The cells or reticulations are small, red in colour, the partitions being thick and black. On the ventral surface the derm is chocolate-brown. The opening of the cavity containing the eggs is small, 1.75 millim. wide, and nearly square. There is a narrow white fringe of secretion around the ventral margin. A white patch remains on the bark when the insect is removed. Length 5 millim.; width 4 millim.; height 1.25 millim. Anal cleft 1.20 millim. long, sides contiguous. Boiled in a solution of KOH it colours the liquid dark red. The dorsal derm remains thick and brown. The central portion is composed of large, irregular, oval glands, with a small sub-circular hyaline spot near one end, while near the margin there is a border composed of four or five rows of smaller sub-circular glands. The hyaline spots in these glands are apparently the openings. The outer portion of the ventral derm is chitinized, forming a border about 1 millim. in width.

Antennæ slender, of seven joints. All the joints except joint 3 bear hairs, joint 2 bearing one long one. Length of antennæ about .340 millim. Approximate formula: 4 (1 2 3 7) 5 6. Length of joints: (1) 44, (2) 44, (3) 44, (4) 93, (5) 36, (6) 31, (7) 44. Legs short and thin, varying in length. Tarsus and claw as long as the tibia. Average length of joints of the first pair of legs: coxa 93, trochanter with femur 164, tibia 102, tarsus and claw 102. The coxa bears a short spine on the proximal end; the coxa and trochanter each bear a long terminal hair on the distal end. Tarsal digitules very long and slender, with expanded ends (53  $\mu$  long). Digitules of claw large, unequal in size, with expanded ends. Rostrum small, situated between the insertion of the second pair of legs. Mentum monomerous, with bifid end, bearing eight hairs. Rostral loop short. Spiracles small. Around the lateral margin there is a row of short, sharp, thick spines, placed at intervals of about 111  $\mu$  apart. Anal plates small, with the outer angle rounded and the antero-lateral side longer than the postero-lateral.

*Hab.* Ypirauga, State of S. Paulo. On branches of *Zanthoxylum* sp. Situated on the bark, where it resembles the leaf-scars and buds so closely as almost to escape notice.

*Lecanium infrequens*, Hempel.

Adult female large, dark brown, irregular in outline, dorsum convex, sometimes with small patches of white wax.

The dorsum has six pits arranged in two longitudinal parallel rows. The two anterior pits are shallow, but the other four are very deep. Between these pits the dorsum stands out in thick transverse ridges. Derm thick, not shiny, with numerous oval glands. Length 8 millim., width 6 millim., height 4 millim. Anal cleft 1.60 millim. long, sides contiguous. Boiled in a solution of KOH it colours the liquid dark brown. After boiling the derm becomes semitransparent, but remains brown, thick, and hard.

Antennæ of six joints, of which the third is the longest. Average length of antennæ .380 millim. Approximate formula: 3 1 (2 4 5) 6 or 3 1 (5 6) 2 4. Length of joints: (1) 53, (2) 40-44, (3) 156-173, (4) 30-44, (5) 44, (6) 40-44. All the joints bear hairs. Legs ordinary, all the joints bearing hairs near the distal end. Claw short, sharp, and much curved at tip. Digitules of claw wide, with widely expanded ends. Tarsal digitules long, slender, with ends expanded, reaching beyond the digitules of claw. Length of joints of last pair of legs: coxa 111, femur and trochanter 209, tibia 133, tarsus and claw 124. First and second pair of legs widely separated, second and third pair of legs close together. Rostrum small, situated between the first pair of legs. Rostral loop short. Stigmata large, with peculiar pouch-shaped glands around the external orifice. These glands are also present near the lateral margin on the ventral surface. The anal ring bears ten hairs. Anal plates small, each one hemispherical in form. The dorsal derm is composed of large irregular glands, with oval centres, and a hyaline spot within the oval. Over these glands there is a very thin covering, apparently composed of minute square pieces of material. Around the lateral margin there is a scant row of short thick hairs.

*Hab.* Ypirauga, State of S. Paulo. On the bark of *Zanthoxylum* sp.

*Lecanium discoides*, Hempel.

Adult female light reddish brown, subcircular, flat, with a slight notch in the posterior margin. The derm is hard, reticulated, the reticulations being orange-red in colour, while the partitions are thick and brown. The surface is dull, shiny, slightly roughened by very shallow radial furrows. Many specimens also show a faint median longitudinal ridge. The younger specimens are usually ornamented with small patches of brown wax, especially on the margin, which contains from sixteen to twenty triangular pieces. In the older specimens this wax is usually rubbed off. All the specimens

agree in having a narrow fringe of white secretion around the ventral margin. It leaves an oval patch of white wax behind when removed from the bark. Length 8 millim., width 7·25 millim., height 1·50 millim. Anal cleft 2·75 millim. long, sides contiguous. Boiled in a solution of KOH it stains the liquid dark red. The derm remains thick and brown, the colour being differentiated into a series of light and dark brown concentric rings. The marginal ring is light brown and narrow; within this there is a narrow dark brown ring, then a wide light brown ring, then a narrow darker ring, then a light ring of the same width, and, finally, a dark brown oval central spot. The entire derm is crowded with large irregular glands, with the opening near one side. Three or four rows of marginal glands are smaller than the others.

The antennæ are small and variable, of six joints. Joint 3 is the longest and sometimes has a false joint. All the segments bear hairs. Length about ·258 millim. Approximate formula: 3 1 (2 6) (4 5) or 3 1 6 (2 4) 5. Length of joints: (1) 36, (2) 31, (3) 106, (4) 27, (5) 27, (6) 31. Legs short. The coxa bears two and the trochanter bears one long hair. Length of joints of first pair of legs: coxa 49, trochanter and femur 124, tibia 67, tarsus and claw 84. Claw small, greatly curved; digitules unequal in size, with expanded ends. Digitules of tarsus long and slender, with ends slightly expanded. Second and third pair of legs close together. Rostrum small, placed near the insertion of the second pair of legs. Anal plates small, the outer angle rounded, and the two lateral sides equal in length. The stigmata are large and disk-shaped, with about a dozen small round spinnerets about the external orifice. Around the lateral margin there is a single row of small, sharp, conical hairs, placed about ·120 millim. apart.

The eggs are elliptical, smooth, dull, orange-yellow in colour.

*Hab.* Ypirauga, State of S. Paulo. On guava, *Psidium* sp., and other plants of the order Myrtaceæ.

This species evidently secretes a great deal of honey-dew, for it is frequently covered with a black fungus, and is also attended by an ant, *Camponotus* sp., that often builds a covering of earth or grass over it. This covering may serve as a protection against rain and sun and parasitic Hymenoptera.

#### *Lecanium mayteni*, Hempel.

Adult female very dark purple, almost black, oval, not very convex; dorsal surface hard, moderately shiny, slightly roughened by gland-pits; margin thin, wrinkled; two chalky

white lines beneath on each side. The dorsum has a faint indication of a median longitudinal ridge. Length 6 millim.; width 4 millim.; height 1.25 millim. Anal cleft about 1 millim. long, sides contiguous. Viviparous. Boiled in a solution of KOH it colours the liquid dark reddish brown. The dorsal derm remains chitinous; around the margin there is a narrow stripe, light-coloured and semitransparent, the remainder being dark and opaque. The dorsal surface is perforated by many minute holes, and also bears a few scattered hairs.

Antennæ variable, usually of seven joints. Sometimes only six joints are present. All the joints except joint 3 bear hairs. Length about .385 millim. Approximate formula: 4 (2 7) 3 1 5 6 or (4) (2 7) (3 1) (5 6). Average length of joints: (1) 49, (2) 62, (3) 53, (4) 102, (5) 31, (6) 27, (7) 62. Legs ordinary; coxa and trochanter each with a long hair. Length of joints of first pair of legs: coxa 111, trochanter and femur 213, tibia 138, tarsus and claw 102. Digitules of claw large, of equal size, with expanded ends. Tarsal digitules long, with expanded ends. Rostrum small, inserted just behind the first pair of legs. Spiracles small, with a double row of about thirty small round spinnerets extending to the lateral margin. Anal ring apparently with eight hairs. Anal plates small, triangular, with the outer angle slightly rounded and the antero-lateral side slightly longer than the postero-lateral. On the ventral surface there are several long hairs in front of the anal plates, and two groups, of from twenty to twenty-five small round spinnerets each, just behind the anal plates. Around the lateral margin there is a row of small tuberculate hairs. The margin is slightly indented in the stigmatal areas, and each bears a group of two short straight spines and one long curved one.

*Larva* (just born).—Oval, flat, brown, .415 millim. long; eyes dark brown, small, conical. Antennæ irregular, apparently of six joints. The body ends in two long setæ. Margin of the body serrated and bearing a row of short hairs. Stigmatal areas characterized by a group of two short and one long blunt spine. Rostral loop long, extending to the anal plates. Legs long, claw slender. Digitules of claw long, unequal, one large, the other fine, both with expanded ends. Tarsal digitules 2, long, slender, with expanded tips.

*Hab.* Ypirauga and Jundiaby, State of S. Paulo. Occuring singly on the bark of a bush, *Maytenus* sp.

*Lecanium eugeniæ*, Hempel.

Adult female elliptical, the middle portion of the dorsum

inflated, very convex, shiny, yellowish brown in colour, smooth or but slightly pitted, and with a slight longitudinal furrow on each side of the median line. The ends are slightly flattened, the sides are contracted and dark brown in colour and have the derm roughened by small pits and wrinkles. A minute fringe of white wax encircles the margin of the body, and there is a small tuft of white cottony wax over the anal plates. The abdomen has two white lines on each side. When removed from the bark it leaves a small patch of white cottony substance behind. Length 5·25 millim.; width, dorsum 4 millim., abdomen 2·50 millim.; height 3·50 millim. Anal cleft 1·25 millim. long, sides contiguous. Boiled in a solution of KOH it colours the liquid light brown. The derm remains hard and brown. On each side of the middle there are seven or eight longitudinal rows of small dark spots radiating from the anal plates. The derm also contains many round hyaline spots. The ventral derm, especially near the margin, contains many large tubular glands.

Antennæ variable, usually of eight joints, although some have only seven joints. All the joints bear hairs. Length about ·365 millim. Approximate formula: 3 1 (5 8) 2 4 (6 7). Average length of joints: (1) 58, (2) 44, (3) 71, (4) 40, (5) 49, (6) 27, (7) 27, (8) 49. Legs ordinary, trochanter with one long terminal hair and several spines; coxa with a shorter hair; claw large, slightly notched. Digitules of claw of equal size, large, curved, nearly twice the length of claw, bulbous at base, with buttoned ends. Tarsal digitules long and slender, with expanded tips. Length of joints of first pair of legs: coxa 89, femur and trochanter 222, tibia 169, tarsus and claw 111. Rostrum small, situated between the first pair of legs. Rostral loop short, not extending to the second pair of legs. Anal ring apparently with six small hairs. Anal plates small, the outer angle rounded and the two lateral sides about equal in length. The ventral surface bears two median longitudinal rows of hairs. The lateral margin is thickly set with large spine-like hairs.

*Hob.* Ypirauga, State of S. Paulo. On the branches of a bush of the genus *Eugenia*. They are closely crowded on the branches, but rarely overlap. Their hard, shiny, dark brown bodies have the appearance of seeds.

#### *Lecanium jaboticabæ*, Hempel.

Female asymmetrical, subcircular, flat, light yellowish green in colour, with some taint brown markings on the dorsum. Derm covered with a slight waxy secretion. Length 3 millim.; anal cleft ·475 millim. long, sides not contiguous. Boiled in a solution of KOH the derm becomes

soft and transparent. Not tessellated or composed of plates, but homogeneous and thickly set with minute tubular glands and some short hairs. Around the lateral margin there is one row of short hairs and another row of longer hairs, each arising from a tubercle. The stigmatal groups consist of three thick blunt spines, two short and one long. About seventy spinnerets, in several irregular rows, extend from each spiracle to the margin. The derm on the ventral surface contains a marginal strip, which is slightly chitinized and thickly set with large tubular glands and round complex spinnerets. On each side of the genital opening there is a group of fifty to fifty-five of these spinnerets.

Antennæ large, of eight joints, all except joints 3 and 4 bear hairs, joints 2 and 5 each bearing one long hair. Length of antennæ .513 millim. Formula: 2 3 1 (4 5 8) (6 7). Length of joints: (1) 67, (2) 120, (3) 98, (4) 58, (5) 58, (6) 27, (7) 27, (8) 58. Legs long and thin, with few hairs. The coxa bears one hair and several short spines; the trochanter bears one long terminal hair; the femur bears no hairs; the tarsus and tibia each have two or three short hairs. Length of joints of the first pair of legs: coxa 111, femur and trochanter 293, tibia 213, tarsus with claw 164. Digitules of claw unequal in size, with knobbed ends, not extending far beyond the tip of claw. Tarsal digitules long, slender, with expanded ends. Rostrum ordinary, inserted in front of the first pair of legs. Rostral loop short. Anal ring with ten hairs. Anal plates triangular, the two together diamond shaped. On the dorsal surface, near the lateral margin, there is a row of peculiar conical glands. These glands are twenty-four in number, are about  $18 \mu$  wide and  $22 \mu$  high, and form a ring around the body, thus readily separating this species from all other known members of this genus.

*Hab.* Ypirauga, State of S. Paulo. Under the bark of *Eugenia jabolicaba*.

#### *Lecanium lanigerum*, Hempel.

Adult female light yellow in colour, large, subspherical, 7 millim. in diameter, entirely covered with a large mass of dense white secretion. Boiled in a solution of KOH it colours the liquid deep yellowish brown. Derm is chitinized only in spots; after boiling it becomes transparent, colourless, and soft.

Legs and antennæ rudimentary. The antennæ are short tubercles with a terminal brush of hairs. The legs are  $133 \mu\mu$  long, short, cylindrical, with claw and digitules. The mouth-parts are small; rostral loop short. The stigmata are

large, and around the external orifice of each are clustered several hundred round spinnerets and a few smaller tubular spinnerets. The ventral surface of the abdomen is divided into segments by transverse furrows and the posterior part is thickly set with round spinnerets. The anal plates are small, the postero-lateral side is convex and as long as the antero-lateral. Around the lateral margin there is a row of minute hairs set far apart. The dorsal derm is thickly set with small tubular glands.

*Hab.* On an unidentified forest-bush on the banks of the Rio Mogy-guassu, near Itapira, State of São Paulo. Rare.

*Lecanium campomanesicæ*, Hempel.

Adult female elliptical, shiny, very convex, 7.5 millim. long, 5 millim. wide, and 4 millim. high. Anal cleft 2 millim. long, sides not contiguous. The dorsum is creamy white, spotted with a number of small, irregular, dark olive-green spots, and with four irregular longitudinal furrows formed by a number of gland-pits. The derm is not very hard and is wrinkled and pitted by gland-pits. Beneath it is concave, light yellow, and with two prominent chalky lines on each side. Boiled in a solution of KOH it colours the liquid light brown. The derm becomes soft and transparent, but shows a number of small, dark, subcircular spots.

Antennæ variable, usually of eight joints, although sometimes but seven joints are present. Length about .500 millim. All joints except 3 and 4 bear hairs. Approximate formula: 3 (2 1) 8 (4 5) (6 7) or 3 (2 1) (8 4 5) (6 7). Length of joints: (1) 76, (2) 76, (3) 89, (4) 55, (5) 55, (6) 35, (7) 35, (8) 57. Legs ordinary; coxa with several hairs and about four short spines; trochanter with two short spines and one long apical hair; tibia longer than tarsus. Tarsal digitules long, slender, with expanded ends; digitules of claw large and thick, ends flattened and expanded. All the digitules extend far beyond the tip of claw. Length of joints of first pair of legs: coxa 186, femur with trochanter 267, tibia 191, tarsus and claw 142. Rostrum well developed, situated between the first pair of legs. Mentum large, with eight hairs near the tip. Rostral loop short. Spiracles large, with the exterior orifice greatly expanded and flattened. Many small round spinnerets are grouped about the spiracles. Anal ring apparently with eight hairs, one being found with nine hairs. Anal plates small, triangular, with the antero-lateral side longer than the postero-lateral. There is a double row of short hairs around the lateral margin of the body. The stigmatal areas are characterized by groups of three large blunt spines, one of which is longer than the others,



with slightly curved end. About each group of spines are massed thirty to thirty-five small round spinnerets. A number of short spines are scattered over the dorsal and ventral surfaces of the derm.

*Hab.* Ypirauga, State of S. Paulo. On the twigs of *Campomanesia* sp., a bush common on the "campos."

### Genus PSEUDOKERMES, Ckll.

#### *Pseudokermes nitens*, Ckll.

Male scale small, elliptical, convex, white, thin and very frail. The dorsum and margin are ornamented with several small tubercles. The posterior end is recurved and carries on the dorsal surface a small flat round plate, which is pushed off when the male emerges. Length 1.25 millim.; width .50 millim.

Adult male dimorphous, some individuals being winged, others wingless. The body is dark brown, oval, widest across the thorax, truncated behind. Total length 1.041 millim., width .416 millim. Length of genital spike .312 millim. The winged form emerges about a week or ten days after the other. The antennæ are hairy and of ten joints, the last joint terminated by two long knobbed hairs. Wings ordinary; no halteres were found. Head small, with four ocelli. Genital spike broad and flat, obtusely pointed. Legs long, slender, and hairy. Claw long and slightly notched. The four digitules are slender and knobbed; the tarsal digitules do not extend to the tip of claw. In the wingless form the antennæ are 9-jointed, otherwise the two forms agree.

*Hab.* Rio Grande do Sul and S. Paulo. On the twigs of *Myrtus* (*Blepharocalyx*) *Tweedii*, *Psidium* sp., and other plants.

[To be continued.]

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

June 20th, 1900.—J. J. H. Teall, Esq., M.A., F.R.S.,  
President, in the Chair.

The following communications were read:—

1. 'On the Skeleton of a Theriodont Reptile from the Baviaans River (Cape Colony).' By Prof. H. G. Seeley, F.R.S., F.L.S., V.P.G.S.

The fossil described in this paper was discovered by Mr. W. Pringle at Ealdon, in the bed of the Baviaans River, a tributary of the Great Fish River. It is now preserved in the Albany Museum. The slab containing it is of hard siliceous sandstone, and is 31 inches long by

10 inches wide. It is split so as to expose a portion of the skull, the vertebral column and ribs as far as the pelvis, the scapula, part of the humerus, the femur, and parts of the tibia and fibula. The tail and left hind-limb, and apparently part of the right fore-limb, are lost, owing to the jointed condition of the rock. The bones have decomposed, and are represented by natural moulds from which a beautiful cast was obtained by means of a jelly mould in the Geological Department of the Natural History Museum, before the specimen was returned to Grahamstown. The remains indicate an animal about 2 feet long, exclusive of the tail, and standing probably about 8 inches high; it was not more than 6 inches wide in the fore part of the body. The animal was of great mobility, capable of easily bending the body, and, by straightening the limbs, of occasionally raising its height to 10 inches or more. It is a new type of Theriodont reptile, contributing important facts to the osteology of the group, and especially in regard to the natural association of the bones. It is possibly to be included in the Cynodontia, from which it differs in characters of the ilium, scapula, and skull.

2. 'Fossils in the Oxford University Museum.—IV: Notes on some Undescribed Trilobites.' By H. H. Thomas, Esq., B.A., F.G.S.

Two new species of *Dalmania* from the Wenlock Shales and one of *Olenus* from the Shineton Shales of Shropshire are described in this paper. The specimens on which the first species of *Dalmania* is founded were collected by the late Dr. Grindrod at Malvern Tunnel. The species has a strong resemblance to certain varieties of *D. caudatus*, especially those more nearly approaching *D. longicaudatus*; its nearest ally seems to be *D. nevilis*. Among its characters are spines round the head, the height of the head-shield, and the distance between the eyes. The type-specimen of the second species came from the Wenlock Shale of Baulth. The Shineton specimen was presented to the Oxford Museum by the Right Rev. Bishop Mitchinson.

3. 'On Radiolaria from the Upper Chalk at Coulsdon (Surrey).' By W. Murton Holmes, Esq.

The radiolaria described in this paper were contained in the cavities of two small flints which were thrown out of the new cutting between Coulsdon Station and the new Merstham Tunnel on the L. B. & S. C. Railway. They were probably derived from the zone of *Holaster planus*. After treatment with hydrochloric acid, the material yielded silicified casts of foraminifera as well as radiolaria. The surface of the radiolaria is so much altered by corrosion that specific identification is in most cases impossible. Twenty genera have been recognized, and the organisms appear to belong to forty-one species of these genera. A list of the radiolaria is given, accompanied by a short description of each form, and four new species are described. The Discoidea appear to have the predominance, and the species of *Dictyomitra* come next in numerical order.

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\*.\* It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.

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# THE ANNALS

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## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 39. MARCH 1901.

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XXIX.—*The Coloration of Marine Animals.* By W. C. M'INTOSH, Professor of Natural History in the University of St. Andrews\*.

THE coloration of marine animals has long formed the theme of many a descriptive text and ancient figure—in which sea-flowers, sun-stars, purple urchins, gorgeously iridescent annelids, blue and red crabs, the very varied and beautiful tints of shellfishes and cuttlefishes, and the endless hues and resplendent lustre of fishes were each in turn portrayed. Some of the old authors even went into the origin and meaning of such tints. On the present occasion, however, it is not so much the abstract beauty everywhere so prevalent in the coloration of marine animals (and these chiefly British) which will form the subject of our attention, but rather the application of certain recent theories to the explanation of the tints so characteristic of many marine animals.

As indicated, the older naturalists in many cases clearly recognized the connexion between the tints of an animal and its surroundings. It was reserved for the illustrious Charles Darwin and other distinguished naturalists, such as Mr. Wallace, and many of the younger zoologists who follow in their footsteps, to endeavour to explain the production and modification of the tints of land-animals (the term being used in its

\* The Introductory Lecture for Session 1900-1901.

widest sense, so as to include birds) by Natural Selection and Sexual Selection. Moreover, the subject has been treated under such heads as *Protective Resemblance*—that is, the tints enable an animal to escape its enemies; *Aggressive Resemblance*—that is, the tints aid in capturing prey; *Protective Mimicry*—a condition in which an animal is mistaken for another, and thus, as it were, lives on the reputation of another; and, lastly, *Warning Coloration*, as exemplified by conspicuous coloration in an animal having an unpleasant attribute. Besides these subdivisions there are other cases in which special markings occur on an animal, apparently for recognition (for instance, the white tail of the rabbit) or for the purpose of diverting attack from a vital part (for example, wings of butterflies). In certain cases none of the foregoing causes exist, and these have therefore been termed cases of typical coloration. The facts and arguments brought forward in support of the foregoing views will have the more weight if it be found that similar features are met with in the mammals, fishes, and invertebrates inhabiting the ocean. The sea offers a very different environment, however, from the land, since it is continuous throughout its vast extent, so that it is possible for animals to pass from one region to another without the presence of those formidable barriers which, for example, restrict the land-mammals to certain isolated regions of the earth's surface. Yet if Natural Selection or Sexual Selection be held responsible for the coloration in the one case—that is, on land—it is difficult for either to escape similar responsibility in the marine forms.

Again, it has to be remembered that light, aeration, and an abundant supply of food have a connexion with animal coloration, as may be observed in the subdued tones in the Nudibranchs and in anemones, either from deep or shallow water, after confinement.

In dealing with the coloration of marine animals under the several classes it will suffice to divide them severally into two great groups, a classification which has been of service on former occasions, viz.: (1) pelagic, that is, swimming or floating animals, and (2) demersal, or forms which frequent the bottom of the sea. This division is truly one of convenience, since the two groups are closely connected, some in their young state being pelagic whilst they are demersal in their adult; others, again, though perhaps springing from pelagic young, generally live on the bottom till they put on their nuptial dress, when they swim freely in the water, scattering their eggs all around and then perishing.

Amongst the simplest marine animals colour is often



present. Thus A. Agassiz notes that the pelagic Globigerinæ floating in masses are occasionally tinted reddish or scarlet, and pelagic Infusoria, like *Ceratium* and *Peridinium*, are of a greenish or reddish hue. In such forms the influence of Natural Selection or other cause just indicated would appear to be slight.

It cannot be said that the bright yellow, white, purple, red, and brown hues of littoral sponges, or the blue or pinkish-purple of deep-sea sponges, are due to Natural Selection—not more, indeed, than the tints of the calcareous corallines. Mr. Garstang's view that they are thus conspicuously coloured because they have a nauseous taste is balanced by the fact that many are of an extremely sober tint, and that numerous palatable animals are equally conspicuous in their hues. Moreover, the common crumb-of-bread sponge assumes, under the same circumstances, various hues in the tidal region, such as brownish, purplish, yellowish, and greenish. The white colour of *Grantia compressa*, *Leuconia nivea*, and the occasional purple of *Leucosolenia botryoides* are also devoid of relation to their surroundings. Further, tufts of *Chalina* and *Suberites* are occasionally found in the stomach of the cod, and sea-lemons browse upon sponges of various hues. The opinion of the author just mentioned that the association of the red *Suberites* (which, like other sponges, is, he says, intensely disliked by fishes) with *Pagurus cuanensis* is for the benefit of the crab may be true, but *Suberites* is brownish or stone-coloured in some cases, and does not always protect the crab from fishes. The view that some crustaceans, a group so much sought after by fishes, escape capture by dwelling in sponges (Garstang and Poulton) needs confirmation. Many annelids and some zoophytes are found in sponges, but it has generally been thought that they occur there just as they occur under compound ascidians, tangle-roots, and *Melobesia*—viz. for protection. In like manner the crustaceans and annelids found in the interior of Venus's flower-basket are there for shelter, not because the sponge is inedible.

In considering these views of the coloration of sponges it would seem to be as legitimate to state that the forms of *Chondrocladia virgata* and *Cladorhiza pennatula* (which, for the moment, may be supposed to be palatable) were specially given them for protection, since they escape search in the one case by resembling the backbone of a fish and in the other a tiny pinnate zoophyte.

It is generally stated that the surface-fauna of the ocean is transparent or faintly coloured, apparently for the sake of

protection, but it seems to have been overlooked that many of the surface-animals are there only for a limited period during fine weather, and disappear into the depths on the advent of storms and cold. Moreover, not a few of the forms disporting themselves at the surface are conspicuously coloured—for example, the jellyfishes\*.

Protective coloration, by which is meant that hue in harmony with the surroundings, and which, for instance, causes a very young leveret on the approach of danger instinctively to leave the green sward and crouch on the brown earth to escape observation, reaches its acme in the transparent tissues of the jellyfishes. There are, however, many exceptions, and even the most transparent forms by-and-by develop opaque bands (the ovaries and spermaries) just when the existence of the organism is most valuable. The brightly coloured forms again, such as *Oceania*, *Pelagia*, *Velella*, *Porpita*, and many others, which follow precisely the same habits as the uncoloured and transparent, raise doubts as to the validity of the interpretation so generally accepted. These doubts, indeed, find expression in Prof. Moseley's remark that deep blue forms are so coloured for protection. Deep blue jellyfishes, however, form but a small proportion of the vast numbers found in the ocean. Neither are the varied hues of any advantage as warning colours, for the brightly coloured and the translucent (as Beddard remarks) are equally palatable to whales and other forms (not excepting man) utilizing them for food. The pelagic sea-anemones are also coloured, and the floating stages of others (*Arachnactis*) are often tinted with white and yellow.

The brilliant colours of anemones in general cannot be said to be either protective or warning, since on the one hand there is no more deadly bait for cod, and on the other many small fishes swim in comfort in tanks amongst anemones, and in the China Sea a red fish takes shelter in the stomach of an anemone two feet across. Anemones for the most part seem to defy protective coloration, as is sufficiently proved by a glance in the rocky caverns on the eastern shores or along the creeks of the west, where the olive-green tangle-blades and other seaweeds are studded with the opelet (*Anthea cereus*), whose long trailing tentacles, with their hues of green and red, wave with every surge of the tide. The view that the gaudy

\* Beddard observes:—"If transparency of pelagic organisms, according to Darwin, be due entirely to Natural Selection, it is remarkable that there is so little modification in this direction amongst the species inhabiting the bottom" (*op. cit.* p. 126). He is inclined to think that protective resemblance may be due to other causes than Natural Selection.

colours of anemones act as a warning is not borne out by the eagerness with which the cod swallows the brightest, such as *Stomphia*, while the smaller flatfishes fill their stomachs with *Edwardsia*.

Thus it would appear that mechanical protection is mostly subserved by the bag of small anemones around the caudal extremity of the Indian hermit-crab, *Chlænopagurus Andersoni*.

The red of *Tubipora* and the coral of commerce, the varied tints of coral polyps, in which green of many shades predominates, the blue of *Heliopora*, the purple of *Pennatula*, the reddish or pink colour of *Tubularia*, *Coryne*, and *Syncoryne*, and the long chain of reddish-orange polypites of *Diphyes* as it darts hither and thither amongst the bluish masses of floating oceanic animals with much greater speed and certainty of direction than usually shown by them, and even seems to elude the hand-net or the dipping-bottle, appears to have as little to do with protection or warning as the green of *Rhizosolenia* or the red of the wild poppy. Nor does sexual selection appear to be exercised in the group, though in some, as in the American *Aurelia flavidula*, the female has yellow ovaries, while the male shows roseate spermata. Nor is the habit followed by *Tealia crassicornis* in coating its column with gravel (as some sea-urchins do with their bodies), or still more conspicuously with white shell-fragments, in harmony with the views concerning warning coloration.

The colours of Echinoderms are often most conspicuously bright, as, for instance, the blues, reds, and purples of Asteroids, the blues, reds, and variegated red and white of Echinoids, the reds and purples of Crinoids and Ophiuroids. It may be that it is in consequence of these bright colours that some authors have fancied that sea-urchins exhibit protective measures when they cover themselves with bits of pebble and shells; but the same, as already explained, occurs in anemones.

The brilliant orange-red of *Hippasterias* in deep water may subserve a purpose unknown to us, yet from analogy this is unlikely. Few forms are more conspicuous on the bottom of the sea or on the blades of tangles at low water than the common cross-fish, yet gulls, fishes (cod and catfishes), and an ally of its own (the sun-star) devour it. Thus, while its coloration is certainly not protective, it does not seem to serve as a warning or to be the result of Sexual Selection. The brilliant scarlet of *Solaster papposa* as it hangs on the tangle-blades makes it very conspicuous, but there is no evidence either as to protective or warning properties. The same may

be said of the purple or orange hue of *S. endeca* from deep water and of *Cribrella sanguinolenta* between tide-marks. The sand-stars (e. g. *Ophiura lacertosa*) are often tinted of a hue resembling their surroundings, yet they and the more brightly tinted forms are common in the stomachs of fishes and are eagerly devoured by gulls when stranded on the beach.

The common sea-urchins of our own shores are often conspicuous on the tangles at extreme low water, and their tints are neither protective nor warning as regards man and certain fishes. Though some species (e. g. *Strongylocentrotus lividus*) show sexual differences, the male being darker and the female of a violet tint more inclined to red, Sexual Selection need scarcely be considered. The burrowing habit of the species just mentioned would seem to indicate that its colour was neither protective nor warning. The colours and habits of the heart-urchins give the same lessons. Amongst others the green-pea urchin is a favourite food of the haddock.

The brown and purple hues of the sea-cucumbers may in some way subserve protection amongst the dark masses of the tangles, yet both they and the transparent forms are found in the stomachs of fishes. In the purple forms in the deep sea Prof. Moseley is of opinion that the colouring is useless, "and is merely due to the persistence of colouring developed originally in shallow-water ancestors." But there may be other explanations which are less theoretical, especially as the same purple colour is found in a feather-star in shallow water in the tropics and in a sea-cucumber in 1955 fathoms in the antarctic sea.

The transparent Holothurians and the Synaptidæ are often almost colourless, so that the arguments in connexion with coloration do not fit.

No group is more beautiful or more varied in coloration than the marine Annelids, and no group of Invertebrates offers a better field for the manifestations of protective resemblance, for the display of warning coloration, and, since the sexes in the majority are separate, for the operations of Sexual Selection. Yet some of the most brilliantly tinted, like the sea-mouse, frequent muddy sand or mud, where the metallic lustre of their resplendent bristles would only betray them; and the same may be said of some of the most conspicuously coloured Hesionidæ, e. g. *Ophiodromus*. It is true the bright colours and iridescence of many are hidden within tubes, but this would rather point to coloration in these cases being independent of protection. Even in forms that dwell in sand, like *Nephtys*, *Ophelia*, and *Mogelona*, the iridescent pearly

lustre or the flesh-tint by no means resembles their surroundings, whilst other dwellers in sand, viz. *Phyllodoce maculata* and *Anatilis rosea*, are finely coloured. Forms frequenting the fissures of rocks or tunnels in calcareous algæ are equally varied in tint, from the sombre grey of *Trophonia plumosa*, the deep green of *Eulalia viridis*, the straw-coloured body and red branchiæ of *Morphysa*, to *Lysidice* with its madder-brown anterior end and white collar. Those having finely coloured plumes anteriorly, like the Sabellidæ, occupy tubes, and in few instances are their plumes in harmony with their surroundings. One instance, however, is given by Prof. Semper \* of agreement between an allied form (*Myxicola*, one of the Eriographididæ) at Port Mahon and a coral (*Cladocera*). Both the polyps and the funnel of the annelid were of the same chocolate-brown colour, and thus at first sight protective resemblance might have been diagnosed; but the annelid also occurred in a sponge of a totally different colour and in clefts of rocks where no tint resembled it. When Semper tapped the coral the annelids retracted their plumes at once, but the corals remained expanded. There was really no protective resemblance. Dr. Eisig mentions an *Eunice* parasitic in a sponge of a yellow colour, the annelid being yellow with orange spots, and he considers this an instance of protective coloration, though Beddard thinks the tint arises from feeding on the sponge. As, however, these annelids generally construct a tough parchment-like tube in sponges, the example is dubious. Two annelids, *Euphrosyne* and *Spinthes*, are also partial to yellow sponges, on which they feed and they may be held to be protectively tinted. Some Polynoidæ with mud-covered scales approach the hue of the muddy inner surface of shells dredged from deep water, or the muddy inferior surface of stones between tide-marks. The dorsum under the scales and the free parts of the body posteriorly in others are coloured conspicuously with brown bars, so that the case may fairly be claimed as one of protective adaptation. *Malmgrenia*, commensalistic on purple urchins, also agrees with its surroundings, being tinted of a deep purple, and the polynoid in the interior of *Euplectella* is more or less translucent. On the other hand, *Nereilepas*, commensalistic with the hermit-crab in the great whelk, is conspicuously tinted.

Pelagic annelids, again, are not always colourless, even the Alciopidæ having finely coloured eyes. The pelagic stages of *Autolytus* so common in various seas are often coloured both green and pink. Little change in the tint of the green

\* Fide Beddard.

Palolo takes place for its pelagic stage, and the hues of the pelagic phases of the Nereides are likewise vivid. The colours of the pelagic young of the sedentary forms, such as *Sthenelais*, are often brightly coloured.

Annelids which perforate hard substances, as *Polydora* and *Dodecaceria*, are coloured equally with the free, and the pelagic phases of the latter retain vivid tints.

The Nemerteans and other Turbellaria, with a few exceptions, such as *Nemertes carcinophila*, are often of a colour at variance with their surroundings—and the same may be said of the Leeches; but the Gephyreans, especially those frequenting mud, are generally inconspicuous, though *Bonellia* is green. The marine Planarian *Eurylepta vittata* between tide-marks is conspicuously banded with brown and yellow, and others are similarly variegated with red, purple, and yellow. Many, however, are of a uniform colour and often resemble their surroundings. As anemones and fishes prey on them, their colour would not seem to be protective, either in the sense of corresponding with their environment or acting as a warning to predatory forms. Mr. Punnett tells of a small Nemertean parasitic in an Ascidian which is brightly striped, and larger free species are similarly banded. *Borlasia Elisabethæ*, which is boldly blotched with purplish brown and white, lives in a tube of mud under stones in Herm.

The coloration of the sexes in the Crustaceans is often similar, as in the common and the Norway lobsters, though in some (*e. g.* the shore-crab) there are marked differences. Yet after all what selection can a female shore-crab exercise when the courting is carried on when she is in a soft and helpless condition immediately after casting her shell? The minute complemental males of certain Cirripedes afford similar data.

The evidence in regard to protective coloration is somewhat ambiguous. On the one hand, Prof. Moseley states that the Crustaceans (*Nautilograpsus*) found on the gulf-weed resemble it in tints, even to the white patches which imitate those of *Membranipora* and the sea-acorns (*Balani*). He also records a similar crab of a blue hue on the float of *Janthina*. *Portumnus variegatus* somewhat resembles the greyish hue of the sand amongst which it lives. The coloration of the stalk-eyed crustaceans is often curiously complicated by parasitic growths, such as algæ and zoophytes. Even the slender *Stenorhynchus rostratus* has its dorsum and limbs enlivened by tufts of *Ulva* or by *Plumularia*, *Campanularia*, patches of *Halichondria*, and the tubes of *Terebellæ*.

The modification of the natural hue is thus considerable. Yet *Hyas araneus* far surpasses it in the number and variety of its parasitic growths, that of young specimens from cavern-roofs resembling the dorsum of *Aphrodita*. As the hue of this species is brownish purple or reddish purple, it might be supposed that the extraneous growths would be protective. *Hyas coarctatus* is even more subject to such growths, yet both, covered with parasites as they are, abound in the stomach of the cod, which pays scant attention to coloration. *Hippolyte* in the rock-pools of St. Andrews often differs from the tints of the seaweeds it frequents. Again, why should the female *Pinnotheres* in the horse-mussel be so brightly coloured, the male being less conspicuously so? Both are equally protected. Many pelagic crustaceans are also more or less translucent. *Mysis flexuosa* is grey when on sand, brown or green when amongst seaweed of these two colours. The gribble, whose sole function is to perforate wood, and thus is constantly sheltered, is more soberly tinted than, for instance, other Isopods, such as *Spheroma* in fissures of rocks, which has its under surface speckled with white, legs with brown, and head with brown, white, and red. *Hyperia galba* in the gastric cavities of *Aurelia aurita* is often reddish brown. Brightly coloured crustaceans like *Dexamine spinosa* are eaten by fishes. The pelagic *Zoecæ* have conspicuous greenish-blue eyes, and the pelagic young of *Crangon* are brightly tinted. *Coprella tuberculata*, again, occurs in swarms on *Ceramium rubrum*, and is of the same tint. *Idotea pelagica* on *Ceramium rubrum* is sometimes beautifully speckled with white in marginal scallops or central streaks, and is thus more conspicuous than usual. *Podocerus pulchellus* frequents the same seaweed, with which it harmonizes in colour; but here, again, it is sometimes gaudily tinted with reddish brown and white, so as to be conspicuous. Many sessile-eyed crustaceans are beautifully tinted, like *Montagua monoculoides*, with reddish-orange or orange specks in rows on the dorsum, and others are marbled with brown and white. The pelagic *Eurydice pulchra* and *Janira maculosa* of our seas are not inconspicuous in coloration.

On the other hand, many land-crabs, such as *Ocypoda*, as Prof. Moseley tells us, are tinted of a bright red or other conspicuous hue. The reddish Norway lobster frequents greyish mud, from which the cod picks it up so readily. The common shore-crab is often variegated with white in the brackish inlets of the Outer Hebrides. The reddish-orange *Alpheus ruber* is as conspicuous as it can be in the tidal pools of Herm. The multitudes of the sand-hoppers are white and

easily seen amongst dried sand and seaweeds. The parasitic cirripede on whales (*Coronula*) retains its white colour, and *Lepeophtheirus* on the salmon and *Caligus* on the cod each have their brownish-olive hue and are readily seen on the skin.

Some pelagic crustaceans (Copepoda) are of a deep blue or brilliant scarlet, and the young pelagic stages of many of the higher Crustacea are marked with vivid tints. The pelagic barnacles are not inconspicuous. Even the translucent *Phoronima* (Amphipod) has three sets of conspicuous eyes. Prof. Moseley describes the deep-sea shrimps and schizopods as of an intense bright scarlet colour. A deep-water *Serolis*, again, described by Mr. Beddard is blue.

There is no evidence that the tints in any of those conspicuously coloured act as a warning, since they are found in the stomachs of fishes equally with those of sober tint. The diurnal changes of hue in such as *Hippolyte* are, moreover, not always explained by their environment\*.

The Brachiopods are generally pale, yet *Lingula*, an ancient type which frequents sand, has its valves tinted of a fine greenish hue.

Some of the Polyzoa are brightly coloured, e. g. *Bugula*, which is purple, whereas others, such as *Gemellaria*, have a uniform pale straw-colour. *Membranipora* is conspicuous by its pale lacework on the blades of the tangles. The majority of the Polyzoa, e. g. the *Lepraliæ*, have no vivid coloration, though some are pinkish, and so with *Flustra*. Their colour does not appear to have any relation to Natural Selection and is neither protective nor warning—not more so than the purple of the alga *Corallina officinalis*.

While the adult *Phoronis*, which is tubicular, is either pale or with dark brownish tentacles and pale body, the pelagic young (*Actinotrocha*) is brightly tinted. This might be explained by supposing that these tints are ancestral and that former conditions may have necessitated them. Such, however, is conjecture, as also is the view that disadvantageous colours in the young have little time to do harm.

The colours of the next group—that of the shellfishes—have long been a source of interest; and as they affect both the hard and the soft parts, their study might be supposed to throw some light on the questions before us.

Comparatively few examples of protective coloration occur amongst the bivalves, the calcareous valves of which, perhaps,

\* *Vide* on this subject the valuable paper by Messrs. Gamble and Keeble, Quart. Journ. Micr. Sc. vol. xliii. pp. 589-698, pls. xxxii.-xxxvi. (1900).



and the enormous powers of reproduction, suffice in some cases for safety. Those which perforate rocks, wood, and other media are, as a rule, white, yet the date-shell (*Lithodomus*) has dark brown valves, whilst *Modiolaria* in the tests of Ascidians and in sponges is feebly tinted. The species which burrow in sand have diverse and often bright tints, such as *Psammobia* and *Tellina*, dull brown, as in *Cyprina*, or pale, like the cockle and *Thracia*. Littoral forms are likewise varied. The mussel is dark blue or purplish blue on mud or rock; *Galeomma* with its outspread valves on the under surfaces of stones is pure white, *Arca* in the chinks of rocks is dull grey, and *Lima hians* has brilliant orange fringes, but the animal makes a nest. The beds of sedentary dull greyish oysters and the brownish-black horse-mussels in the adjoining area under water are in contrast with the more brightly tinted and free scallops in similar regions.

There is endless variety under the same circumstances, but no certainty as to protective or warning coloration or sexual changes in the valves of marine forms.

It is interesting that pelagic young mussels and the slightly older forms which settle on zoophytes in myriads are differently tinted from the adults. The latter (young mussels) especially harmonize with their surroundings. The pelagic young of marine lamellibranchs (after the formation of the shells), indeed, seem to approach each other more or less closely.

The parasitic bivalves, like *Montacuta substriata* on *Spatangus purpureus*, are in harmony with their surroundings, though as regards coloration they are pale and more or less transparent.

Coloration in the univalves (Gastropoda) has no apparent relation to their acceptability to forms which prey on them, and therefore has no protective or warning functions. All the available smaller forms—whatever their colour may be—are equally palatable to the haddock, which, as Edward Forbes said, is a great conchologist. In their pelagic stages, it is true, they are less brightly tinted, and thus may be held to be protectively coloured; but other young forms, which are not pelagic, are of similar pale or neutral hues, so that there is room for doubt. The question may well be asked, Are the bold bluish iridescent streaks of *Helcion pellucidum* equally protective or warning in the young on the dark blades of the tangles in the rock-pools, and on the adults hidden under the hard roots of the same seaweed?

Protective coloration in the Gastropods is exhibited by *Ovula patula* on *Gorgonia verrucosa* (Poulton) and *Ovulum*

*uniplicatum* on *Leptogorgia*. *Hermæa*, a transparent Nudibranch on a reddish weed (*Griffithsia*), has a reddish outline and a greenish aspect on green seaweed. This coloration is probably due to the contents of the intestine. Some mollusks, like the limpet, chiton, periwinkles, and certain Nudibranchs, are more or less in harmony with their surroundings; and the same may be said of *Trochus lineatus* on the granite rocks of Cobo Bay, Guernsey. A red *Doris*, probably *D. concinna*, frequents *Hymeniacidon sanguinea*, and *Xenophora* attaches fragments of shell, rock, and coral to the edges of the growing shell, and thus resembles its surroundings. The common and Johnston's sea-lemons (*Archidoris tuberculata* and *A. Johnstoni*) may, as insisted on by Prof. Herdman and Mr. Garstang, be protectively coloured so long as they remain contracted and quiescent. Yet it must be noted that the colours of *A. tuberculata* vary, some being gaily tinted with yellow and purple, others, especially under large stones in tidal pools, having more sober hues. Moreover, the species is found not only on the surfaces of *Halichondria*, on which it feeds, but under ledges amongst the red *Styela grossularia* and zoophytes, under large stones, and occasionally on the surface of rocks and *Fuci* at low water. It must also be borne in mind that *A. Johnstoni* accompanies it in its haunts, especially on *Halichondria*, the hues of which it much more closely resembles than *A. tuberculata*. It may well be asked why the latter has not more closely adapted itself to the colour of the sponges on which it feeds.

Again, the smaller examples of *Doris repanda* are "of a pure waxy semitransparent white" (Alder and Hancock), and the largest are dusky yellowish, colours which are conspicuous in a rock-pool, especially as they sometimes crawl on the blades of *Fuci* fringing the margin. The border of the mantle in many is injured, as if a portion had been removed. *Doris aspera*, which occurs under stones near low-water mark, is equally prominent, most being white, though a few are yellow. The tints of the abundant *Doris bilamellata* likewise do not seem to be protective between tide-marks, where they are met with all the year round, as is the case also with the conspicuously whitish *Goniodoris nodosa*, usually found under stones in tidal pools. These and the brilliantly coloured *Triopa claviger* are at once detected when the stone is upturned; but they are not wholly confined to such localities, and all are occasionally tossed on shore by storms on the blades or roots of tangles. If some would hold that the conspicuous whitish coloration is thus shielded by their habit of living under stones, what is to be said of their associate *Aegirus punctilucens*, which

specially delights in the dark surfaces of stones in rock-pools from low-water mark to some distance above half-tide? The unpractised eye would certainly mistake these rough little lumps for muddy and stunted masses of zoophytes and debris. How are their gem-like dots of pigment to be explained? Rarely *Ægirus* has been found crawling just under the water-line in a sequestered pool. *Polycera quadrilineata*, *P. ocellata*, and *Ancula cristata* all occur under stones in quiet rock-pools, and are not difficult to detect in their habitats. It is doubtful if they are in want of protective or warning coloration in such places, especially when it is found that in these localities *Doto coronata*, which swarms on the branches of *Sertularia pumila*, requires careful and minute inspection to detect it. It is pale and devoid of much of the beauty of the deep-water specimens so often tossed on shore on the blades of the tangles covered by forests of *Obelia geniculata* or on *Hydrallmania falcata* brought in by the fishing-boats. A clearer case of harmony with environment, however, is that of *Tritonia plebeia* on *Alcyonium*, yet it is readily seen when frequenting *Obelia geniculata* on the blades of tangles.

On the other hand, the dog-whelk between tide-marks is fairly conspicuous, and so is the cowry, especially when the soft parts are protruded. The colours of the Eolids are remarkably bright, and cannot therefore be protective in so far as being in harmony with their surroundings. It has yet to be proved that they are warning colours, for it needs a considerable amount of inedibility to scare a hungry fish, and the cod does not respect this property (if it exists) in *Eolis papillosa*. Fishes which are partial to anemones might be supposed to be careless of the nematocysts of Nudibranchs. Further, the haunts of the Eolides and an attentive survey of their coloration leads to no conclusive results. The amethystine and ultramarine hues of *E. coronata* and the scarlet or bright brick-red of *E. rufibranchialis* seem to have no relation to their surroundings, and does not prevent their being devoured by their hungry fellows when disabled or dead. The same may be said of the fine purplish and the orange varieties of *Eolis Farrani* and of *E. Adelaideæ*. The smaller *Eolis olivacea* and *E. viridis* are not so easily seen on the under surfaces of the stones they frequent; but immersion of these in sea-water readily shows them.

Prof. Herdman, who has given much attention to the colours of Nudibranchs, truly considers that "the red-brown" hues of *Dendronotus* effectively conceal it. Some, however, are brightly tinted with scarlet and rose-pink, and a splendid white variety is common in the same haunts in deep water

and occasionally between tide-marks, while a third is pale and more or less translucent. Moreover, the eggs of Nudi-branches are generally conspicuous.

The pelagic Gastropods also offer very varied coloration. Some are pale like *Spirialis*, others, darker like *Limacina*, show orange-pink like *Clione*, deep blue like *Glaucus*, purple like *Janthina*, or a glassy translucency like *Carinaria* and *Pterotrachea*. If, in the open ocean, translucency be a protective attribute of such forms, it cannot be held that the tinted species conform to this view. Prof. Moseley, again, considered that *Janthina* and *Glaucus* (like *Verella*) are coloured blue for protection, since they thus resemble oceanic water. There appears, however, to be no general feature in the pelagic stages of the group that would point out translucency or a particular colour as the result of natural selection and of importance to the species.

If translucency or a bluish tint are to be held as protective to oceanic forms, the pelagic cuttlefishes do not fulfil these conditions, for the play of colours, like those on "shot silk," occurs throughout the whole series. Moreover, though courtship is known to take place, and though the sexes offer certain external differences in structure, yet the colours are, as a rule, the same in both sexes; so that, in these comparatively intelligent and active Invertebrates, the long ages of Sexual Selection have effected no evident change in coloration, whatever may have been accomplished in other respects. The young forms on escaping from the egg are pelagic and have the same pigment-corpuseles as their parents, though, perhaps, they may be fewer in number.

In the group of the Urochordates the translucent chains of *Salpæ* have been cited as instances of protective coloration; but the chains are readily seen in clear sea-water from the surface to the bottom, in several fathoms, probably 5 or 6. Moreover, the gulls readily strike the surface-forms and remove the nuclei containing the vital parts of the animal. Prof. Moseley thought that some *Salpæ* had a blue and others a brown nucleus for protection, but experience proves that both are equally liable to the attacks of gulls. The translucent *Pyrosoma*, again, is phosphorescent, and it cannot be supposed that it has this property to lure other forms to destruction, since it derives nourishment from minute plants and animals carried in currents of water.

The Ascidians (*Ascidia scabra*) attached to the blades of the seaweeds in the Outer Hebrides, and to various structures in deeper water elsewhere, are brightly coloured; yet this is not protective, as they are most conspicuous, nor can it always

be a warning colour, as Mr. Garstang supposes, for some fishes eat them. The tadpoles of such forms as *Styela* are pink. *Clavelina* shows bright orange and yellow, and bright green characterizes *A. intestinalis* in tangle-roots and similar places between tide-marks, and *A. depressa* under stones in rock-pools. If the red hue of some Ascidiæ, e. g. *A. scabra*, is assumed to be a warning colour, what is to be said about such as *Molgula*, a colourless form, invested by a thick layer of gravelly mud or sand?

Is the dull red of *Styela grossularia*, projecting here and there through a layer of *Halichondria panicea* on the roofs of sheltered caverns, in the same category in regard to warning coloration as *Ascidia scabra* on the floating blades of the tangles?

The pelagic Appendicularians and their houses are generally translucent, but some are pinkish. Their vast numbers, however, are little in need of protection.

The Compound Ascidiæ, such as *Botryllus*, *Botrylloides*, *Leptoclinum*, and *Aplidium*, are often strikingly coloured, such as the yellow stars of *Botryllus Schlosseri*, the white surface of *Leptoclinum durum*, or the cinnabar colour of others; yet this does not appear, so far as observations go, to be either for protection or warning. Fishes bite off the seaweeds on which some grow and swallow them.

Certain Cyclostomes, like *Myxine*, living in mud are of a flesh tint or purplish, as in *Bdellostoma*, while the river-lamprey is olive and the marine boldly mottled with bluish grey and black. *Myxine* has no warning tint, yet its abundant mucus is most offensive.

Amongst Fishes the bony forms (Teleostei) are, on the whole, the most brightly coloured, the Elasmobranchs being more soberly tinted. In some bony fishes both sexes are brilliantly coloured, in others only the male. One general rule, with a few exceptions, prevails throughout the series, viz. that the dorsum is dark and the under surface pale, apparently for protection, the explanation usually given being that, looked at from above, the dark dorsum renders the fish more or less obscure, whereas looked at from below the white or pale under surface is invisible against the sky. Yet *Cottus scorpius* in rock-pools occasionally has the head pale orange and the dorsum speckled with the same colour, and the skate has a grey under surface. Further, when the under surface is upturned, as in *Remora*, it becomes dark, but no mention is made of the dorsum, which remains dark. It can hardly be supposed, however, that many species of skate have a white under surface for this purpose, though

they can dart upward very actively, nor will the explanation altogether suit the frog-fish (*Lophius*). Some of the finest silvery bluish-green or yellowish touches of the short-spined *Cottus* are under the throat. The gorgeous colours of several of the British wrasses do not appear to be either for warning or protection, nor do they appear to be connected with Sexual Selection. Moreover, it may be asked if the white under surface of many terrestrial mammals has been acquired for the same reason, viz. rendering them invisible against the sky when viewed from beneath. In connexion with this explanation it has also to be remembered that the enemies of fishes do not always look at them from these points of view. Again, freshwater and marine fishes agree in regard to this coloration, and whilst the dark dorsal surface does aid in rendering the fishes obscure, the constant movement of the tail in streams makes them obvious enough. Besides certain silvery fishes with laterally compressed bodies are very conspicuous and the ventral edge is thin. Thus in the tidal pools in May young sand-eels of 4 inches swim in parallel ranks, conspicuous by their finely iridescent green backs and silvery sides, or sport amongst the fringing seaweeds like flashes of silvery light in the sunshine. Such forms are no less conspicuous in the open sea—indeed, their only safety in this respect is immersion in sand. The dull bluish-black dorsum of the herring renders it less visible, but the approach of an enemy causes it to dart aside and expose the flashing silvery body.

Prof. Moseley gives the instance of *Antennarius*, which is coloured, like the gulf-weed (*Sargassum*), with spots of white to imitate the patches of *Membranipora*. Bright spots of white are common in young sea-scorpions, young lump-suckers, and others, but it would be difficult to draw a similar conclusion. The adult shanny and the gunnel are certainly coloured in harmony with their surroundings, just as the upper surface of many flat-fishes is. The same may be said of other blennies. Mr. Garstang cites the black dorsal fin of the weever as a warning colour, lest it should be mistaken for the gurnard. The bold touches of black and other colours on the dorsal fins of other fishes are not, however, thus to be explained.

Deep-sea fishes are black or white as if bleached (Moseley). On the other hand, the pelagic young of the conger (*Leptocephalus*) and of *Plagusia* are transparent.

The pelagic young of some fishes, *e. g.* the skulpin, have the under surface darkly pigmented, yet its habits agree with those of its fellows which have the same region translucent

or white. Some may consider, however, that such is a provision for reducing the numbers of troublesome fishes. At any rate the view that the pale under surface is protective meets with exceptions in those forms. Again, the conspicuously pigmented fins of the young mackerel midges (*Motellæ*) can scarcely be for protection, unless they mimic spines when collapsed, and the same may be said of the yellow pelvics of the young ling. Mr. Beddard thinks the bright colour and large size of the fins of certain fishes may be protective (*e. g.* flying gurnard). Another example is the sapphirine gurnard, yet in this case the protective function is doubtful.

The transparent pelagic eggs of the cod tribe, flounder tribe, and many others are supposed to escape notice by this provision, but then the young becomes conspicuously tinted before hatching, and therefore at a time when it is most important that it should be invisible. If translucency be a protection in the one case, colour under the same circumstances cannot likewise be so.

The very great variety of markings and tints in larval fishes under the same conditions shows the difficulty of drawing rigid conclusions as to protective or warning coloration in such forms, though they may be remnants of ancestral coloration. Some might be disposed to think this a crucial test of the theories propounded concerning the environment of certain forms on land. Yet the history of the changes of coloration undergone by a single species, *e. g.* the cod, shows that important purposes are subserved by these changes. Thus the minute larval cod escapes from the egg with a series of transverse bars; then the black pigment is rearranged longitudinally along the dorsum as it swims high in the water. To this is by-and-by added yellow pigment, causing (with the black) a greenish hue. When it seeks the rocky margins it becomes boldly tessellated. At a later stage it again becomes more uniformly tinted as it seeks the offshore, though some which haunt the tangle-forests are boldly blotched with reddish brown. In its adult state its sides and dorsum are mottled with yellowish green, though this does not seriously affect its uniformity. If we attempt to contrast the foregoing changes with those of the haddock, uncertainties arise. The larval haddock has no transverse bars, though bred side by side with the cod, but the dorsal band of black pigment is developed in the next stage (post-larval). Instead of seeking the shore the little haddock keeps to deep water, and it soon develops the characteristic bold touches of black on the sides above the pectoral region, the rest being uniformly

tinted with a silvery sheen and a cupreous lustre. Not till it is between 3 and 5 inches long does the haddock seek the inshore waters. To sum up: the haddock differs from the cod in its larval coloration, agrees in its post-larval, and thereafter diverges. If the tessellated condition of the cod is protective amidst the tangle-forests, what can the function of the isolated black spots on the whitish sides of the haddock be in its deep-sea retreats and as it passes when from 3 to 5 inches long to inshore waters?

Mr. Beddard and Dr. Browne Goode think the colours of certain fishes (*e. g.* rock-cod) are directly derived from red algæ through the coloured crustaceans, and Dr. Günther and Miss Newbiggin have similar views in connexion with the salmon. Mr. Beddard gives as his reason that if Natural Selection had caused a change in colour, it would rather have been by an alteration of existing pigment than by the formation of fresh pigment red in colour. Other fishes, however, which feed largely on red crustaceans show no increase or alteration of their pigment, and some which do not feed on red forms of any kind may present similar pigment. Brightly coloured wrasses, such as the rainbow-wrasse, occur at considerable depths where no seaweeds are. The view of Prof. Poulton, for which he cites also the support of Prof. Herdman, that bright colours in fishes have a compensation in increased wariness, whilst protectively coloured forms are more readily caught, is interesting, but needs further corroboration.

Fishes, moreover, are a group in which it may be supposed, and Mr. Darwin has supposed, that Sexual Selection has come into play in connexion with beauty of colouring in the males. In such fishes as the salmon, lump-sucker, goby, dragonet, stickleback, and others the sexes are distinguished by marked coloration at the spawning-season, the males being then highly tinted. Moreover, the dragonet and *Arnoglossus* are examples of fishes in which the sexes are so different that they have each been described as separate species. On the other hand, fishes like the cod, haddock, herring, pilchard, and mackerel, which roam in vast shoals, are characterized by the uniformity of tints in the sexes. Recently experiments have been made with a view to test the selective powers of the female fish in certain cases, as by Saville Kent and Holt in the dragonet and by Heineke and Guitel in the gobies. On the whole these have given no certain indication of Sexual Selection on the part of the female, for she is as readily attracted by a male of sober hues as by one in all the



bravery of his conspicuous coloration. Why these bright colours are specially developed at the spawning-season is still an open question. It has been suggested they may be of use occasionally in terrifying other fishes. In the lump-sucker the bright colours do not seem to act as a warning, for the cod will in May swallow two of them, the larger about a foot long. It is interesting that the bimaculated and other suckers are often conspicuously coloured. The females do not seem to be less conspicuous in order to subserve protection for the eggs. In the case of those fishes, *e. g.* the gunnel, which attend the ova the colour is similar in both sexes.

The coloration of the large marine lizard (*Orecephalus amblyrhynchus*) of the Galapagos Islands (500 miles west of South America) and of the oceanic turtles present few features of moment. The former is of a dirty black colour. The water-snakes, which occasionally are captured in sea-water, are often boldly banded with blackish grey and white.

Sea-birds offer few parallels to land-birds in regard to protective coloration. The great group of the gulls is more or less white and uniformly tinted in both sexes. Exceptional coloration occurs in the tern-like boatman-bird, which has two long pink feathers in the tail. The skuas, which have similar aerial habits, are often brown, and so are the petrels, whereas the gannets are yellowish white.

The swimmers, like the auks, puffins, divers, and penguins, have the dorsum dark and the under surface whitish or greyish, as in the cormorants. Many ducks and geese are similarly tinted, while others are white or black. The sexes in the ducks are boldly separated by the brighter colour of the males.

Shore-birds, again, are usually greyish and less visible in many cases, yet the oyster-catcher is prominently speckled.

With the exception of the shore-birds, it cannot be said that the coloration of sea-birds is protective.

In connexion with the highest group, that of the marine mammals, it has been stated by Mr. Wallace and others that the black and white colours of the dorsum and under surface of porpoises have been acquired for protection (on the same principle as already mentioned in the fishes); but this distribution of colour would not avail them against their greatest destroyers, the killers, which swim on a level with them. The dark brownish-grey hue of the seals in the water avails them no better, for they are likewise captured by the killers. The colour of the larger whales, again, is similar to that of

the porpoises, and some, like the killer, are boldly blotched with white, as also is the arctic seal. Moreover, the hump-backed whale (*Megaptera longimana*) has pure white flippers 12 feet long, whilst the smaller rorqual has a bold white band across the flipper. The well-known *Beluga* is dull whitish all over. As all cetaceans come to the surface to breathe, they must frequently expose a black or brownish-black surface. Now black is a tint which is conspicuous in the sea, and accordingly the fishermen use black flags in preference to white on their dandys, since they are so easily recognized in the darkness or dull light of the early morning. That black should be a protection to these animals, and that species are whitish all over or have pure white flippers or bands, is a condition of things creative of uncertainty in regard to the theories alluded to. The bold white touches, for example, of the killer can scarcely be held to be recognition-markings, like the white tail of the rabbit. The variegated hues of the arctic seal may subserve protection. If they do, those of other colours are at a disadvantage. Considerable variety, indeed, occurs in the group; thus the elephant-seal is dull greyish above, light beneath, and the sea-leopard is spotted yellowish white and dark grey on the back, with a yellowish under surface. The sirenians are dull brownish dorsally and ventrally, so that the lighter hue seen against the sky is absent in their case; but, on the other hand, they are not oceanic.

A general survey of the coloration of marine animals raises doubts as to the interpretations which have been brought forward to explain it. Some of these explanations, it is true, are more or less in agreement with facts; but, so far as can be seen, other facts are adverse, and demonstrate the extreme caution necessary in dealing with such interpretations. Before anything definite can be produced a much more extensive, more exact, and long-continued series of observations on the subject is imperative. That the coloration, often so varied and so beautiful, is of importance to marine animals can scarcely be doubted, for Nature is ever prescient; but it is not always easy to adapt the theories of the day to her workings.

XXX.—On new Species of Histeridæ and Notices of others.  
By G. LEWIS, F.L.S.

THE present paper is the nineteenth of a series on the Histeridæ published in this Magazine.

*List of Species.*

<i>Plæsius cossyphus</i> , Mars.	<i>Hister apicalis</i> , Fairm., 1898,
<i>Apobletes Migneauxi</i> , Mars.	= <i>Notolister sulcicollis</i> , Lew., 1895.
<i>Platysoma pictipenne</i> .	<i>Pelorurus Cregoei</i> .
<i>Cypturus bengalensis</i> .	<i>Tribalus Hornii</i> .
<i>Hister Lameerei</i> .	<i>Saprinus viridipennis</i> .
— Maindronii.	

*Plæsius cossyphus*, Mars. Abeille, i. p. 285 (1864).

Marseul was doubtful whether the above was a variety of *P. pudicus*, Mars., or not. I have recently acquired a considerable number of specimens, and I have no doubt it is distinct; beyond the characters mentioned by Marseul, all of which I find are constant, the anterior femora are very distinctly punctured, and their edges are but slightly raised. The femora in *P. pudicus* are smooth and markedly marginate.

*Apobletes Migneauxi*, Mars. Mon. p. 855. n. 10, fig. 2 (1860).

Herr J. Schmidt published a note on this species in the Ann. Soc. Ent. Fr. p. 290 (1892), formed on an erroneous impression. The species is very different to *A. foliaceus*, Payk., and, indeed, to any other described species. The description and figure given by Marseul are both very good, but the mesosternal marginal stria, although very fine, is sometimes, if not always, complete. Marseul says it is interrupted (p. 856), and it may be so in the type specimen.

*Platysoma pictipenne*, sp. n.

Oblongo-ovatum, depressiusculum, nigrum, nitidum; fronte stria integra leviter bisinuata; elytris striis 1-3 integris, 4-5 brevissimis, macula media rubra; tibiis anticis 4-dentatis.

L.  $3\frac{1}{2}$  mill.

Oblong-oval, rather depressed, black and shining, with a red spot rather before the middle of each elytron equal in width to three of the interstices between the dorsal striæ; the head, frontal stria complete, not strong, and feebly bisinuous anteriorly; the thorax, surface under the microscope appears finely punctured, lateral stria complete, parallel, and close to

the edge, but it is continued behind the head somewhat away from the edge; round the anterior angles there is also a marginal stria; the elytra, the oblique humeral stria is fine but clearly marked, the other humeral striæ are wanting, dorsal striæ 1-3 complete, the second at the base for one third of its length turns inward towards the third, 4-5 are apical and rudimentary; the propygidium is transversely punctured; the pygidium wholly and more densely punctured; the punctures on both appear under the microscope to be obscurely ocellate, outer margin of the pygidium is slightly raised; the prosternum is without striæ; the mesosternum is marginate and feebly sinuous behind the prosternal keel; the anterior tibiæ are 4-dentate.

The form of this species is similar to *P. carolinum*, Payk., *P. sincerum*, Sch., and others. It is only the second species of *Platysoma* known with maculate elytra.

*Hab.* Palembang, Sumatra.

*Cyrturus bengalensis*, sp. n.

Ovalis, oblongus, convexus, æneo-niger; fronte rugoso-punctata; elytris, striis 1-3 integris, 4-5 basi evanescentibus, suturali utrinque vix abbreviata; prosterno stria marginali antice acuminata.

L. 6 mill.

Oval, oblong, convex, brassy black, somewhat shining and very similar to *C. ænescens*, Er., in general sculpture; but it differs distinctly in being larger, the head more coarsely and rugosely punctate; the elytral striæ are less clear, owing to their interstices being very densely granulate-punctate (not simply punctulate as in *C. ænescens*), the prosternal keel anteriorly is acuminate (not arcuate), the mesosternum is sometimes distinctly punctulate, and the female has two rather small rugose lobe-shaped impressions close together behind the middle of the disk of the pygidium, and on either side of them, but nearer the apex, is a transverse rugose excavation; the two excavations are somewhat larger than the two impressions. In *C. ænescens* ♀ the pygidium has a smooth median carina, and on either side of it are two large and deep rugose impressions which occupy the whole area of the disk.

*Hab.* Bengal.

I am indebted to Herr Hilmar v. Schönfeldt for fourteen examples of this species. *C. ænescens* is also reported as occurring in Bengal, but all the specimens in my collection are from the Nilgiri Hills and Ceylon.

*Hister Lameerei*, sp. n.

Oblongus, convexus, niger, nitidus; elytris, macula lata obscure rubra; fronte stria valida integra, bisinuata; elytris striis 1-3 integris, 4-5 apicalibus, suturali ante basin abbreviata; mesosterno emarginato, stria marginali valida (ut in *H. binotato*); propygidio pygidioque dense punctatis; tibiis anticis 3-dentatis. L.  $5\frac{3}{4}$  mill.

Oblong, convex, black and shining, with the elytra obscurely red except narrowly at the margins and the region of the scutellum; the head, frontal stria deep and complete, feebly bisinuous anteriorly; the thorax, the marginal stria and two lateral striæ are like those of *H. binotatus*, Er., except that the outer lateral is short and confined to the region of the anterior angle; the elytra, humeral stria is similar to that of *H. binotatus* except that it reaches the apex, dorsal 1-3 complete, 4-5 apical and short, sutural shortened before the base; the propygidium and pygidium are densely punctate, some of the punctures are ocellate; the prosternum is without striæ, and the mesosternum is emarginate, with a strong marginal stria; the form of both sterna closely resembles those of *H. binotatus*; the anterior tibiæ are 3-dentate.

This species is similar to, but larger and more convex than, *H. binotatus*, Er.

*Hab.* El Oued, Sahara (*A. Lameere*, 9th May, 1898). Two examples.

*Hister Maindronii*, sp. n.

Ovalis, convexus, niger, nitidus; fronte impressa, stria retrorsum acuminata; pronoto utrinque foveolato, stria integra sed basi parum abbreviata; elytris rare rubro-maculatis, striis 1-4 integris, 5 ante medium abbreviata, suturali obsoleta; propygidio pygidioque parce punctatis; mesosterno subsinuato, stria interrupta; tibiis anticis 3-dentatis, posticis biseriatis multipinosis. L. 6-7 mill.

The above is distinguished from *H. bipustulatus*, F., by its much larger size, shortened fifth dorsal stria, sutural stria rudimentary, and by the mesosternal stria being interrupted behind the prosternal keel. Of the six examples I possess, one only has a red elytral spot similar to that of *H. bipustulatus*. *Hister scutellaris*, Er., *lentus* and *depistor*, Mars., belong to the same group with a foveolate thorax.

*Hab.* Kurrachi (*Maindron*), Sept. 1896.

*Hister apicalis*, Fairmaire, Ann. Soc. Ent. Belg. xlii. p. 470 (1898).

= *Notolister sulcicollis*, Lew. Ent. M. M. ser. 2, xxxi. p. 187 (1895); Ann. & Mag. Nat. Hist. ser. 7, vi. p. 290, pl. x. fig. 7 (1899).

*Pelorurus Cregoei*, sp. n.

Breviter ovalis, modice convexus; elytris viridi-æneis; fronte concava; pronoto stria marginali integra, lateribus punctato; elytris striis dorsalibus 1-3 geminatis, 4-5 apicalibus, suturali subintegra; pygidio utrinque compresso, basi excepta.

L.  $4\frac{1}{4}$  mill.

Shortly oval, somewhat convex, coppery black beneath, with the elytra brassy green; the head punctulate, margined laterally, and the forehead concave; the thorax, lateral stria well marked and complete, broadly but not very closely punctured laterally, with a few transverse punctures before the scutellum; the elytra, striæ 1-3 geminate, deep and punctured, but in the third stria the inner line is interrupted before the base, 4 is represented by a complete outer line and a short inner apical line (these do not join), 5 consists of a short apical line, with an apical puncture to represent the outer line, it also has a basal puncture; the sutural stria is a single rather fine line, feebly shortened at the base and sinuous apically; the propygidium has two shallow impressions, and the punctures are slightly imbricate and largest at the sides; the pygidium is compressed on either side except at the base, which is transversely triangular and is on the same plane as the propygidium.

This species is somewhat similar to *P. formosus*, Sch., and *P. glaucopterus*, Mars., but it is more convex than the first and it differs from the second in its dorsal striation &c.

*Hab.* Bulawayo, Matabeleland (*J. P. Cregoe*).

*Tribalus Hornii*, sp. n.

Ovatus, convexus, piceus vel nigro-piceus; elytris sæpe utrinque late rufo-brunneis; fronte, stria laterali supra oculos elevata; pronoto antice angustato, basi transversim rugoso-punctato, stria marginali integra ad angulos elevata; elytris, striis humeralibus (externa et interna) integris, dorsalibus obsolete; pygidio, antennis, pedibusque rufo-brunneis.

L.  $2-2\frac{1}{3}$  mill.

Oval, convex, piceous or nigro-piceous, shining; elytra sometimes with a lateral broad reddish-brown margin; the head, forehead not concave, but impressed on either side close to the lateral stria, which is markedly elevated over the eyes; the thorax is clearly and finely punctulate, especially on the sides, along the edge of the base is a transverse rugose band of punctures, the marginal stria is entire and elevated laterally behind the anterior angles; the elytra, surface punctulate like

that of the thorax, outer and inner humeral stria fine and complete, dorsal striæ almost obsolete, but indications of short striæ are to be seen near the base, there is no sutural; the propygidium and pygidium are finely and evenly punctulate, the pygidium is usually distinctly reddish brown, the propygidium partly so; the prosternum is broad and the lateral striæ are divergent at either end; the mesosternum, marginal stria is very fine, complete, and close to the edge, the transverse stria at the suture is straight and fine and minutely crenulate.

The general form of this species corresponds with *T. rubriculus*, Sch., and *T. acceptus*, Mars., from South Africa, and is in no way similar to the other known species from Ceylon.

*Hab.* Matala and Negambo, Ceylon.

Captured by Dr. Walther Horn during his visit to Ceylon in 1899, and to whom I have had much pleasure in dedicating the species.

*Saprinus viridipennis*, sp. n.

Ovalis, convexus, nitidus; pronoto cupreo, margine ciliato, lateribus elytrisque viridibus; prosterno lævi haud striato; mesosterno marginato; tibiis anticis ciliatis, valide 3-dentatis.

L.  $5\frac{1}{2}$ – $6\frac{1}{2}$  mill.

Oval, somewhat oblong; thorax brightly copper, with the lateral punctured margins greenish; elytra and the pygidia brilliant green, body beneath more obscure; the head punctulate, stria entire; the thorax smooth on the disk, with a broad lateral band of somewhat coarse and confluent punctures; the elytra are very finely and sparingly punctulate on the apical half, the outer humeral stria complete, inner humeral short and basal, 1 dorsal long and apically nearly joins the outer humeral, 2–5 are nearly equal one to another and are nearly two thirds of the elytral length, sutural stria shortened before the base; the pygidia are evenly and rather densely punctured; the prosternum, the keel has no striæ, but is smooth and narrows anteriorly; the mesosternum is truncate and marginate; the anterior tibiæ have three strong teeth and a small basal one, the inner edges of the anterior tibiæ and femora are ciliate.

Somewhat resembles *S. lætus*, Er., but the thorax is ciliate, elytra without any bluish tint, the prosternum is without striæ, and the dentations of the tibiæ are different.

*Hab.* Australia (*C. H. French*).

Examples in the Belgium Museum and in my own cabinet.

XXXI.—*The LEPIDOPTERA-PHALÆNÆ of the Bahamas.* By  
Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S., &c.

UP to last year no list of the Lepidoptera of the Bahamas had ever been published, and scattered descriptions of but very few species were all that was known of them. In the P. Z. S. 1900, pp. 197–203, Miss E. M. Sharpe published a list of the butterflies collected by Mr. J. L. Bonhote, which I now supplement by a list of the moths, with the exception of the Pterophoridae and Tineidae, which are in the hands of Lord Walsingham. Besides Mr. Bonhote's material we have in the British Museum a few species collected by Mr. Neville Chamberlain in Andros, and I have added to the list the few described by other authors; but even now scarcely anything is known beyond the species found at Nassau, Mr. Bonhote's specimens having almost all been taken in the gardens of Government House at the electric light; and though on none of the islands does the land rise more than a few feet above sea-level and the physical features and vegetation are of a similar somewhat arid character, yet as such a prominent insect as *Composia fidellissima* is confined to one islet near Nassau and to the large island of Andros, I should expect a thorough exploration of the other islands to add considerably to the list of species. Of species which are not widely spread the greater part seem to occur also in Haiti; but our knowledge of the Lepidoptera of Cuba, Haiti, and the other larger West-Indian islands is so slight that it would be unsafe at present to enlarge on the origin of the Bahamas fauna.

**Syntomidæ.**

*Bombiliodes carminata*, sp. n.

♀. Differs from *B. capistrata* in the tegulæ and patagia being deep crimson; palpi crimson in front; throat white; sides of pectus and legs striped with crimson; abdomen deep crimson, with the sublateral white marks smaller and with a ventral series of short black bands.

*Hab.* Nassau (*Bonhote*), 1 ♀ type. *Exp.* 32 millim.

*Eunomia latenigra*, Butl. Journ. Linn. Soc., Zool. xii. p. 395 (1876); Hmps. Cat. Lep. Phal. B. M. i. p. 202, pl. vii. fig. 18.

Nassau (*Bonhote*), 3 ♂, 2 ♀; Andros (*Neville Chamberlain*), 1 ♂.



*Pseudomya splendens*, Druce, A. M. N. H. (6) ii. p. 240 (1888); Hmps. Cat. Lep. Phal. B. M. i. p. 262, pl. x. fig. 3.

Bahamas; not taken by Mr. Bonhote.

*Empyreuma lichas*, Fabr. Spec. Ins. ii., App. p. 505 (1781).

Nassau (*Bonhote*), 2 ♀.

### Arctiadæ.

#### ARCTIANÆ.

*Calidota strigosa*, Wlk. iii. 615 (1855).

Andros (*Neville Chamberlain*), 1 ♂; Nassau (*Bonhote*), 2 ♂.

*Utetheisa bella*, Linn. Syst. Nat. i. p. 534 (1758); subsp. *speciosa*, Wlk. ii. 568.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

### Noctuidæ.

#### AGROTINÆ.

*Agrotis ypsilon*, Rott. Naturf. xi. p. 141.

Nassau (*Bonhote*), 2 ♀.

*Agrotis malefida*, Guen. Noct. i. p. 267.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

#### MAMESTRINÆ.

*Leucania solita*, Wlk. ix. 99.

Nassau (*Bonhote*), 1 ♀.

#### CARADRININÆ.

*Euplexia circuita*, Guen. Noct. ii. p. 227.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Euplexia concisa*, Wlk. ix. 191.

*Celæna punctifera*, Wlk. x. 263.

Nassau (*Bonhote*), 1 ♂, 1 ♀; Andros (*Neville Chamberlain*), 1 ♀.

*Prodenia commelinae*, Smith & Abb. Lep. Ins. Georgia, ii. 189, pl. xcv.

Nassau (*Bonhote*), 1 ♂.

*Caradrina subaquila*, Harvey, Can. Ent. x. p. 57 (1878).

Nassau (*Bonhote*), 1 ♂, 1 ♀. A small grey form.

NOCTUINÆ.

*Erebus odora*, Linn. Syst. Nat. ii. 811. 11.

Nassau (*Bonhote*), 1 ♂.

*Homoptera lunata*, Drury, Ins. i. 40, pl. xx. fig. 3.

Nassau (*Bonhote*), 1 ♂ of the ab. *edusa*, Drury.

*Eubolina diffundens*, Wlk. xv. 1688.

Nassau (*Bonhote*), 1 ♂, 7 ♀.

*Melipotis famelica*, Guen. Noct. iii. p. 62.

Nassau (*Bonhote*), 3 ♂, 4 ♀; Andros (*Neville Chamberlain*), 1 ♂.

*Remigia repanda*, Fabr. Ent. Syst. iii. 2. 49. 133.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Remigia megas*, Guen. Noct. iii. p. 317.

Nassau (*Bonhote*), 1 ♂, 2 ♀; Andros (*Neville Chamberlain*), 1 ♂, 1 ♀.

*Epidromia poaphiloides*, Guen. Noct. iii. p. 315.

Nassau (*Bonhote*), 2 ♂, 1 ♀.

*Teratocera ericata*, Cram. Pap. Exot. p. 370, pl. cclxxxvii. E.

Nassau (*Bonhote*), 1 ♂; Andros (*Neville Chamberlain*), 1 ♀.

*Ingura obrotunda*, Guen. Noct. ii. p. 312.

Nassau (*Bonhote*), 5 ♂, 6 ♀; Andros (*Neville Chamberlain*), 1 ♀.

*Parachabora triangulifera*, sp. n.

♂. Head and thorax grey, the scales pencilled with brown; frons, vertex of head, tegulæ, and the crest behind them with salmon-pink spots; abdomen brown, with a prominent white band on second segment and slight segmental lines on the others, the sides variegated with red-brown towards extremity, the ventral surface white, the long anal tuft tinged with ochreous above. Fore wing brown, thickly pencilled with grey; a very oblique brown antemedial line, defined by white on outer side; a triangular golden brown patch extending from apex to below vein 3 and to below angle of cell, with

pure white points on it above and below vein 5, its upperside broadly defined by grey-white, extending in submedian fold to the antemedial line and shading into the greyer inner area. Hind wing semihyaline white, the veins of terminal half and the termen tinged with brown, the latter broadly so towards apex.

*Hab.* Nassau (*Bonhote*), 1 ♂ type. *Exp.* 30 millim.

*Lussa nigroguttata*, Grote, Can. Ent. xv. 127 (1883).

*Stictoptera tumidicosta*, Himpson, Trans. Ent. Soc. 1898, p. 249, pl. xvii. fig. 5.

Nassau (*Bonhote*), 1 ♀.

*Phrygionis micca*, Druce, Biol. Centr.-Am., Het. i. p. 319, pl. xxix. fig. 22.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Atethmia subusta*, Hübn. Samml. exot. Schmett. ii. 8. 103, figs. 205, 206.

Nassau (*Bonhote*), 1 ♀.

*Cydosia histrio*, Fabr. Spec. Ins. ii. 203. 139.

Nassau (*Bonhote*), 2 ♂, 3 ♀; Andros (*Neville Chamberlain*), 1 ♂.

#### HYPENINÆ.

*Nodaria acastusalis*, Wlk. xvi. 122.

Nassau (*Bonhote*), 1 ♂.

#### *Nodaria aræalis*, sp. n.

Antennæ of male not knotted; fore tibia, but not the tarsus, covered with a sheath. Grey-brown, irrorated with fuscous; vertex of head with black point; abdomen fuscous, with grey segmental lines. Fore wing with subbasal blackish bar from costa to submedian fold; an antemedial black line expanding into a patch on inner area; a pale discoidal striga on a black spot, with blackish mark on costa above it and spot below it; a minutely waved postmedial line bent outwards from below costa to vein 3, then incurved; a sinuous subterminal line expanding into black spots in the sinuations; a terminal series of black points. Hind wings grey, irrorated and suffused with brown, the inner area paler; underside with fuscous discoidal point and waved postmedial and subterminal lines.

*Hab.* Nassau (*Bonhote*), 1 ♂. *Exp.* 14 millim.

*Nodaria pachypalpia*, sp. n.

Palpi with a tuft of scales on inner side of both second and third joints at extremity; antennæ of male not knotted; fore tibia without sheath.

♂. Head blackish, irrorated with grey; thorax brown, irrorated with black; a black tuft on metathorax; tarsi black, ringed with grey; abdomen grey, irrorated with fuscous. Fore wing brown, irrorated with black; a basal black spot below the cell; a curved antemedial line; a medial shade; two black and white discoidal points; a minutely dentate postmedial line, angled outwards beyond lower angle of cell; a subterminal series of dentate black marks; a terminal series of black points. Hind wing pale brown, irrorated with black; traces of waved postmedial and subterminal lines.

♀. More rufous brown; fore wing striated with black; the lines indistinct; the medial shade absent; the black discoidal points on a white lunule; a small black and white spot on costa before apex; a terminal shade and subterminal series of minute streaks instead of the dentate marks; hind wing with the postmedial line more distinct and angled outwards at vein 1; a terminal shade; both wings with terminal lunulate black line.

*Hab.* Nassau (*Bonhote*), 1 ♂, 1 ♀. *Exp.*, ♂ 20, ♀ 26 millim. The female may turn out to be a distinct species from the male.

*Tortricodes orneodalis*, Guen. Delt. & Pyr. p. 73, ♂.

*Herminia tagusalis*, Wlk. xvi. 116, ♀.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Hypena lividalis*, Hübn. Samml. eur. Schmett., Pyr. figs. 11, 186.

Nassau (*Bonhote*), 1 ♂.

**Hypsidæ.**

*Composia fidellissima*, H.-Schäff. Corresp. Regensb. xx. p. 131 (1866).

Nassau (*Bonhote*), 1 ♀; Andros (*Neville Chamberlain*), 3 ♂, 3 ♀.

**Sphingidæ.***CHÆROCAMPINÆ.*

*Pachylia ficus*, Linn. Syst. Nat. i. p. 491 (1758).

Nassau (*Bonhote*), 1 ♂.

*Chærocampa evana*, Druce, A. M. N. H. (6) iv. p. 77 (1889).

Nassau (*Bonhote*), 1 ♂; Andros (*Neville Chamberlain*), 1 ♂, 1 ♀. *Exp.* 68 millim.

*Calliomma pluto*, Fabr. Gen. Ins. p. 274 (1777).

Nassau (*Bonhote*), 1 ♀; Andros (*Neville Chamberlain*), 1 ♂, 1 ♀.

#### SPHINGINÆ.

*Protoparce cingulata*, Fabr. Syst. Ent. p. 545 (1775).

Nassau (*Bonhote*), 1 ♀.

*Pseudosphinx tetrio*, Linn. Mant. Plant. p. 538 (1771).

Nassau (*Bonhote*), 1 ♂, 1 ♀.

#### MACROGLOSSINÆ.

*Perigonia lusca*, Fabr. Gen. Ins. p. 272 (1777).

Nassau (*Bonhote*), 1 ♀.

#### Notodontidæ.

*Heterocampa bichorda*, sp. n.

♀. Head and thorax grey-white, mixed with black scales; palpi black at sides; patagia with a black line at tips; meta-thorax with two black points; tibiæ and tarsi irrorated with black, the latter with black points; abdomen white, thickly irrorated with fuscous on dorsal surface. Fore wing grey-white, thickly irrorated with fuscous; a double waved sub-basal fuscous line from costa to submedian fold, then with oblique streak from its extremity to vein 1; a double ante-medial line, sinuous towards costa and inner margin; a double discoidal lunule; a double waved postmedial line, angled outwards below costa and at vein 4, then incurved, and with an oblique black shade beyond it from costa to vein 6; a slightly sinuous subterminal black line, angled outwards to termen at veins 3 and 2. Hind wing white, with some brown irroration on termen and a fuscous mark at tornus.

*Hab.* Nassau (*Bonhote*), 1 ♀. *Exp.* 46 millim.

#### Geometridæ.

##### BOARMIANÆ.

*Merocausta vinosaria*, sp. n.

♂. Head, thorax, and abdomen deep purple-red; head

darker, irrorated with grey; antennæ white at tips. Fore wing deep purple-red, with slight silvery-grey irroration. Hind wing brownish orange. Underside brownish orange, the costa and termen of fore wing and the hind wing suffused with purple-brown and with dark striæ.

*Hab.* Nassau (*Bonhote*), 1 ♂. *Exp.* 18 millim.

*Phrygionis argentata*, Drury, Exot. Ins. ii. p. 25, pl. xiv. fig. 2.

Nassau (*Bonhote*), 1 ♀.

*Macaria inoptata*, Wlk. xxiii. 892.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Macaria gentilata*, Feld. Reis. Nov. pl. cxxviii. fig. 29.

Nassau (*Bonhote*), 1 ♀.

*Macaria everiata*, Guen. Phal. ii. p. 80.

Nassau (*Bonhote*), 6 ♀.

*Numia terebintharia*, Guen. Phal. i. p. 403.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

*Thysanopyga apicitruncaria*, H.-Schäff. Aussereur. Schmett. fig. 536.

Nassau (*Bonhote*), 1 ♀.

*Azelina nerissaria*, Wlk. xx. 188.

Nassau (*Bonhote*), 1 ♀.

*Boarmia delinquaria*, Wlk. xxi. 360.

Nassau (*Bonhote*), 1 ♀.

*Boarmia terraria*, Guen. Phal. i. p. 390.

Nassau (*Bonhote*), 1 ♂.

#### LARENTIANÆ.

*Scotosia stellata*, Guen. Ur. & Phal. ii. p. 443.

Nassau (*Bonhote*), 2 ♂, 4 ♀.

*Pterocypha defensata*, Wlk. xxv. 1366.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

#### GEOMETRINÆ.

*Geometra frondaria*, Guen. Ur. & Phal. i. p. 376.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

*Nemoria glauciptera*, Hmps. A. M. N. H. (6) xvi. p. 333 (1895).

Nassau (*Bonhote*), 1 ♂, 2 ♀.

ACIDALIINÆ.

*Ephyra nanaria*, Wlk. xxii. 633.

Nassau (*Bonhote*), 2 ♀.

*Chrysocraspeda insulsatia*, Guen. Ur. & Phal. i. p. 469.

Nassau (*Bonhote*), 3 ♂, 3 ♀.

*Craspedia yponomeutaria*, Guen. Ur. & Phal. i. p. 471.

Nassau (*Bonhote*), 1 ♂.

*Craspedia figurinata*, Guen. Ur. & Phal. i. p. 473.

Nassau (*Bonhote*), 1 ♀.

*Rhodostrophia phorcaria*, Guen. Ur. & Phal. i. p. 470.

Nassau (*Bonhote*), 2 ♂, 1 ♀.

*Rhodostrophia botydata*, Wlk. xxii. 727.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Somatina terminata*, Guen. Phal. i. p. 483.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

*Somatina fusaria*, sp. n.

♂. White; palpi, frons, and stripes on fore and mid legs brown-pink; wings thickly irrorated with pale brown; an indistinct fine waved subterminal line; underside of fore wing with the costa brown-pink.

*Hab.* Nassau (*Bonhote*), 1 ♂. *Exp.* 24 millim.

Uraniadæ.

*Dirades mamilata*, Feld. Reis. Nov. pl. cxxxiii. fig. 18.

Nassau (*Bonhote*), 2 ♂, 3 ♀.

Limacodidæ.

*Altha rufipuncta*, sp. n.

♂. White; palpi black above; antennæ with the shaft above and branches black; tegulæ yellowish in front; tarsi

*Ann. & Mag. N. Hist.* Ser. 7. Vol. vii.

blackish at extremity. Fore wing with ferruginous red spot on vein 2 near termen and patch of black scales at tornus.

Antennæ bipectinate to tips; fore wing with vein 7 from cell; 8, 9, 10 stalked.

*Hab.* Nassau (*Bonhote*), 1 ♂. *Exp.* 26 millim.

#### Psychidæ.

*Animula* sp., very near *A. Huebneri*, Westw., from Australia, in structure and appearance, but not in a condition to describe.

Nassau (*Bonhote*), 1 ♂.

#### Zygænidæ.

*Setiodes bahamensis*, Dyar, Ent. News Philad. x. p. 100 (1899).

Bahamas. Not taken by Mr. Bonhote.

#### Thyrididæ.

*Rhodoneura myrsusalis*, Wlk. xix. 892.

Nassau (*Bonhote*), 1 ♂.

#### Pyralidæ.

##### CRAMBINÆ.

*Ptochostola incanella*, Zell. Hor. Ent. Ross. xvi. p. 50.

Nassau (*Bonhote*), 1 ♀.

*Crambus minuellus*, Wlk. xxvii. 164.

Nassau (*Bonhote*), 3 ♂, 1 ♀.

*Diatræa lineolata*, Wlk. ix. 100.

Nassau (*Bonhote*), 1 ♂, 3 ♀.

##### *Chilo funerellus*, sp. n.

♂. Head and thorax dull black-brown; palpi below and pectus mixed with white; abdomen fuscous brown, greyish below. Fore wing dull black-brown, slightly tinged with greyish towards inner margin and termen; a minute terminal series of black points. Hind wing brownish, the inner area pale.

*Hab.* Nassau (*Bonhote*), 1 ♂. *Exp.* 26 millim.



## PHYCITINÆ.

*Plodia interpunctella*, Hübn. Samml. eur. Schmett., Pyr. fig. 310.

Nassau (*Bonhote*), 2 ♂, 2 ♀.

*Eurythmia hospitella*, Zell. Verh. zool.-bot. Ges. Wien, 1872, p. 338.

Nassau (*Bonhote*), 1 ♀.

*Unadilla stictella*, sp. n.

Hind wing with veins 3-5 stalked.

Pale grey-brown; palpi at tips and frontal tuft blackish; abdomen with the extremity and anal tuft ochreous. Fore wing slightly irrorated with fuscous; traces of antemedial dark points on costa, median nervure, and vein 1; an oblique medial series of diffused spots almost forming a maculate line and nearly joined at inner margin by the similar oblique post-medial maculate line; a slight dark terminal line. Hind wing semihyaline white, tinged with brown towards termen and with terminal brown line.

*Hab.* Nassau (*Bonhote*), 1 ♂, 1 ♀. *Exp.* 10 millim.

*Unadilla latercula*, sp. n. (Zell. MS.).

Hind wing with veins 3-5 from cell.

♀. Head and thorax ferruginous; pectus, legs, and abdomen fuscous brown, the last ferruginous at base and extremity. Fore wing ferruginous to nearly half the length of wing, the terminal half fuscous brown. Hind wing brownish semihyaline, with terminal brown line.

*Hab.* Nassau (*Bonhote*), 1 ♀. *Exp.* 20 millim. Also 1 ♀ from Zeller Coll., marked "*Euzophera latercula*, Zell. M.S.: Mendez 11/12. Pet."

*Ephestia cautella*, Wlk. xxvii. 73 (1863).

Nassau (*Bonhote*), 3 ♂, 3 ♀.

*Ephestia bipunctella*, sp. n.

♂. Head and thorax white and pale brown; palpi with the extremity of second joint and medial part of third and antennæ blackish; pectus, legs, and abdomen white. Fore wing with slight costal fold at base on underside; the base of costa blackish; colour white, tinged with pale brown; antemedial brown spots on median nervure and vein 1; traces of the discoidal points and of an oblique diffused subterminal

line. Hind wing semihyaline white, with slight brown terminal line.

*Hab.* Nassau (*Bonhote*), 2 ♂. *Exp.* 12 millim.

*Homæosoma longiventrella*, Rag. Nouv. Gen. p. 34; id. Rom.

Mém. viii. p. 253, pl. xxxv. fig. 17.

Nassau (*Bonhote*), 1 ♀.

*Ephesiodes uniformella*, sp. n.

♂. Head, thorax, and abdomen fuscous black. Fore wing greyish fuscous, with traces of three obliquely placed fuscous medial points and of the two discoidal points. Hind wing semihyaline, tinged with fuscous.

*Hab.* Nassau (*Bonhote*), 2 ♂. *Exp.* 12 millim.

*Ephesiodes granulella*, sp. n.

Head and thorax white and pale brown; abdomen ochreous white. Fore wing white, slightly tinged and irrorated with brown; three obliquely placed medial dark points; the two discoidal points prominent; an indistinct oblique subterminal line. Hind wing semihyaline white; the veins, costa, and termen tinged with brown. Underside of fore wing with the base of costal area and both wings with the inner area ochreous in male.

*Hab.* Nassau (*Bonhote*), 1 ♂, 1 ♀. *Exp.* 12 millim.

Genus ENCYSTIA, nov.

Proboscis fully developed; palpi porrect, downcurved, extending about twice the length of head; maxillary palpi of male brush-like, in a hollow of labial palpi, of female filiform; antennæ of male with the basal joint long, the base of shaft excised and strongly curved, then laminate. Fore wing with veins 2 and 3 from angle of cell, 4 and 5 strongly stalked, 6 from upper angle, 7 and 9 absent, 10 and 11 from cell. Hind wing with vein 2 from angle of cell, 3 and 5 strongly stalked, 4 absent; the discocellulars oblique; 6 and 7 stalked, 8 strongly anastomosing with 7.

*Encystia Bonhoti*, sp. n.

Head and thorax grey mixed with reddish brown; abdomen grey, tinged with fuscous, the extremity ochreous. Fore wing grey-white, the basal area tinged with brown; a subbasal blackish mark on inner area, largely developed in female; antemedial black spots in cell and on vein 1, with a brown point above them on costa; a brown streak on middle of costa; the medial area strongly irrorated with crimson,

leaving the medial costal area nearly pure white; the discoidal points indistinct; an obscure diffused waved subterminal line; some black points on termen except towards apex and tornus. Hind wing semihyaline white, the veins and termen tinged with brown.

*Hab.* Nassau (*Bonhote*), 3 ♂, 2 ♀. *Exp.* 16 millim.

*Lætilia coccidivora*, Comst. N. Am. Ent. i. p. 25, pl. iv. (1879).

Nassau (*Bonhote*), 1 ♀.

*Nephopteryx ephestiella*, sp. n.

♂. Head, thorax, and abdomen grey and dark brown. Fore wing grey, irrorated with dark brown; the basal area suffused with brown; the antemedial line thick on costal half, oblique from costa to submedian fold, angled inwards on vein 1, then outwards to inner margin; a brownish spot above middle of vein 1 and another on angle of discocellulars; three obliquely placed points on the veins beyond lower angle of cell; the grey subterminal line angled inwards on vein 5 and with obscure series of brown spots on the veins on its inner side; a terminal series of black points; cilia pale brownish, with fine pale line at base. Hind wing semihyaline white; the veins and a fine terminal line brown; cilia brownish, with fine pale line at base.

*Hab.* Nassau (*Bonhote*), 1 ♂. *Exp.* 2½ millim.

*Elasmopalpus rubedinellus*, Zell. Isis, 1848, p. 885.

Nassau (*Bonhote*), 1 ♀.

*Phycita laidion*, Zell. Hor. Ent. Ross. xvi. p. 211, pl. xii. fig. 27.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

*Phycita ptyonopoda*, Hmps. A. M. N. H. (6) xvi. p. 347 (1895).

Nassau (*Bonhote*), 4 ♂, 2 ♀.

*Etiella zinckenella*, Tr. ix. 1, p. 201.

Nassau (*Bonhote*), 1 ♀.

Genus *STYLOPALPIA*, nov.

Proboscis fully developed; palpi with the second joint oblique, not reaching vertex of head, the third naked, very long and porrect; maxillary palpi filiform; antennæ of female almost simple. Fore wing narrow; vein 3 from before angle

of cell, 4 and 5 separate, 6 from below upper angle, 8 and 9 stalked, 10 and 11 from cell. Hind wing with the cell half the length of wing; vein 2 from well before angle, 3 from angle, 4 and 5 strongly stalked, 6 and 7 stalked, 8 free.

*Stylopalpia luniferella*, sp. n.

♀. Head and thorax brownish ochreous, irrorated with black; abdomen pale ochreous, irrorated with fuscous. Fore wing greyish, strongly irrorated with black, the costal and inner areas tinged with ochreous; a pale medial lunule extending from vein 2 to inner margin; the discoidal points distinct; a pale subterminal line excurved at middle and broken by blackish streaks below apex and above tornus; a terminal series of black points. Hind wing hyaline white; the apex and termen tinged with fuscous.

*Hab.* Jamaica; Bahamas, Nassau (*Bonhote*), 3 ♀. *Exp.* 24 millim.

*Lipographis subossella*, Rag. Rom. Mém. vii. p. 565, pl. xx. fig. 23.

Bahamas in Coll. Hulst; not taken by Mr. Bonhote.

*EPIPASCHIANÆ.*

*Pococera melanogrammos*, Zell. Verh. z.-b. Wien, 1872, p. 546, pl. iii. fig. 24.

Nassau (*Bonhote*), 1 ♀.

*Pococera insularella*, Rag. Ann. Soc. ent. Fr. 1888, p. 138.

Nassau (*Bonhote*), 1 ♀.

*Pococera atramentalis*, Led. Wien. ent. Mon. 1863, p. 347, pl. vii. fig. 11.

Nassau (*Bonhote*), 1 ♂, 6 ♀.

*CHRYSAUGINÆ.*

*Streptopalpia deera*, Druce, Biol. Centr.-Am., Het. ii. p. 195, pl. lx. fig. 1.

Nassau (*Bonhote*), 2 ♀.

*PYBALINÆ.*

*Herculia tenuis*, Butl. P. Z. S. 1888, p. 681.

Nassau (*Bonhote*), 1 ♀.

## HYDROCAMPINÆ.

*Ambia metalophota*, Hmpsn. Trans. Ent. Soc. 1897, p. 166.

Nassau (*Bonhote*), 4 ♂, 3 ♀.

*Piletocera bufalis*, Guen. Delt. & Pyr. p. 245.

Nassau (*Bonhote*), 2 ♂, 4 ♀.

## PYRAUSTINÆ.

*Entephria callidalis*, sp. n.

♀. Fulvous orange; the antennæ, vertex of thorax, and dorsal surface of abdomen suffused with black; legs white and fulvous. Fore wing with the medial area suffused with purplish fuscous, extending to termen on inner half and leaving a slight orange discoidal lunule; the postmedial line very obliquely curved from costa to vein 4, then inwardly oblique; cilia dark purplish brown. Hind wing with purplish-fuscous suffusion between veins 2 and 4 and on vein 1; a purplish fuscous terminal line and line through the cilia from apex to vein 2; underside with six black points on medial part of termen.

*Hab.* Nassau (*Bonhote*), 1 ♀. *Exp.* 16 millim.

*Syngamia florella*, Cram. Pap. Exot. iv. pl. cccxlviii. L.

Nassau (*Bonhote*), 2 ♂, 1 ♀.

*Samea ecclesialis*, Guen. Delt. & Pyr. p. 194, pl. vi. fig. 7.

Nassau (*Bonhote*), 5 ♀.

*Pagyda traducalis*, Zell. Lep. Caffr. p. 54.

Nassau (*Bonhote*), 1 ♀.

*Bocchoris minima*, Von Hedem. Stett. ent. Zeit. lv. p. 295.

Nassau (*Bonhote*), 2 ♂, 2 ♀.

*Nacoleia iurchasalis*, Wlk. xix. 983.

Nassau (*Bonhote*), 2 ♀.

*Nacoleia stenialis*, Guen. Delt. & Pyr. p. 231.

Nassau (*Bonhote*), 1 ♂.

*Desmia tages*, Cram. Pap. Exot. ii. pl. xcvii. D.

Nassau (*Bonhote*), 2 ♀.

*Zinckenia fascialis*, Cram. Pap. Exot. iv. pl. cccxcviii. O.

Nassau (*Bonhote*), 4 ♀.

*Pilocrocis tripunctata*, Fabr. Mant. Ins. ii. p. 213.

Nassau (*Bonhote*), 2 ♀.

*Pilocrocis inguinalis*, Guen. Delt. & Pyr. p. 346.

Nassau (*Bonhote*), 1 ♀.

*Pilocrocis collustralis*, Möschl. Abh. Senck. Ges. xiv. 3, p. 76.

Nassau (*Bonhote*), 3 ♂, 1 ♀.

*Pilocrocis dryalis*, Wlk. xviii. 573.

Nassau (*Bonhote*), 5 ♂.

*Sylepta gordialis*, Guen. Delt. & Pyr. p. 374, pl. v. fig. 10.

Nassau (*Bonhote*), 1 ♀.

*Sylepta helcitalis*, Wlk. xviii. 574.

Nassau (*Bonhote*), 1 ♂, 2 ♀.

*Sylepta onophasalis*, Wlk. xviii. 735.

Nassau (*Bonhote*), 1 ♂, 7 ♀.

*Glyphodes hyalinata*, Linn. Syst. Nat. i. p. 874.

Nassau (*Bonhote*), 2 ♂, 3 ♀.

*Glyphodes quadristigmalis*, Guen. Delt. & Pyr. p. 304.

Nassau (*Bonhote*), 1 ♂, 3 ♀.

*Glyphodes sibillalis*, Wlk. xvii. 506.

Nassau (*Bonhote*), 1 ♀.

*Syllepsis marialis*, Poey, Lep. Cuba.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Ommatospila narcæusalis*, Wlk. xix. 972.

Nassau (*Bonhote*), 1 ♀.

*Hellula phidilealis*, Wlk. xix. 972.

Nassau (*Bonhote*), 2 ♂.

*Crocidolomia palindialis*, Guen. Delt. & Pyr. p. 380.

Nassau (*Bonhote*), 3 ♂, 2 ♀.

*Pachyzancla phœopteralis*, Guen. Delt. & Pyr. p. 349.

Nassau (*Bonhote*), 1 ♀.

*Pachyzancla bipunctalis*, Fabr. Ent. Syst. iii. 2, p. 227.

Nassau (*Bonhote*), 1 ♂.

*Phlyctænodes ophionalis*, Wlk. xvii. 316.

Nassau (*Bonhote*), 1 ♂, 1 ♀.

*Phlyctænodes similalis*, Guen. Delt. & Pyr. p. 405.

Nassau (*Bonhote*), 2 ♀.

*Phlyctænodes oblitalis*, Wlk. xxxiv. 1892.

Nassau (*Bonhote*), 1 ♀.

*Pyrausta mopsalis*, Wlk. xviii. 594.

Nassau (*Bonhote*), 3 ♂, 1 ♀.

XXXII.—*On some Deep-sea Fishes collected by Mr. F. W. Townsend in the Sea of Oman.* By G. A. BOULENGER, F.R.S.

[Plate VI.]

THE fishes listed in this paper were obtained by Mr. F. W. Townsend by means of a fish-trap whilst engaged in cable-work in the Sea of Oman between the 21st and 29th October last, and presented by him to the British Museum. The collection, small as it is, is a valuable one, as extending our knowledge of the distribution of the deep-sea fishes of the Arabian Sea and as containing examples of an undescribed form which requires the establishment of a new genus.

1. *Scopelus pyrsobolus*, Alcock.

A single specimen.

Lat. 24° 49' N., long. 56° 56' E., 225 fathoms.

2. *Harpodon squamosus*, Alcock.

Several specimens.

Lat. 25° 24' N., long. 57° 27' E., 230–243 fathoms.

3. *Uroconger lepturus*, Richards.

Several specimens.

Lat. 23° 56' N., long. 58° 5' E., 142 fathoms.

Lat. 24° 5' N., long. 57° 35' E., 205 fathoms.

Lat. 24° 21' N., long. 57° 5' E., 170 fathoms.

4. *Epinephelus præopercularis*, Blgr.

A single specimen.

Lat. 24° 21' N., long. 57° 5' E., 176 fathoms.

## PARASCOLOPSIS, gen. nov.

Agrees in every respect with *Scolopsis*, Cuv., but for the total absence of a suborbital spine. *Scolopsis inermis*, Schleg., in which the said spine is feeble, is a link between the two genera.

5. *Parascolopsis Townsendi*, sp. n. (Pl. VI.)

Depth of body equal to length of head,  $2\frac{2}{5}$  to  $2\frac{3}{4}$  times in total length. Snout very short, shorter than the eye, the diameter of which is 3 to  $3\frac{1}{3}$  times in length of head; inter-orbital region flat, equal to the diameter of the eye; nasal openings large, separated by a dermal flap; mouth with bands of small conical teeth, outer largest; maxillary extending to below anterior third of eye; suborbital and præ-opercular borders finely denticulated; a single well-developed opercular spine; head entirely covered with strongly ctenoid scales. Gill-rakers very short, tubercular, 6 or 7 on lower part of anterior arch. Branchiostegal rays 5. Dorsal X 8-9; spines strong, middle longest,  $\frac{2}{3}$  or nearly  $\frac{1}{2}$  length of head, as long as longest soft rays. Anal III 7; spines strong, second and third equal and nearly  $\frac{1}{3}$  length of head. Pectoral acutely pointed,  $\frac{3}{4}$  or  $\frac{4}{5}$  length of head. Ventrals extending to vent. Caudal deeply notched. Caudal peduncle nearly twice as long as deep. Scales strongly ctenoid, 45-48  $\frac{4-5}{14}$ ; lat. l. 37-42. Uniform reddish, with a more or less distinct silvery lateral stripe.

Several specimens, measuring from 110 to 160 millim., were obtained at three different points:—

Lat.  $24^{\circ} 5' N.$ , long.  $57^{\circ} 35' E.$ , 205 fathoms.

Lat.  $25^{\circ} 22' N.$ , long.  $57^{\circ} 47' E.$ , 225 fathoms.

Lat.  $25^{\circ} 31' N.$ , long.  $57^{\circ} 14' E.$ , 198 fathoms.

6. *Tetraroge Guentheri*, Blgr.

Two specimens.

Lat.  $23^{\circ} 56' N.$ , long.  $58^{\circ} 5' E.$ , 142 fathoms.

This species was described from a single specimen obtained at Muscat by Surgeon-Lieut.-Col. A. S. G. Jayakar. The present specimens differ from the type only in having 12 soft rays to the dorsal instead of 11.

7. *Physiculus argyropastus*, Alcock.

Several specimens.

Lat.  $24^{\circ} 5' N.$ , long.  $57^{\circ} 35' E.$ , 205 fathoms.



Lat.  $24^{\circ} 21' N.$ , long.  $57^{\circ} 5' E.$ , 170 fathoms.

Lat.  $24^{\circ} 49' N.$ , long.  $56^{\circ} 56' E.$ , 225 fathoms.

Lat.  $25^{\circ} 22' N.$ , long.  $57^{\circ} 29' E.$ , 107 fathoms.

Lat.  $25^{\circ} 31' N.$ , long.  $57^{\circ} 14' E.$ , 198 fathoms.

### 8. *Cynoglossus Carpenteri*, Alcock.

Several specimens.

Lat.  $24^{\circ} 21' N.$ , long.  $57^{\circ} 5' E.$ , 170 fathoms.

Lat.  $24^{\circ} 49' N.$ , long.  $56^{\circ} 56' E.$ , 225 fathoms.

Lat.  $25^{\circ} 24' N.$ , long.  $57^{\circ} 27' E.$ , 230–243 fathoms.

#### EXPLANATION OF PLATE VI.

*Parascolopsis Townsendi*, natural size.

### XXXIII.—*A new Scotophiline Bat from British East Africa, with the Description of a new Genus of the Group.* By OLDFIELD THOMAS.

AMONG some small mammals sent to the British Museum by Mr. S. L. Hinde occurs the skin, with skull, of a Scotophiline bat which does not appear to have been described, and which I propose to name in honour of its collector, who has contributed large numbers of specimens at various times to the National Museum.

It is allied only to *Scotophilus albofuscus*, Thos.\*, and *S. hirundo*, de Wint.†, and with them forms a special group, which, on a reconsideration of the question, and fortified by the published opinion of Mr. de Winton, I propose to regard as a genus.

This may be called

#### *Scotæcus*, gen. nov.

Like *Scotophilus*, but with the following special characters:—The two lower premolars are subequal, instead of the first being far smaller than the second; the upper canines are flattened and grooved anteriorly; the last upper molars have much larger posterior lobes, so that they are triangular instead of equally narrow externally and internally; the talon of the last lower molar is bi- or tricuspidate and practically as large in cross-section as the main part of the tooth; the brain-

\* Ann. Mus. Genov. (2) ix. p. 84 (1890).

† Ann. & Mag. Nat. Hist. (7) iv. p. 355 (1899).

case is decidedly more flattened and less dome-shaped; and both nasal and anterior palatal notches are much deeper\*, the latter reaching nearly to the line of the front of *m*.<sup>1</sup>.

Type "*Scotophilus*" *albofuscus*, Thos.

In my first description of it *S. albofuscus* was only placed provisionally and with great doubt in *Scotophilus*. Mr. de Winton, in describing *S. hirundo*, expressed his opinion that neither were properly congeneric with the previously described species, and, now that a third member of the group has turned up, I think it advisable to form a special genus for all three. In the characters above noted the three precisely agree, and differ from any of the members of the true *Scotophilus*.

In some respects, perhaps, *Scotæcus* is even more nearly allied to the American *Nycticeius*, which shares with it the triangular *m*.<sup>3</sup> and more complicated *m*.<sub>3</sub>, but still has, like *Scotophilus*, the marked disproportion between the sizes of the two lower premolars, the canines rounded in front, and the comparatively shallow nasal and prepalatal notches.

*Scotæcus Hindei*, sp. n.

Size largest of the genus. Fur close and soft, hairs about 3 mm. in length on the back; not extending either above or below on limbs or membranes, except slightly on and around the base of the tail. General colour above chocolate-brown, the bases of the hairs darker; below the colour is paler, the hairs being brown basally and dull buffy terminally. Muzzle and chin blackish brown. Ears of medium length, their tips rounded, with a slight and even concavity below them. Tragus short, of equal breadth above and below, an indistinct lobe at its external base. Wings to the metatarsus. Post-calcaneal lobe well-defined. Penis very long, apparently provided with a bone.

Skull very similar to that of *S. hirundo*, but larger and heavier throughout; nasal notch very deep, its depth, measured from the base of *i*.<sup>1</sup>, going only about three times in the distance from it to the occiput; prepalatal notch reaching to the level of the front of *m*.<sup>1</sup>; sagittal crest fairly developed.

Upper incisors short, stout, strongly convergent. Lower incisors transverse, slightly overlapping. Anterior lower premolar three fourths the height of the posterior one.

Dimensions of the type:—

Forearm 35 millim.; height of ear 12, of tragus (on inner edge) 2.4.

\* At least in *S. hirundo* and *Hindei*, the skull of *S. albofuscus* being broken.

Skull: greatest length 15; basal length 12·9; orbital breadth 8; intertemporal breadth 4·9; breadth of brain-case 8·2; nasal notch 3·3 × 2·5; palate from bottom of prepalatal notch 5; front of upper canine to back of  $m_3$  6; front of lower canine to back of  $m_3$  6·5.

*Hab.* Kitui, British East Africa; altitude 3500 feet.

*Type.* Male. B.M. no. 1. 2. 5. 1. Original number 63. Collected 26th November, 1900, by S. L. Hinde.

Its larger size and different colour will readily distinguish this species from its nearest ally *S. hirundo*.

XXXIV.—*Descriptions of some new Species of Heterocera.*

By W. SCHAUS, F.Z.S.

Fam. *Arctiidæ*.

*Hyperthæma albipuncta.*

Head and thorax brown. Abdomen roseate; a lateral row of black spots. Primaries reddish brown, with fine wavy transverse shadings; fringe black at the base, white terminally; a white spot, circled with black, near the base and below the median vein; a minute black spot beyond the cell between veins 4 and 5. Secondaries greyish brown, the fringe white.

Expanse 32 millim.

*Hab.* São Paulo, Brazil.

*Hyperthæma hæmacta.*

Palpi crimson. Head and thorax orange; two black points on collar. Abdomen red; two rows of black spots laterally. Primaries red, shaded with brown towards apex; costa finely brown; fringe dark grey; a black point at the base, a round white spot circled with black below the median vein, and a similar larger spot beyond the cell between veins 5 and 6. Secondaries brown, streaked with white at the base.

Expanse 35 millim.

*Hab.* Costa Rica.

*Neritos sanguipuncta.*

Palpi yellow, outwardly roseate. Head brown; vertex yellow. Thorax brown. Abdomen roseate, underneath yellow. Legs yellow. Primaries: the base from the costa at one third to the inner angle brown, outwardly edged with reddish; a crimson spot about the middle of the submedian

vein; the rest of the wing pale yellow except a large subapical irregular brown spot faintly edged with reddish. Secondaries brownish yellow.

Expanse 32 millim.

*Hab.* Palanda, Ecuador.

*Robinsonia polyplagia.*

Palpi white, laterally edged with brown and circled with brown at joints. Frons, collar, and patagia white, edged with brown. Thorax posteriorly fulvous, with a large white dorsal spot. Abdomen fulvous. Primaries light brown, streaked with white along costa, in cell, and on the inner margin; a large oval white spot below median vein near base; a large triangular white spot beyond cell and two elongated white spots at apex; elongated white spots along the outer margin, the spot at inner angle being the largest. Secondaries white.

Expanse 39 millim.

*Hab.* Aroa, Venezuela.

*Halisidota perdentata.*

*Male.*—Antennæ deeply pectinated. Pale fawn-colour. Primaries crossed by indistinct and dentate transverse lines, the outer lines geminate; a terminal row of oval spots between the veins. Secondaries fawn-colour; the inner margin broadly clouded with slightly darker scales. The female is larger, slightly darker, and the subterminal line is very deeply angulate; the anal tuft is very large and thick.

Expanse, ♂ 41, ♀ 55 millim.

*Hab.* Orizaba, Mexico.

*Halisidota huaco.*

Frons and vertex brown; thorax buff; abdomen brown. Primaries buff, thinly irrorated with dark scales; the inner and outer lines indistinct, dentate, the latter followed by a dark shading; a black point at the origin of veins 3, 4, and 5; a subapical shade; subterminal and terminal dark spots between the veins. Secondaries whitish, the inner and outer margins broadly smoky grey.

Expanse 32 millim.

*Hab.* Rio Janeiro, Castro, Parana.

*Halisidota arenacea.*

Head, collar, and abdomen pale ochreous, the thorax and abdomen subdorsally at base with still paler hairs; third joint of palpi black; a black point on vertex; two black

points laterally on patagia; a lateral row of black points on abdomen. Primaries pale ochreous, the veins darker. Secondaries whitish, semihyaline; the veins and fringe slightly yellowish.

Expanse 51 millim.

*Hab.* Loja, Ecuador.

*Halisidota pallida.*

Head, collar, thorax, and subdorsal basal hairs on abdomen greyish fawn-colour; abdomen yellowish, with an outer row of large black spots and a lateral row of black points; legs greyish fawn-colour, black points on fore coxæ; palpi with third joint brown and lateral brown spots. A black point on frons and one on vertex; three black points on patagia. Primaries greyish fawn-colour; a black point at base of costa. Secondaries whitish, semihyaline.

Expanse 52 millim.

*Hab.* Loja, Ecuador.

*Amastus coccinator.*

Palpi crimson, tipped with brown. Frons white; vertex red. Collar and patagia dark ochreous, the former edged with white anteriorly, the latter inwardly edged with white. Thorax crimson above and below. Tibia crimson; tarsi greyish. Abdomen reddish dorsally, ochreous on last segment, grey ventrally. Primaries roseate brown, thinly scaled in the disk; an indistinct dark spot at the end of the cell; a paler subterminal shade. Secondaries whitish, thinly scaled; faintly brownish on outer margin; the inner margin with roseate hairs.

Expanse 70 millim.

*Hab.* Colombia.

*Amastus adela.*

Palpi roseate, tipped with black. Head roseate; a black spot on vertex; collar roseate, crossed by black streaks, which continue on the patagia, leaving a central roseate line on each patagium. Thorax crimson, with a dorsal black line. Abdomen black dorsally and ventrally, crimson laterally spotted with black; the anal segment crimson. Primaries dark olivaceous brown, some roseate spots at the base; an inner row of elongated pale roseate spots; an outer irregular row of round white spots; a costal median spot divided by the costal vein; a broad subterminal white band broken by the black veins; the margin terminally olivaceous brown; the fringe slightly darker. Secondaries thinly scaled,

olivaceous brown; some subterminal white spots between the apex and vein 2.

Expanse 46 millim.

*Hab.* Castro, Parana.

*Ischnocampa nigradorsata.*

Palpi and legs brown. Body yellow, except a large black dorsal space on abdomen, which is also brown ventrally. Primaries white, the veins brown. Secondaries light grey, the veins brown.

Expanse 39 millim.

*Hab.* Peru.

*Ischnocampa nigrivena.*

Palpi brown. Body ochre-yellow, some brown on abdomen ventrally. Tibia outwardly and tarsi brown. Primaries yellow; the costal and inner margins tinged with lilacine, the veins black. Secondaries pale yellow, the veins brownish.

Expanse 58 millim.

*Hab.* Suapi.

*Turuptiana obscura.*

Head, legs, and thorax dark brown; collar and patagia ochreous brown. Abdomen black dorsally, otherwise yellow, with a lateral row of black spots. Primaries brown, the veins cream-colour; the lines, which are broad on costa, black; a basal interrupted line; the inner line much curved, interrupted in cell; the median line angled on median vein, outwardly curved on inner margin; the outer line much curved beyond cell, inwardly oblique to submedian, then outwardly angled; an irregular, subterminal, interrupted band partly edged with cream-colour; the outer margin ochreous brown. Secondaries yellow, with median and subterminal interrupted blackish bands.

Expanse 36 millim.

*Hab.* Peru.

*Hyalarctia sericea.*

Palpi yellowish white circled with black. Fore tibia yellow, spotted with black; legs otherwise pale yellow; tarsi white circled with black. Body whitish yellow. Primaries pale silky yellow, the veins darker; a black and orange spot at base. Secondaries whitish.

Expanse 37-44 millim.

*Hab.* Castro, Parana.

Very similar in appearance to *Munonia iridescens*, Sch.

*Mænas bilinea.*

Dark olivaceous brown. Abdomen with a lateral yellow band. Primaries crossed by three dark and thick lines, the inner angled on median vein, the outer and subterminal slightly wavy and close together; a black crescent-shaped mark at the end of the cell. Secondaries with a subterminal dark line and a dark crescent-shaped line at the end of the cell. All the fringes darker at base.

Expanse 40 millim.

*Hab.* Castro, Parana.

*Antarctia fervida.*

Ochreous brown. Abdomen with transverse black dorsal bands. Primaries: the veins and line at end of cell dark brown. Secondaries somewhat translucent at base and irrorated with grey scales.

Expanse, ♀, 48 millim.

*Hab.* Petropolis, Castro, Brazil.

*Holomelina trigonifera.*

Body black; base of palpi underneath orange; patagia outwardly orange; abdomen with a lateral reddish-orange streak. Primaries black, except the basal half above the submedian vein, which is yellow. Secondaries black, with a large basal costal spot, which is reddish yellow.

Expanse 23 millim.

*Hab.* Guadalajara, Mexico.

*Holomelina cocciniceps.*

Body greyish brown; base of palpi, vertex, back of head, and base of patagia crimson. Primaries above olivaceous brown; the basal half of costa finely crimson. Secondaries crimson, the outer margin broadly and evenly bordered with black, slightly intermingled with crimson scales. Underneath the primaries are red; the apex, outer and inner margin light brown. Secondaries as above.

Expanse 30 millim.

*Hab.* Manitou, Colorado.

## Fam. Hysidæ.

*Pericopsis biformis.*

*Male.*—Body blackish; four pale yellow spots on collar and a small darker yellow spot on patagium. Abdomen with

two rows of yellow spots below and some crimson scales on anal segment. Primaries dark brownish grey; a median angular black transverse line; a black spot on costa beyond the cell, followed by a curved pale yellow band from costa to outer margin above vein 3; the apex and a large space from inner angle to vein 3 darker; some indistinct terminal yellowish spots. Secondaries yellow or roseate, the margin narrowly black, but more widely so at apex. Underneath there are crimson spots at the base of costal margins and a reddish quadrate spot at end of cell on primaries.

*Female*.—Darker, with only the yellow band distinct on primaries. Secondaries black, with a curved subterminal red band, not reaching the inner margin.

Expanse, ♂ 53, ♀ 60 millim.

*Hab.* Castro, Parana.

XXXV.—On *Sciurus caniceps* and allied Species.

By J. L. BONHOTE, B.A.

THE squirrels called "*Sciurus caniceps*" and its allies have been less confused with a mass of names than those of some of the other groups with which I have dealt; this is no doubt due to the fact that a well-marked change of pelage was known to take place and the nearly allied forms were supposed to be specimens in various stages of change; thanks, however, to a large series at the British Museum, as well as to a considerable number of specimens brought home from the Malay Peninsula by the "Skeat Expedition" and now in the Cambridge Museum, I have been enabled to arrive at certain conclusions, which will, I trust, cause the various forms of this group to be more easily understood.

In the first place five species may be recognized, viz.:—

- (i.) *Sc. caniceps* (the only species having a distinct breeding-dress), ranging through Burma, Siam, and the north of the Malay Peninsula.
- (ii.) *Sc. concolor*, a nearly allied species with no seasonal change, confined, so far as we are aware, to the Malay Peninsula, at the northern extremity of which it meets with *Sc. caniceps*.
- (iii.) *Sc. epomophorus*, sp. n., which ranges down the west coast of the Malay Peninsula from Bankasun to Malacca.
- (iv.) *Sc. pygerythrus*, from Burma and Tenasserim.
- (v.) *Sc. griseimanus*, from Cochin China.



*Sciurus caniceps*, Gray.

*Sciurus caniceps*, Gray (nec Temm.), Ann. & Mag. Nat. Hist. x. 1842, p. 263; Thos. P. Z. S. 1886, p. 68; Anders. Zool. Res. Yunnan, p. 229 (1879); Blanford, Faun. Br. Ind., Mamm. p. 380 (1891); W. L. Sclater, Cat. Mamm. Calc. Mus. ii. p. 13 (1891).  
*Sciurus chrysonotus*, Blyth, J. A. S. B. vol. xvi. 1847, p. 873, pl. xxxvii.

This species, although closely allied to *Sc. concolor* and *Sc. epomophorus* described in this paper, is quite distinct in having a breeding-pelage, which is assumed during the winter months, being at its brightest in January. It ranges throughout Burma and Tenasserim, spreading eastwards into Siam, and being found as far south as Bangkok in the native State of Patelong, although I know of no instance of its occurrence on the western side of the peninsula.

In its dull pelage, which is worn from March to November, it is of a uniform grizzled grey, lighter on the underparts, top of the head, and feet. The tail is similar in colour to the back, and shows, especially towards its tip, annulations of black and grey. The tip itself is black. Each hair above is dark at its base, with three or four light annulations, while those below have dark bases and light ashy-grey tips.

In its bright pelage the underparts, limbs, feet, tail, sides of the face, and top of the nose are unchanged, but the rest of the pelage, which includes all the upper parts, becomes of a deep rufous orange, each hair being black at its base with a deep rufous tip. The change, which takes place by moult and not by a change of colour, is undergone equally by both sexes, and takes place, I believe, during the rutting-period. In the bright pelage *Sc. caniceps* is quite distinct from all other species, and there can be no risk of confusion; but in the dull pelage it bears a considerable likeness to *Sc. concolor* and *Sc. epomophorus Davisoni*. The latter, however, may always be distinguished by its much darker colour, the presence of a patch of very pale rufous on the underparts at the base of either thigh, and a similar very pale rufous patch on the sides of the neck below the ear. *Sc. concolor* is distinguished by the annulations on the hairs of the back being of varying degrees of ferruginous, instead of pale ashy. The hairs on the ears are also rufous, which is never the case in *Sc. caniceps*, and the long black hairs at the tip of the tail have fulvous ends, which latter characteristic will serve to distinguish *Sc. concolor* from all the other species except *pygerythrus* and *griseimanus*. There is no risk of confusing the most vividly marked specimens of *Sc. concolor* with the bright pelage of *Sc. caniceps*, for the hairs of *Sc. concolor* are always

annulated, which is never the case with those of a bright *Sc. caniceps*. Those specimens in the "Skeat Collection" from Singora and Bangkok, Patelung, which I have referred to \* as being somewhat greyer than the rest, belong to this species, the remainder belonging to *Sc. concolor*.

*Sciurus concolor*, Blyth.

*Sciurus concolor*, Blyth, J. A. S. B. xxiv. 1855, p. 474.

*Macroxus inornatus*, Gray, Ann. & Mag. Nat. Hist. xx. 1867, p. 282.

*Sciurus caniceps*, Gray, W. L. Sclater, Cat. Mamm. Calc. Mus. ii. p. 14 (1891); Flower, P. Z. S. 1900, p. 356; Bonhote, P. Z. S. 1900, p. 877.

This species, which has long been confused with *Sc. caniceps*, and still more perhaps with the next species to be described, is in reality a very well-marked and distinct form, and is, so far as we are at present aware, confined to the Malay Peninsula, where, judging from a large series lately brought home from the native States, it appears to be the commonest squirrel. It is also found on the Laos Mountains in Cochin China, where the type of Gray's *Sc. inornatus* was procured, and there is a specimen in the Museum, labelled "Sadya," from Col. Godwin-Austen's collection.

The general colour is a ruddy fulvous on the upper parts, deepest on the median line and the rump, and lighter on the sides and across the shoulders; the fulvous tinge extends a little way up the tail, but the annulations towards the tip get lighter; the tip itself is black, each hair, however, having a light fulvous end. Underparts light ashy. Limbs, feet, and head grizzled grey. Hairs on the ears pale rufous, and there is a more or less distinct rufous tinge round the eye. Each hair on the upper parts is very dark brown or black, with three or four annulations, which vary in colour from deep ferruginous to pale fulvous according to their position on the body; the hairs of the underparts are light ashy with dark bases.

The type of the species was procured by Mr. Moxon in Malacca and is now in the Calcutta Museum.

*Sciurus epomophorus*, sp. n.

*Sciurus caniceps concolor*, Bly., Thos. P. Z. S. 1886, p. 70.

*Sciurus caniceps*, Gray, Blanford, Faun. Br. Ind., Mamm. p. 380 (1891); W. Sclater, Cat. Mamm. Calc. Mus. ii. p. 14 (1891).

Resembles the dull pelage of *Sc. caniceps*, but is much darker, this being chiefly caused by the light annulations on each hair being narrower and thus allowing more of the dark

\* Bonhote, P. Z. S. 1900, p. 877.

colour to reach the surface; these annulations are, moreover, pale fulvous instead of ashy grey. The feet, limbs, and head are not lighter than the back, and the underparts only slightly so. On either side of the neck just below the ear is a round patch of deep chestnut, and there is a line of the same colour which starts from above and behind the shoulders, and, running along either side, turns inwards and downwards, to end on the underside opposite the thighs. There is also a fainter patch of the same colour at the root of the tail, and a faint line along the outer side of each hind limb. The tail, which is annulated with fulvous and black, ends in a black tip.

Dimensions (from skin):—Head and body 275 millim.; tail 195 (doubtful measurement); hind foot 50.

*Hab.* The west coast of the Malay Peninsula from Penang to south of Tenasserim.

*Type* ♀, B.M. 85. 8. 1. 192. Salanga Island. Collected on 4th March, 1879, by Mr. J. Darling, and presented to the Museum by Mr. A. O. Hume.

This species, which by its rufous markings may be easily distinguished from all the others, has no breeding or seasonal change of pelage, and is practically the same at all times of year.

*Sciurus epomophorus Davisoni*, subsp. n.

Very similar to the preceding species, from which it may be recognized by the rufous patch on the neck being replaced by a rather yellowish tinge; the lateral lines are hardly visible, being most discernible as two pale rufous spots on the underparts opposite the thighs, and in some specimens there is a trace of rufous at the base of the tail.

Dimensions as in *Sc. epomophorus*; tail 210 millim.

*Hab.* Burma, from Moulmein to the south of Tenasserim.

*Type* ♀, B.M. 85. 8. 1. 187. Bankasoon, S. Tenasserim. Collected on the 20th June, 1877, by Mr. W. Davison, and presented to the Museum by Mr. A. O. Hume.

The remaining three species of this group are quite distinct and recognizable from all the preceding forms by the yellow colour of the underparts.

*Sciurus pygerythrus*.

*Sciurus pygerythrus*, Is. Geoff. St.-Hil. Mag. Zool. 1832, Cl. 1; id. Voy. Bélang. 1834, p. 145, pl. vii.; Anders. Zool. Res. Yunnan, p. 227 (1879); Blanford, Faun. Br. Ind., Mamm. p. 379 (1891); W. Sclater, Cat. Mamm. Calc. Mus. ii. p. 12 (1891).

*Sciurus Blanfordi*, Blyth, J. A. S. B. xxxi. 1862, p. 333.

*Sciurus caniceps pygerythrus*, Is. Geoff. St.-Hil., Thos. P. Z. S. 1886, p. 69.

Somewhat smaller than the succeeding species; general colour on the upper parts light grizzled grey, similar to *Sc. caniceps*. Underparts pale fulvous, and a small patch of the same colour behind the ear. Tail grizzled above and fulvous below, each hair being black with a fulvous end; tip of the tail black. Feet fulvous.

Dimensions (from skin):—Head and body 175 millim.; tail 150; hind foot 40.

*Hab.* Pegu and Burma.

*Sciurus pygerythrus Phayrei.*

*Sciurus pygerythrus*, var. *Phayrei*, Blyth, J. A. S. B. xvii. 2, 1848, p. 345.

*Sciurus Phayrei*, Blyth, J. A. S. B. xxiv. 1885, pp. 472 & 476; Anders. Zool. Res. Yunnan, p. 230 (1879); Blanford, Faun. Br. Ind., Mamm. p. 379 (1891).

*Sciurus caniceps Phayrei*, Bly., Thos. P. Z. S. 1886, p. 69.

Very similar to *Sc. pygerythrus*, from which it differs only in its larger size and in the presence of a short dark stripe along either side between the limbs. The colour of the underparts is rather deeper in tone than in *Sc. pygerythrus*.

Dimensions (from skin):—Head and body 225 millim.; tail 200; hind foot 45.

*Hab.* S. Burma and Tenasserim.

A certain amount of confusion seems to exist on the subject of the colour of the underparts, Mr. Sclater leading us to understand that the underparts of *Sc. pygerythrus* and *Sc. Blanfordi* were of a "bright red," while Dr. Anderson, on the other hand, gives the colour as pale orange-yellow, which latter statement agrees with all the specimens I have examined; but the latter states that the underparts of *Sc. Phayrei* are orange-red, whereas all the specimens in the British Museum are yellowish orange (about halfway between "orange" and "yellow-buff," Ridgway).

*Sciurus griseimanus*, M.-Edw.

*Sciurus griseimanus*, A. M.-Edw. Rev. Zool., June 1867, p. 195; Anders. Zool. Res. Yunnan, p. 233 (1879); Blanford, Faun. Br. Ind., Mamm. p. 381 (1891).

*Sciurus leucopus*, Gray, Ann. & Mag. Nat. Hist., Oct. 1867, vol. xx. p. 282.

*Sciurus caniceps griseimanus*, M.-Edw., Thos. P. Z. S. 1886, p. 69.

*Sciurus pygerythrus*, var. *D. griseimanus*, M.-Edw., W. Sclater, Cat. Mamm. Calc. Mus. ii. p. 12 (1891).

General colour of the upper parts pale grizzled; underparts fulvous; feet dirty white; tail uniformly grizzled, like the back, with no black tip.

Dimensions about as in *Sc. p. Phayrei*.

*Hab.* Cochin China.

## Key to the Species.

- A. Underparts grey.
- a*<sup>1</sup>. Tail with black tip and no hoary ends to hairs.
  - a*<sup>2</sup>. Back deep orange . . . . . *Sc. caniceps* (winter).
  - b*<sup>2</sup>. Back uniformly grizzled.
  - a*<sup>3</sup>. Sides of neck of same colour as the back . . . . . *Sc. caniceps* (summer).
  - b*<sup>3</sup>. Sides of neck with patch of colour.
  - a*<sup>4</sup>. Patch on the neck deep chestnut. . . . . *Sc. epomophorus*.
  - b*<sup>4</sup>. Patch on the neck pale rufous . . . . . *Sc. e. Davisoni*.
  - b*<sup>1</sup>. Tail with black tip and hoary ends to the hairs . . . . . *Sc. concolor*.
- B. Underparts buff or yellow.
- a*<sup>1</sup>. Tail with black tip.
  - a*<sup>2</sup>. Colour of underparts not bordered by a dark stripe on flanks . . . . . *Sc. pygerythrus*.
  - b*<sup>2</sup>. Colour of underparts bordered by a dark stripe on flanks . . . . . *Sc. p. Phayrei*.
  - b*<sup>1</sup>. Tail with no black tip . . . . . *Sc. griseimanus*.

XXXVI.—*Descriptions of Seventeen new Genera of Ichneumonidæ from India and One from Australia.* By P. CAMERON.

IN this paper I have described a number of well-marked genera of Ichneumonidæ, mostly belonging to the Joppini and the Heresiarachini. Very little has been published upon the Joppini occurring in India, but in all probability they will prove to be quite as numerous there as in the Neotropical Zoological Region, which has hitherto been looked upon as the headquarters of the group. Two genera of Indian Joppini have been described by Dr. Kriechbaumer in Ent. Nachtr. xxiv. 1898, where he also revises the genera; and there is a further revision of them by Mr. W. H. Ashmead in Bull. U.S. Nat. Mus. xxiii. 1900. The Heresiarachini are easily known by their toothless mandibles. This tribe appears to be well represented in India, but no species has hitherto been recorded therefrom. The species are in the collection of Mr. G. A. J. Rothney.

GATHETUS, gen. nov.

Wings with an apical cloud. Areolet five-angled, narrowed at the top. Antennæ short, thickened and compressed beyond the middle. Cheeks swollen. Labrum hidden. Scutellum flat, the sides not margined, the apex incised in the

middle. Postscutellum rounded. Median segment obliquely depressed from the top to the postscutellum; there are three central areæ—a large central and one on either side of it at the top, these being somewhat rounded on the outer side; the spiracular area is defined and extends to the apex. Abdomen with seven segments, the basal five longitudinally striated; the apical segments smooth; the segments project at the apices on the sides beneath; the ventral fold is on the second and third segments.

In Kriechbaumer's classification of the "Joppinen" this genus is referable to the *Holojoppinæ* and comes nearest to the American *Microjoppa*, which differs from it in the areolet being four-sided, the nervures being united at the top, in the scutellum not being quite flat and not incised at the apex, and in the ventral fold being distinct. The antennæ in my genus are shorter, the head is not so much depressed between the eyes, the abdomen is longer compared with the thorax, and the areolet is not so oblique; the legs are stout. Characteristic is the strongly longitudinally striated back of the abdomen.

*Gathetus melanocerus*, sp. n.

Luteus; flagello antennarum abdominisque apice nigris; alis flavo-hyalinis, apice violaceo. ♂ et ♀.  
Long. 16-17 mm.

Antennæ black, the scape rufous beneath, the apex fuscous; the scape closely punctured, thickly covered with short fuscous hair. Head luteous, the face paler, the inner orbits slightly yellowish; the face closely punctured, the clypeus punctured in the middle, its sides almost smooth; the inner orbits distinctly and sharply margined; the base of the mandibles yellowish, the teeth black. Thorax luteous; the middle of the mesonotum slightly darker; the pleuræ with a faint yellowish tinge on the lower side. Mesonotum closely punctured, thickly covered with short fuscous hair. Scutellum shining, slightly narrowed towards the apex, flat, covered with large moderately deep punctures; the postscutellum very smooth and shining, the space on either side of it strongly longitudinally striated. The base of the median segment in the middle slightly raised above the top of the postscutellum; the whole segment at the base separated from the mesonotum by a deep wide transverse depression. The base of the median segment in the middle smooth, impunctate, this smooth space being continued shortly down the middle on either side of the central depression; the rest of the segment coarsely, transversely, irregularly striolated; the areæ are not clearly

defined; the central space is bordered by keels; from the side of the smooth basal space a stout curved keel runs to join the apex of the prolongation of the smooth part. The spiracular area is separated from the pleuræ by a distinct keel. Propleuræ closely punctured, the apex in the middle stoutly striated; the lower part projects, is there smooth, but above the smooth projection it is roundly hollowed and stoutly perpendicularly striolated. The tubercles form an elongated, narrow, sharp projection under the tegulæ, and are longer than them, extending from the base to the apex of the pleuræ; the space immediately underneath them stoutly, slightly obliquely striated, all the striæ distinctly separated; the rest of the pleuræ with shallow punctures, except on the middle behind; the lower part behind immediately over the hind coxæ roughly irregularly striolated; the metapleuræ closely punctured, less strongly behind, separated from the sternum by a stout keel, the part immediately over the keel being crenulated. Legs coloured like the thorax, except that the apical two joints of the hinder tarsi are black. Petiole stoutly striated down the middle, the sides, especially at the apex, strongly punctured; the other segments except the last strongly, closely, longitudinally striolated. Gastroceli transverse, deep, smooth, except in front of the middle, where they are striolated.

DIMÆTHA, gen. nov.

Antennæ short, flattened and compressed beyond the middle. Labrum distinctly projecting. Scutellum flat, sloping downwards from the middle towards the apex, its sides stoutly keeled on the basal half. Median segment with one large central, one lateral, and the spiracular area clearly defined. Wings large, with an apical cloud; the areolet oblique, four-sided; the transverse cubital nervures united on the top. Abdomen with seven segments and with a ventral fold on the second, third, and fourth, the dorsal segments closely punctured; the sides of the segments not angled. The hinder femora reach to the apex of the third segment.

This genus belongs to the Hemijoppinæ, but does not fit well into either of the sections into which Kriechbaumer divides the group. In the male the antennæ are much longer and serrate. Comparing *Dimætha* with *Gathetus*, it may be readily distinguished by not having the abdominal segments longitudinally striated, by the petiole being longer, by the postpetiole being narrower and shorter than the narrowed basal portion, the abdominal segments do not project so much at the apices, the scutellum is not so flat, and the hinder tarsi are much longer compared with the tibiæ.

*Dimætha tibialis*, sp. n.

Lutea; antennis, abdominis apice late apiceque tibiæ posticarum nigris; alis flavo-hyalinis, apice violaceo-fumato. ♀.  
Long. 20 mm.

Antennæ black, the scape yellow except above. Head luteous, the face and eye-orbits of a paler yellow tint, smooth and shining, the face and clypeus with some scattered punctures. Mandibles luteous, the base broadly pale yellow. Mesonotum closely and minutely punctured, the middle slightly raised. Scutellum strongly and deeply punctured, the sides stoutly keeled to shortly beyond the middle; the apex with a gradually rounded slope. Postscutellum smooth and shining, the space at its sides stoutly longitudinally striated. The base of the median segment closely punctured and obliquely depressed; in the middle at the top of the depression is a smooth and shining space, from which run a smooth and shining keel along the sides and two diverging ones down the centre, which is irregularly transversely reticulated; the sides are transversely striated. The upper part of the propleuræ is coarsely aciculated, the middle bears stout perpendicular keels, the apex stout longitudinal keels; the lower part is aciculated. Mesopleuræ obscurely punctured above, the lower part closely rugose, running into striæ behind. Metapleuræ closely rugosely punctured. Legs coloured like the body, with the apical third of the hinder tibiæ and the hinder tarsi (except the base of the hinder tarsi, which is obscure luteous) black. Wings yellowish hyaline, the apex from the apex of the areolet dark violaceous; the stigma and nervures are yellow. Abdomen coloured like the thorax, except the apical three segments, which are black, and a black transverse line on the base of the second and third segments, the black on the second segment being produced backwards between the gastrocœli. The basal three segments are closely punctured; the apex of the petiole and the base of the second and third segments striated. Gastrocœli smooth, bordered with stout striæ behind.

## FACYDES, gen. nov.

Areolet five-angled, the nervures distinctly separated above; the apex of the wings with a fuscous cloud; the transverse median nervure distinctly received in front of the basal. Antennæ short, flattened, and compressed beyond the middle. Clypeus with a shallow curved incision on the apex; the labrum not projecting. Scutellum pyramidal, distinctly raised



above the level of the mesonotum. Median segment with one elongate central area. Legs short and stout, the hinder femora not extending beyond the apex of the third segment. The second and third abdominal segments are longitudinally striated; the ventral fold is distinct on the second, third, and fourth segments.

The depression between the median segment and the mesonotum is wide and deep; the base of the former is largely raised and has a rather steep slope; the transverse median nervure is not quite interstitial; the abdominal segments are distinctly angularly separated at their apices; the tarsi are spinose.

*Facydes purpureo-maculatus*, sp. n.

Luteus; antennis nigris, abdominis apice nigro-purpureo; alis flavo-hyalinis, apice violaceo. ♀.

Long. 14 mm.

Antennæ black, the scape luteous beneath. Head smooth and shining; the cheeks with scattered punctures; the eye-orbits and the face and clypeus lemon-yellow. The mesonotum is of a darker rufous colour than the rest of the thorax and is closely punctured. Scutellum pyramidal, the basal slope more abrupt and shorter; it is closely punctured and thickly covered with short black hair. Postscutellum smooth, shining, and glabrous. Median segment closely punctured, the base in the middle smooth and shining; on the apex are two central and a lateral bordering narrow keel. Propleuræ smooth and shining. The upper part of the mesopleuræ smooth, the middle and lower parts punctured, but not closely. The base of the metapleuræ slightly, the apical closely rugosely punctured. Legs coloured like the body; the coxæ slightly paler. Wings hyaline, with a slight but distinct yellow tint; the apex from the end of the stigma fuscous-violaceous. Abdomen luteous, the apical three segments black, variegated with purple; the apex of the petiole is stoutly longitudinally striated in the middle, the sides punctured; the second and third segments are longitudinally striated in the middle at the base. Gastrocoeli smooth.

LEPTOJOPPA, gen. nov.

Antennæ short, thickened and compressed beyond the middle. Eyes large, parallel, reaching near to the base of the mandibles. Clypeus separated, the basal foveæ large, deep, its apex transverse. Mandibles bidentate. Occiput margined. The head obliquely narrowed behind the eyes.

Parapsidal furrows distinct at the base. Pronotum tuberculate near the base. Scutellum stoutly keeled on the basal half; the apical half with an oblique slope. Median segment with one central basal and two lateral areæ. Spiracles elongate, narrow, rounded at the base and apex. Legs short, slender; the base of the fore tibiæ incised; the claws simple. Areolet five-angled, narrowed at the top; the recurrent nervure is received shortly beyond the middle; the transverse median nervure is received in front of the transverse basal. Abdomen very long, slender, almost cylindrical, nearly three times as long as the head and thorax united; the apex of the petiole dilated; the large spiracles placed at its base; there is a distinct ventral fold on segments 2, 3, and 4, a less distinct one on 5 and 6; the sheaths of the ovipositor project; there are seven dorsal segments. The labrum is small and projects slightly.

This genus belongs to the *Oxyptigi*, as is shown by the presence of the ventral fold and by the pointed apex of the abdomen. It is easily distinguished from any of the known *Joppina* by the short dilated antennæ and by the very long, narrow, almost cylindrical abdomen, tuberculated pronotum, and keeled scutellum.

*Leptojooppa erythrothorax*, sp. n.

Capite nigro, albo-maculato; thorace, pedibus anterioribus, coxis trochanteribusque posticis rufis; antennis nigris, medio albo-annulato; abdomine cæruleo; alis fusco-hyalinis. ♀.  
Long. 24 mm.

Antennæ thickened and compressed beyond the middle; the apex gradually and distinctly narrowed; the sides and lower part of the five or six joints beyond the middle white; the scape finely and not very distinctly punctured, sparsely covered with short hair; a white somewhat conical mark in the middle at the base. The face and clypeus, the inner orbits (narrow below, wider above) to near the hinder ocelli, a somewhat triangular mark touching the eyes shortly behind the ocelli, a large mark on the lower orbits, narrow above, broad below, and reaching near to the base of the ocelli and the palpi, yellow. Face and clypeus strongly, uniformly, but not very closely punctured. Mandibles to near the teeth closely and rather strongly punctured; the two teeth very large, the upper much larger and more sharply pointed than the lower, which diverges downwards. Thorax rufo-ferruginous, except for a small yellow mark on either side of the pronotum and a slightly larger and longer one under the

tegulæ. Mesonotum closely and rather strongly punctured throughout, its base in the middle transverse; the middle raised, the raised part becoming narrowed and less distinct towards the apex. Scutellum narrowed and depressed towards the apex, more strongly punctured than the mesonotum, and with the punctures more widely separated; its sides stoutly keeled; the depression at its base large, deep, smooth; the sides at the base slightly oblique. Postscutellum coarsely longitudinally striolated. Median segment closely, uniformly, but not very strongly rugosely punctured; the area rather irregular; the supramedian elongate, wide, obliquely narrowed at the base; the apical part coffin-shaped, the apex narrowed; the outer area large, the basal the larger and transverse at the apex; the apex of the segment has a slightly oblique slope. Propleuræ closely punctured, the lower part at the apex strongly longitudinally striolated. The upper part of the mesopleuræ punctured at the base, the upper part under the wings smooth, forming in the centre a stout longitudinal keel; the lower part stoutly perpendicularly striated, the striæ posteriorly becoming curved; the apex crenulated. The metapleuræ closely rugosely punctured. The mesosternum is flat, closely punctured, furrowed down the side, the apex in the middle triangularly depressed. Legs covered with short white pubescence, the four anterior entirely, the hinder coxæ, trochanters and extreme base of the femora red, the hinder femora, tibiæ, and tarsi bluish black. Wings hyaline, with a slight but distinct fuscous tinge; areolet narrowed at the top, the recurrent nervure received in the centre. Abdomen more than twice the length of the head and thorax united, blue; the ventral segments white; the sides of the apical white on the lower side; the sheaths of the ovipositor black, closely pilose, as long as, if not longer than, the last segment. Petiole narrowed at the base, dilated at the apex; the extreme base rufous to near the apex, marked with scattered punctures; the apical part raised in the middle; the middle of the raised part finely reticulated, the apex with largish punctures; the sides above at the apex broadly depressed, irregularly striated; outside this depression it is marked with some large distinctly separated punctures; the other segments closely and uniformly punctured; the gastrocoeli large, oblique, deep; the base blue, rugosely punctured; the apex smooth, dark brownish.

CRATOJOPPA, gen. nov.

Antennæ short, thickened, and dilated beyond the middle. Labrum hidden. Scutellum flat, its sides not margined.

Median segment areolated, the keels not very distinctly defined; there are two central areæ, the basal reaches to the middle and is contracted roundly and largely near the base. Areolet slightly oblique; the transverse cubital nervures are united above. The second and third abdominal segments are closely punctured and longitudinally striated at the base; the ventral keel is largely developed on the second and third segments; the seventh segment is largely developed all round.

The wings are hyaline; the head is large and broad and is well developed behind the eyes, which reach near to the base of the clypeus; they are margined on the inner side; the face is flat and is not separated from the middle of the clypeus; the latter is bounded above on the sides by an oblique furrow; the mandibles have a longish upper and a shorter stout under tooth, which is curved inwardly. Legs stout; the tarsi spinose; the fore tibiæ are narrowed and slightly incised at the base and thickly spined; the abdominal segments are not angled at the apex laterally, but broadly rounded.

The type of the genus is a stoutly built insect, with a large head and stout short antennæ. The legs are also stout and with large hind coxæ; the hinder trochanters reach to the apex of the third segment; the last segment above is more than one half the length of the penultimate. The dilated antennæ in the female (the only sex known) and the absence of regular areæ on the median segment would refer it to the *Joppina*, and, if anywhere, to the Hemijoppinæ Doryphoræ of Kriechbaumer. The distinguishing characteristics are the short, stout, dilated antennæ, the quite flat large scutellum, not keeled laterally, and the three central narrow areæ, not clearly separated, on the median segment. The median segment is large and has a gradually rounded slope; the spiracular area is bounded by two keels.

*Cratojoppa robusta*, sp. n.

Nigra; flagello antennarum late, facie, orbitis oculorum late, maculis late thoracis, lineisque abdominis, flavis; pedibus fulvis; coxis posticis, geniculis posticis apiceque tibiæ posticarum late nigris; alis hyalinis, nervis stigmatæque nigris. ♀.

Long. 14–15 mm.

Antennæ black, stout; the scape beneath and joints 9–20 white, beyond the middle compressed and dilated; the apex attenuated. The face, clypeus, labrum, the mandibles (except the teeth), the palpi, the orbits from the base of the antennæ to shortly above the middle on the outer side narrowly, and

the lower orbits on the outer side widely, yellow. Face strongly punctured all over, the clypeus with the punctures larger and more widely separated, and sparsely covered with long fuscous hair; the sides of the clypeus broadly rounded; the apex in the middle projecting into a stout blunt tooth. Thorax black; the edge of the pronotum from near the base to the tegulæ (the yellow narrowed in the middle), the tegulæ, two lines in the middle on the inner side of the middle lobe, the broad scutellar keels, the sides of the scutellum broadly, the apex more narrowly, the postscutellum, a large mark behind the metathoracic stigmas (extending on their outer side to their apices, on the inner not much beyond their base), the base in the middle, then continued down the outer sides of the posterior area, at the apex broadly dilated laterally, and at the base on the outer side continued backwards into the spiracular area, the prosternum, the base of the mesosternum, the mesopleuræ on the lower side, and the sides of the mesosternum (more broadly on the apical half and the apex of the metapleuræ), yellow. The base of the mesonotum closely punctured; the apex with the punctures larger and more widely separated; the parapsidal furrows are only indicated at the base. The scutellar depression is wide and deep; the scutellum flat, the black central part bearing large deep punctures, which are sparser at its base; the depression at its side and at the sides of the postscutellum stoutly striolated; the postscutellum smooth, glabrous, the sides at the base deeply depressed. The basal half of the median segment coarsely and deeply punctured; in the centre at the base is an hour-glass-shaped area, which is continued down the middle to the posterior median area; its sides are depressed in the centre at the base and transversely striated; the posterior median area is conical at the base, and is stoutly transversely striated throughout; the outer and the tooth-bearing area distinct, as is also the spiracular. The apex of the propleuræ coarsely punctured, the base finely obliquely striated, the middle smooth and shining. Mesopleuræ punctured, except in the middle behind, under the tubercles and at the apex crenulated. Metapleuræ coarsely punctured, the upper part and the apex of the spiracular area obliquely striated. The furrow in the middle of the mesosternum is wide and deep and is stoutly crenulated throughout. The four anterior legs are fulvous, the coxæ and trochanters pallid yellow; the hinder legs of a deeper red, the coxæ black, yellow at the apex above; the base of the basal joint of the trochanters, the apex of the femora broadly, the base of the tibiæ narrowly, and their apex more broadly than the femora, black; the tarsi

yellow, with a fulvous tinge. The areolet narrowed at the top; the cubital nervures almost united; the recurrent nervure is received in the middle; the transverse median nervure is received before the transverse basal. Petiole stout, shining, its base and the sides of the dilated part with scattered punctures; the dilated part with an elongated fovea at the base; the space behind the fovea and the space surrounding the spiracles finely striated; the second, third, and fourth segments closely punctured, the second strongly longitudinally striated between the gastrocoeli, which are large, deep, smooth, and with an oblique slope at the base and apex. The yellow line on the petiole is narrowed in the centre, on the second only very slightly, on the third and fourth acutely narrowed; on the apical two not perceptibly narrowed; the second and third segments broadly in the middle, the fourth and fifth broadly at the apex, and the apical segments are entirely yellow.

[To be continued.]

XXXVII.—*Descriptions of some new African Arachnida.*

By R. I. POCOCK.

Order SCORPIONES.

*Parabuthus cristatus*, sp. n.

*Parabuthus brevimanus*, Pocock, P. Z. S. 1890, p. 125 (nec *Buthus brevimanus*, Thorell).

♀.—Allied to *P. brevimanus*, Thorell, in the complete absence of distinct crests on the sides and under surface of the fourth caudal segment. Caudal segments 1–3 with eight keels, the median lateral weak on segments 2–3 and only granular posteriorly; four inferior keels on segment 1 entirely smooth, on 2 and 3 marked with very coarse tubercular granules, which increase in strength posteriorly, the lateral keels converging posteriorly; on the 3rd segment the terminal tubercles of the four keels form a broad, quadrilobate, U-shaped crest; the anterior edge of the lower side of the 4th segment also raised into a distinct lobate crest. Upper-side of segments 1–2 abruptly elevated anteriorly, the anterior third rising nearly vertically, the posterior two thirds horizontal, excavated and shagreened.

*Chelæ* as in *P. brevimanus* apparently, except that there are

ten teeth along the external series (not including the apical); movable finger lightly curved throughout its length, immovable straight.

*Measurements in millimetres.*—Total length 6.2; carapace 6.5; width of first caudal segment 4.7, of fourth 4.3; length of fourth 6.3; width of hand 2.5, of brachium (not including spike) 2; length of hand-back 3.6, of movable finger 5.

*Loc.* Congo.

Neither Thorell nor Kraepelin, in their description of *P. brevimanus*, mentions the existence of the crests on the fourth and third caudal segments, such as I have described above in *P. cristatus*, and which are, I believe, unique in the genus.

*Parabuthus granulatus* (H. & Ehrb.).

Subsp. *fuscus*, nov.

Differs from the principal form in having the upperside of the trunk and chelæ, the tail above and below, and the femora and patellæ of the legs distinctly and uniformly infusate; the ventral surface of the trunk, the fingers, extremities of legs, vesicle of tail, and mandibles clearer yellow.

*Loc.* Kalahari Desert (*R. J. Cunningham*).

## Order ARANEÆ.

Genus STASIMOPUS, Sim.

*Stasimopus insculptus*, sp. n.

♂.—*Colour.* Carapace and mandibles black; legs deep brown, with reddish-yellow protarsi and tarsi; abdomen yellowish brown, bristly.

*Carapace* coarsely sculptured, rugose, slightly longer than wide, its length a little less than that of patella and tibia or of protarsus and tarsus of first leg, and than patella, tibia, and tarsus of palp and than patella and tibia of fourth leg, and a little longer than protarsus of latter.

*Eyes* of anterior line subequally spaced, the medians about a diameter apart, smaller in area than the laterals, the four slightly procurved; anterior medians about their own diameter from the posterior medians; distance between the two laterals on each side about equal to the long diameter of the anterior lateral.

*Labium* and *maxille* unarmed.

*Palpi* not spined, nearly twice as long as the carapace; tibia fusiform, about twice as long as the patella; tarsus short, truncate; bulb of organ oval, spine long, straightish, except at base, where it is curved and stout.

*Legs* spiny, long and slender, with tarsi scopulate and laterally spined; no tibial spur on first leg.

Total length 16 millim.; carapace 6; palp 11; first leg 20, second leg 17, third leg 15, fourth leg 23.

*Loc.* King William's Town.

This is the first publication of the male characters of *Stasiomopus*. Unfortunately none of the described females have been recorded from King William's Town. Hence it is not possible to refer this male to either of the three known species. It differs markedly from *S. Schönlandi* in the compact arrangement of its eyes.

#### Genus ACANTHODON, Guér.

##### *Acanthodon flaveolum*, sp. n.

♀.—A small pale flavous species approaching *A. Thorellii*, O. P. Cambr., in size and colour, but hardly likely to be the female of that species on account of the greater length of the quadrangle formed by the anterior median and anterior lateral eyes. In *A. Thorellii* this quadrangle is about twice as long as wide, and the distance between the two posterior lateral eyes is greater than that between either of these eyes and the edge of the clypeus. In *A. flaveolum*, on the contrary, this ocular quadrangle is almost or quite three times as long as wide, and the main ocular cluster lies so far back that the distance between the clypeus and a posterior lateral eye is greater than the width of the cluster.

Total length 19 millim.; carapace 8.

*Loc.* Near Grahamstown (*Mrs. White*).

#### Genus HELIGMOMERUS, Simon.

##### *Heligmomerus deserti*, sp. n.

*Eyes* less compact than in *H. somalicus*; the clear amber-coloured area of the anterior medians more than two diameters apart and at least three diameters from the posterior laterals; posterior medians larger than anterior medians and at least as large in area as the posterior laterals; the quadrangle formed by the anterior medians and anterior laterals only about one third longer than wide; the tubercles of the anterior median eyes separated by a space which about equals their own diameter.

Total length 18 millim.; carapace 10.

*Loc.* Kalahari Desert (*R. J. Cunningham*).



## Genus HARPACTIRA, Auss.

*Harpactira pulchripes*, sp. n.

♀.—*Colour*. Carapace deep mahogany, clothed with silky golden-yellow hairs; mandibles blackish, with stripe of yellow hairs above; sternum and coxæ chocolate-brown; legs and palpi with femora yellow and clothed above and below with silky yellow hairs; upperside of patella, tibia, protarsus, and tarsus mahogany-brown, with olive-grey hairs; underside of patella and tibia pale and clothed with long fiery yellow hairs, which are longer and redder on the palpi of the first and second legs than on those of the third and fourth; abdomen olive-black, clothed above and laterally with silky golden-yellow hairs and below with olive-black hairs, the opercula pale, the upperside indistinctly striped.

*Carapace* a little shorter than patella, tibia, and tarsus of palp and than protarsus and tarsus of fourth leg, a little longer than patella and tibia of fourth or of first leg, and as long as tibia, protarsus, and half the tarsus of the third leg.

Stridulating-bristles on outer side of mandible consisting of a single oblique row; no inferior series differentiated.

*Measurements in millimetres*.—Total length 26; carapace 13; first leg 33, second 30·5, third 28, fourth 36; patella and tibia of fourth 11·5; protarsus and tarsus 14.

*Loc.* Near Grahamstown and Beak Kloof (*Mrs. White*); Jansenville.

## Genus DRESSERUS, Simon.

*Dresserus armatus*, sp. n.

♂.—*Colour* brown, integument covered with mouse-brown hairs, with some white hairs intermixed on the upperside of the abdomen.

*Carapace* about as long as patella and tibia and half the protarsus of first and of fourth leg; its anterior edge armed with three forwardly directed spikes, one rising from the median ocular tubercle, the others at the sides above and supporting the lateral eye; a fine crest or keel running backwards from this tubercle to the posterior lateral eye.

*Palpi* and *legs* unarmed. Patella of palp considerably longer than tibia, the latter thicker at its distal end, without apophysis, and about half the length of the tarsus; bulb of palpal organ subglobular, flattened below; from the outer and inner edge of the flattened disk rises a process curved like a cat's claw and hollowed on its concave side.

Total length 11 millim.; carapace 6.

*Loc.* El donyo eb Urru, on the Mombasa-Uganda Railway in British East Africa (*C. S. Betton*).

In the absence of the female I have assumed that the armature and carination of the carapace in this species are merely sexual characters.

*Selenops basutus*, sp. n.

♀.—Resembling *S. atomarius* and *S. Spenceri* in having seven pairs of tibial and three pairs of protarsal spines on the first and second pairs of legs.

*Eyes* of ocular quadrangle\* apparently as in *S. atomarius*, but the anterior laterals with their centres on a level with those of the anterior medians instead of with the upper edges of the latter, and the inferior edge of the posterior lateral scarcely higher than the inferior edge of the anterior medians. (Simons's drawing of the eyes of *S. atomarius* in *Hist. Nat. Araign.* ii. p. 25, is apparently diagrammatic, to judge by the exceptional height of the anterior laterals above the clypeus; but it is not possible to make the figure fit the arrangement shown in *S. basutus*.)

*Vulva* with its lateral lobes subquadrate, in contact in the middle line, the line of junction marked by a groove expanding anteriorly; in front of each lobe a distinct pit, the pit of the right side separated from that of the left by a broad median longitudinal bar, which narrows posteriorly and runs for a short distance in between the two lobes.

Total length 18 millim.; carapace 7.

*Loc.* Teyateyaneng in Basutoland (*L. Wroughton*).

XXXVIII.—*Descriptions of new Species of Lycanidæ in the Collection of the British Museum.* By A. G. BUTLER, Ph.D.

THE following are all species which I have been unable to name during my recent study of the family, or which have been received subsequently.

\* In *Hist. Nat. Araign.* ii. p. 23 (1897), Simon, when discussing the eyes of the Selenopinæ, writes:—"Les auteurs ne se sont jamais prononcés sur l'homologie des petits yeux nocturnes latéro-antérieurs, mais, pour moi, ils représentent des yeux médians postérieurs très fortement déviés de leur situation normale." This view appears to me to complicate a very simple question; for surely the four median eyes in this genus are nothing but the four eyes of the median quadrangle, forming a trapeze unusually wide behind, and not the eyes of the anterior line much or a little recurved, as Simon supposes; and "les petits yeux nocturnes latéro-antérieurs" are the normal antero-lateral eyes.

*Epitola divisa*, sp. n.

Nearly related to *E. honorius* (*teresa*, Hewits.), but the male above with narrower subapical blue bar and more extended dull brand on the primaries; secondaries shorter, more rounded; under surface rather paler; the white macular band beyond cell narrow and not continued to outer margin, the last two spots being thrown outward to the margin and conical in shape; in the secondaries the basal orange suffusion is brighter and more extended. The female differs notably from that sex of *E. honorius*, the oblique white belt of that species being continued across the wing to the submedian vein, its outer margin regularly arched, its inner margin acutely angled; the blue-green submedian streak is widened and extended right up to the white belt; the secondaries show a more restricted green streak and no trace of white. On the under surface the apex of primaries and whole surface of secondaries are paler and more testaceous, the white belt on the primaries extending inwards to submedian vein as above; the basal area of the secondaries is ochreous instead of reddish clay-coloured, the transverse whitish stripe is sometimes absent and the internervular streaks are thickened.

Expanse of wings, ♂ 53, ♀ 52-56 millim.

♂, Sierra Leone (*W. F. Woods*); ♀, Bandajuma (May to November 1898), wet season (*G. J. Arnold*); ♀, Cape Coast Castle. B. M.

*Virachola zeloides*, sp. n.

*Rapala zela*, Butler (not Hewitson), P. Z. S. 1896, p. 832.

♂. Differs from *V. zela* in its fuller, broader wings, much paler colouring above and paler much wider bands below: the primaries above are dull greenish steel-blue, with dark brown fringes; the secondaries clear dead smalt-blue, with ashy-brown abdominal border: the under surface is ashy brownish ("dust-coloured"), with slightly darker whitish-edged bands, much broader and rather more irregular than in *R. zela*; the usual subanal spots are smaller, more rounded, more clearly defined, and more besprinkled with silvery-blue scales than in *R. zela*.

Expanse of wings 35 millim.

Kasungu Mountain, Nyika, 5345 feet, Feb. 29th, 1896.

We have *V. zela* from Sierra Leone collected by Mr. E. E. Austen.

*Spindasis minima*, sp. n.

♂. Probably nearest to *S. lilacina*; but very distinct from all known species. Upper surface greyish brown, faintly

glossy; base of wings slightly more dusky, internal areas slightly ashy, fringes ashy grey; secondaries with a well-defined straw-coloured anal patch enclosing two silver-speckled black spots; tails black, tipped with white; head and collar brown, eyes encircled by a whitish line; thorax blackish, clothed with blue-greyish hair, patagia edged with brownish; abdomen purplish brown, segmental margins white towards base, straw-coloured towards anal extremity; antennæ and palpi normal. Under surface creamy white; bands broad, many of them contiguous, pale buff with dull silver central spots or lines and with sepia-brown margins; excepting that the bands are much more crowded together, their general disposition is that of *S. fusca*; the anal area of the secondaries is pale buff with the anal black spots well defined: body below white, slightly buffish on the abdomen.

Expanse of wings 23 millim.

Puttalam, Ceylon (*J. Pole*).

*Catochrysops phasma*, sp. n.

Above grey-brownish, suffused with pale lilac; outer borders smoky brown, veins brownish; the discocellulars marked by the usual narrow transverse bar; secondaries with one subanal ocellus, black capped with ochreous and with white outer edge, a well-defined white-tipped black tail at extremity of first median branch; body normal: under surface whity brown as in *C. patricia*, but the pattern agrees closely with that of *C. celæus*.

Expanse of wings 37-43 millim.

♂♂, Lagos (*Dr. H. Strachan*); Ashanti, between Cape Coast Castle and Kumassi, in January and February (*Capt. Hon. Grosvenor Hood*).

The tails to the secondaries of this species bring it nearest to *C. patricia*, but the tint of the upper surface separates it from all species known to me, though perhaps most nearly approaching that of *C. celæus*, ♀; its female should be very like the latter excepting for the tail.

*Catochrysops Carsoni*, sp. n.

♂. Allied to *C. patricia*, the primaries more acute at apex; the secondaries with a bilunate orange bar enclosing the usual black spots: under surface whity brown, with slightly darker white-edged macular bands, much more uniform in character than in *C. patricia*, the white hastate spots on the secondaries reduced in size, merely forming an inner series of white submarginal lunules; black anal spots with broad united orange zones as above.

Expanse of wings 41 millim.

Fwambo, Tanganyika (*A. Carson*).

*Chilades Alberta*, sp. n.

*Catochrysops cyclopteris*, Butler, P. Z. S. 1888, p. 68.

♂. Wings above ashy brownish, brightly shot with lilac; borders and veins smoky brown, discocellulars and fringe also smoky brown; secondaries with a submarginal row of smoky brown spots, the last but one (near anal angle) blackish, the last three spots with white outer edges; the fringe of primaries towards external angle and that of secondaries with whitish basal line; body normal: under surface much as in *Euchrysops cyclopteris*, excepting that the last three submarginal spots on the secondaries are surmounted by orange zones, the last spot short and linear. The female is larger and bluer than the male, with well-defined blackish outer border and discocellular dash on primaries; the costal borders of all wings broadly dusky; the secondaries with conspicuous orange zones to the last three submarginal spots on the upper surface: the under surface is whiter than in the male, the markings somewhat reduced in size and less conspicuous.

Expanse of wings, ♂ 27, ♀ 30 millim.

♂, Tamaja, Equatorial Africa, 6th August; ♀, Nadada, 16th June (*Emin Pasha*).

*Iraota Nicevillei*, sp. n.

*Iraota mæcenas*, Moore, Lep. Ceylon, i. p. 102, pl. xl. figs. 2, 2 a, ♀ (1880-81).

This species differs from the true *I. mæcenas* (dry phase of *I. timoleon*) in the much more restricted and metallic *Morpho*-like colouring of the patches of colour on the upper surface. According to Moore these patches are metallic blue; but it would be more correct to call them green, as it is difficult to get them so placed as to eliminate all yellow from the blue; and, when facing the light, the colouring is glittering metallic green. On the under surface the differences are not striking between the two species, but the white discoidal markings are less silvery in the Ceylonese insect and the discal white lunules on the primaries are reversed, their concavities being directed towards the base instead of the outer margin. Our examples, which are females, differ from the rich purple females of *I. timoleon* in their longer secondaries with more slender tails; indeed, in their general aspect they more nearly resemble the male than the female of *I. timoleon*.

Expanse of wings 39-45 millim.

Ceylon (*Mrs. Lindesay and F. M. Mackwood*). B. M.

XXXIX.—*A List of Californian Diatoms.*

By C. MERESCHKOWSKY.

[Plates IV. &amp; V.]

THE recent marine Diatoms of California are interesting in more than one respect. In the first place a list of Californian Diatoms will form a desirable contribution to our knowledge of the geographical distribution of these little Algæ, the more so as the Diatom flora of the Pacific is as yet but very little known. Then, again, the study of recent Californian Diatoms as compared with the extensive fossil deposits of this region is of interest in order to ascertain which of the fossil forms have disappeared and which are still living, and whether these latter have changed in the course of time or not.

It is for these reasons that I undertook the study of Californian Diatoms, which I intend to carry out as completely as possible—a task which will certainly require a number of years in order to accomplish it with a certain degree of completeness. At the present time I will only give a short preliminary list, partly composed of forms observed by myself so far as I have been able to determine them, partly of some species which have been previously noticed by other diatomists, especially by Cleve in his ‘Synopsis of the Naviculoid Diatoms,’ as well as by a few others (Grunow, Greville). This list will also contain the species which I have already mentioned and partly described in a previous publication entitled ‘On Polynesian Diatoms,’ the fourth chapter of which deals with Diatoms belonging to the Californian coast.

The reader will find in this paper the description of a number of new species and varieties, accompanied by figures. Some of them are small and delicate forms which I have observed in a living state or in preserved crude material, and which can hardly be expected to be found in slides, as such forms usually completely disappear during the cleaning of the material. Certain details of their structure (such as the striæ when very fine) could not, for this reason, be ascertained.

In the list I indicate the person who has observed the species by the first letter of his name—C. meaning Cleve, G. Grunow, Gv. Greville, and M. myself.

1. *Diploneis bombus*, var. *bullata*, Cl. [C.]
2. *Diploneis bombus*, var. *densestriata*, Cl. [C.]
3. *Diploneis contigua*, var. *eudoxia*, A. S. [C.]

4. *Diploneis gemmata*, var. *typica*, Cl. Calif. guano. [C.]
5. *Diploneis papula*, A. S. Santa Monica, amongst *Macrocystis*, not rare; Monterey, rare. [M.]

The endochrome of this species (Pl. IV. fig. 26) is very interesting; it is composed of two plates, which, however, are not disposed only along both sides of the valve, leaving its apices free, as is usually the case in the Naviculoid Diatoms, but partly enter into the other half of the valve, thus occupying both ends of the frustule.

6. *Diploneis splendida*, var. *puella*, A. S. [C.]
7. *Diploneis subcincta*, A. S. [C.]
8. *Diploneis vacillans*, A. S. [C.]
9. *Diploneis vacillans*, var. *delicatula*, Cl. Santa Monica, recent. [M.]

Length 0.043 mm., breadth of the valve 0.017 mm.

10. *Caloneis formosa*, Greg. San Pedro, not rare. [C., M.]
11. *Caloneis formosa*, var. *quadrilineata*, Grun. [C.]
12. *Caloneis liber*, var. *elongata*, Grun. Rare. [M.]
13. *Caloneis Schumanniana*, var. *trinodis*, Lewis. [C.]
14. *Navicula approximata*, Grev. Calif. guano. [C.]
15. *Navicula* (*Schyzonema*) *avenacea*, Bréb. San Pedro, common. [M.]
16. *Navicula cancellata*, Donk. San Pedro, not very common. [M.]

Striæ 5 in 0.01 mm. Chromatophores with margins profoundly sinuated.

17. *Navicula clavata*, var. *caribæa*, Cl. (forma minor). Northern California, not very rare. [M.]
18. *Navicula directa*, var. *heterostriata*, Mer. (Mereschkowsky, On Polyn. Diat. part iv.). Northern California, rather common. [M.]
19. *Navicula Febigerii*, Cl. [C.]
20. *Navicula forcipata*, Grev. San Pedro, rare. [C., M.]
21. *Navicula forcipata*, var. *densestriata*, A. S. San Pedro, not rare. [M.]

The form which I have observed has the fine striation characteristic of this variety, but the lateral areas are not or scantily constricted in the middle. I have succeeded in examining a frustule in a vertical position and obtaining in this way an optical section through it, which is represented

in the fig. 24 of Plate IV. The raphe is to be seen as a crack in the wall of the frustule, and the areas are deep invaginations of the surface of the valve on both sides of the raphe.

22. *Navicula forcipata*, var. *nummularia*, Grev. Calif. guano. [C.]

23. *Navicula* (*Rhoiconeis*) *garkeana*, Gr. California, North Pacific. [C.]

24. *Navicula* (*Rhoiconeis*) *genuflexa*, Kütz. San Pedro, rather common. [M.]

The endochrome is composed of two chromatophore-plates, with a deep and narrow sinus on each side in the middle of the plates, and usually two, sometimes more, elæoplasts (Pl. IV. fig. 25).

25. *Navicula granulata*, Bail. (*Navicula Baileyana*, Gr.). Calif. guano; North California, rare. [C., M.]

26. *Navicula* (*Libellus*) *Grevillei*, Ag. [C.]

27. *Navicula* (*Libellus*) *hamulifera*, Grun.? San Pedro. [M.]

28. *Navicula* *Hennedyi*, W. Sm. [C.]

29. *Navicula* *Hennedyi*, var. *californica*, Grev. [C.]

30. *Navicula* *Hennedyi*, var. *circumsecta*, Grun. [C.]

It is on account of its synonym *Nav. californica*, A. S., that I have placed this species in the list of Californian Diatoms, although Cleve does not mention it in his 'Synopsis' as belonging to this locality.

31. *Navicula irrorata*, Grev. Calif. guano. [C.]

32. *Navicula libellus*, Greg. Santa Monica, amongst *Macrocystis*, not very common. [M.]

Length 0.084 mm. Endochrome composed of two chromatophore-plates of the same shape and disposition as in *N. complanata*\*, but the inner angles of the plates are united by a loop or narrow band crossing the interior of the cell, so that in reality there is but one plate. I am very much inclined to think that such a connecting band exists also in *N. complanata*.

33. *Navicula lyra*, var. *dilatata*, A. S. San Pedro. Rare. [M.]

34. *Navicula lyra*, var. *recta*, Grev. Calif. guano. [C.]

35. *Navicula* (*Schyzonema*) *mollis*, W. Sm. San Pedro, rather common. [M.]

\* Cleve, 'Synopsis of the Naviculoid Diatoms,' part i, p. 153.



36. *Navicula mutica*, forma *Cohnii*, Hilse. Lost Spring Ranche, foss. ? [C.]
37. *Navicula ostrearia*, Turp. (*N. fusiformis*, var. *ostrearia*). San Pedro, not very common. [M.]

I have not seen the characteristic blue colour at the apices of the frustule; but this is not a constant character, and in the Black Sea, where this species is very common, I often met with specimens showing no trace of blue colour.

38. *Navicula pennata*, A. S. Northern California, not rare. [M.]

I have already mentioned the occurrence of this species in the Glacial Ocean (Wankarema, North Siberia) \*.

39. *Navicula prætexta*, Ehr. [C., M.]

I have seen only a fragment of a valve in a slide containing diatoms from San Pedro Bay.

40. *Navicula punctulata*, W. Sm. Rather common in a laguna near San Pedro. [C., M.]

41. *Navicula (Libellus) reticulata*, Mer. San Pedro, Santa Catalina Island, very common. [M.]

A detailed description of this species will be found in my paper on the Diatoms of the Black Sea, where it is also very common, as well as in the Mediterranean (Villefranche). Its endochrome is very curious, the single plate forming a complicated network covering the surface of both connecting membranes with transverse bands crossing the interior of the cellule.

42. *Pinnularia cruciformis*, Donk. Northern California, rare. [M.]

43. *Brebissonia Boeckii* (Kütz.), Grun. San Pedro, rare. [M.]

Length 0.097 mm., breadth of the valve 0.021 mm., striæ 8 in 0.01 mm. in the middle (not 10, as stated by Cleve).

44. *Frustulia interposita*, Lewis. Oakland, Calif., brackish. [C.]

45. *Anomæoneis sculpta*, var. *major*, Cl. Santa Rosa, brackish. [C.]

46. *Scoliotropis latestriata*, Cl. [C.]

47. *Gomphonema kamschaticum*, var. *californica*, Grun. Monterey, not very rare; San Francisco. [C., M.]

According to Cleve, length 0.03 mm., striæ 15 in 0.01 mm., valve linear.

\* See my paper "On Polynesian Diatoms," chapter iv.

48. *Trachyneis aspera*, Ehr. San Pedro, common; Monterey, rather common. [M.]

49. *Trachyneis aspera*, var. *intermedia*, Grun. San Pedro, not rare. [M.]

Valve lanceolate, axial area rather broad on one side of the raphe, absent on the other.

50. *Pleurosigma æstuarii*, Bréb. San Pedro, rare. [C., M.]

51. *Pleurosigma cuspidatum*, Cl. San Pedro, not rare. [M.]

Endochrome composed of four narrow bands, having the same disposition as in *P. Normanii*.

52. *Pleurosigma elongatum*, W. Sm. Laguna near San Pedro, marine and brackish, common. [M.]

Endochrome composed of four elongate and straight bands.

53. *Pleurosigma formosum*, W. Sm. Northern California, rather common. [M.]

Endochrome composed of four very elongate and tortuous bands.

54. *Pleurosigma formosum*, var. *longissima*, Grun. San Pedro, not rare. [M.]

Length of the valve .....	0.463	0.538
Breadth .....	0.042	0.055
Oblique striæ .....	10-11	11-12.5

Valves broader than in the type species; differs from var. *balearica*, which has the same broad valves, by the striæ, which in the latter are 8-9 in 0.01 mm.

55. *Pleurosigma latum*, Cl. Santa Monica, on *Macrocystis*, rather common. [M.]

Endochrome composed of four bands forming several undulations of exactly the same kind as in *P. Normanii* and *P. cuspidatum*.

56. *Pleurosigma nubecula*, W. Sm. Santa Monica, amongst *Macrocystis*; Monterey, common. [C., M.]

Endochrome composed of four elongate and very tortuous bands.

57. *Pleurosigma rhombeum*, Grun. [C.]

58. *Gyrosigma attenuatum*, Kütz. San Pedro, rare. [M.]

59. *Gyrosigma balticum*, var. *californica*, Grun. Laguna near San Pedro, not rare. [C., M.]

Endochrome composed of two perforated chromatophore-plates; perforations narrow, oblique.

60. *Gyrosigma fasciola* (Ehr.), Cl. San Pedro, common. [M.]  
 61. *Gyrosigma Febigerii* (Grun.), Cl. Laguna near San Pedro in nearly marine water, rather common. [C., M.]  
 62. *Gyrosigma prolongatum*, W. Sm. San Pedro, very common. [M.]

I do not see any difference between *G. prolongatum* and var. *closteroides*, Grun., the prolongations of the valve being turned on opposite sides or on the same side, according to the position of the frustule.

63. *Gyrosigma Spencerii*, var. *exilis*, Grun. Laguna near San Pedro, very common. [M.]  
 64. *Gyrosigma tenuissimum*, W. Sm. [C.]  
 65. *Gyrosigma Wansbeckii* (Donk.), Cl. Laguna near San Pedro, rare. [M.]

Looks like *G. balticum*, but the striæ are much finer.

In all the species of *Gyrosigma* above mentioned which I have observed myself, as well as in many others from the Mediterranean and the Black Sea, I have invariably found the endochrome to be composed of two plates, while in all species of *Pleurosigma* (with the only exception of *P. rigidum*, where it is granular) the endochrome consists of four narrow, usually tortuous bands. This proves that *Gyrosigma* and *Pleurosigma* must be regarded as two natural and distinct groups, which should not be united in one genus, as has been done by certain diatomists.

66. *Mastogloia (Orthoneis) Wrightii*, O'Meara\* (nec Cleve). (Pl. IV. figs. 22, 23.) Northern California, not rare. [M.]

Valve elliptic, with apices broadly rounded.

Length: 0·015 0·018 0·020 0·020 0·021 0·028

Breadth: 0·011 0·0125 0·014 0·014 0·014 0·020

Median line straight, enclosed between two parallel rows of puncta not differing from the rest; axial area linear, distinct. Puncta of the valve forming transverse and decussating rows, the former radiate, about 8-9 in 0·01 mm.†; two of the median decussating rows more distant, forming a double lyre-like figure with both halves uniting at the centre with the axial area; marginal rim narrow, with quadrangular loculi, 8-9 in 0·01 mm.

\* 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. lxxvii. fig. 6.

† The engraver did not succeed in representing the great regularity in the disposition of the puncta, the transverse rows which the latter form being therefore invisible in figures 22 and 23 of the Plate.

The double lyre-like figure has been reproduced by O'Meara in an exaggerated way; it is not nearly so distinct as in his figure, and is not limited by lines, but by two decussating rows a little more distant than the others.

As to the diatom which has been described by Cleve\* under this name, it belongs in all probability to another species, as he does not mention the lyre-like figure; but, on the other hand, he mentions the existence of a double row of puncta between which the median line is enclosed, which means, I suppose, that these puncta are distinct from the rest, as they are, for instance, in *M. (O.) barbadensis*, Grev.†, and which is not the case in *M. (O.) Wrightii*, these puncta not differing from the others. This would explain the remark which Cleve makes at the end of his description, when he says, "None of the figures (that of O'Meara inclusive) corresponds exactly with this species, so that the identification is doubtful." It is evident that this author has had in view some other species than the original *M. (O.) Wrightii* of O'Meara, or some variety of the latter.

67. *Mastogloia pumila*, Grun. San Pedro, not very rare. [M.]

68. *Amphora acuta*, var. *arcuata*, A. S. San Pedro, rare. [M.]

Length 0·086, breadth of the frustule 0·068 mm.; zone with 4 longitudinal divisions in 0·01 mm.

69. *Amphora acutiuscula*, Kütz. Laguna near San Pedro, common. [M.]

70. *Amphora angusta* (Greg.), Cl. San Pedro, rather rare. [M.]

71. *Amphora angusta*, var. *ventricosa*, Greg. [C.]

72. *Amphora coffæiformis*, Ag. San Pedro, common. [M.]

73. *Amphora costata*, W. Sm. San Pedro, not common. [M.]

74. *Amphora hyalina*, Kütz. San Pedro, rare. [M.]

75. *Amphora lineolata*, Ehr. San Pedro, common. [C., M.]

76. *Amphora marina*, W. Sm. Monterey, rare. [M.]

77. *Amphora ostrearia*, Bréb. San Pedro, common. [M.]

78. *Amphora proteus*, Greg. Northern California, rare. [M.]

79. *Amphiprora alata*, Kütz. Santa Monica, brackish, very common. [C., M.]

Endochrome composed of two plates disposed transversely, leaving in the centre a circular hyaline space.

80. *Amphiprora paludosa*, W. Sm. San Pedro. [M.]

\* Cleve, 'Synopsis of the Naviculoid Diatoms,' part ii. p. 148.

† 'Diatomeentafeln zusamm. f. ein. Fr.' pl. lv. fig. 10.

81. *Amphiprora paludosa*, var. *hyalina*, Eul. San Pedro, not rare. [M.]

Endochrome composed of one plate with margins indented. Length 0·033 mm.

82. *Tropidoneis elegans* (W. Sm.), Cl. San Pedro, not very common. [M.]

Endochrome composed of two plates.

83. *Tropidoneis vitrea* (W. Sm.), Cl. [C.]

84. *Campyloneis Grevillei* (W. Sm.), Grun., var. *typica*. San Pedro, rare; Monterey, rare. [M.]

85. *Campyloneis Grevillei*, var. *regalis*, Grev. Calif. guano; San Pedro, rare. [C., M.]

86. *Cocconeis costata*, Greg. Northern California, common. [M.]

87. *Cocconeis costata*, var. *hexagona*, Grun. San Pedro; Monterey, rare, marine. [M.]

Length 0·016–0·0205 mm., breadth 0·008–0·0115 mm.; axial area narrow, lanceolate.

88. *Cocconeis costata*, var. *pacifica*, Grun. Southern California (*Haliotus* washings), very common; Monterey, very common. [M.]

89. *Cocconeis dirupta*, var. *typica*, Cl. [C.]

90. *Cocconeis heteroidea*, var. *sigmoidea*, Grun. Santa Monica, on *Macrocystis*, not very rare. [M.]

91. *Cocconeis pellucida*, Hantzsch. Northern California, rare. [M.]

92. *Cocconeis placentula*, Ehr. [C., M.]

93. *Cocconeis placentula*, var. *lineata*, Ehr. [M.]

94. *Cocconeis pseudomarginata*, Greg. San Pedro; Monterey, not common. [M.]

95. *Cocconeis scutellum*, Ehr. Rare. [C., M.]

96. *Cocconeis scutellum*, var. *adjuncta*, A. S.\* Northern California, rather rare. [M.]

97. *Cocconeis scutellum*, var. *californica*, Grun. [C.]

98. *Cocconeis scutellum*, var. *ornata*, Grun. Northern California; Monterey, rare. [M.]

Length: 0·042 0·047 0·053

Breadth: 0·028 0·031 0·035

Four rows of puncta in 0·01 mm.; puncta very large, quadrangular.

\* H. Peragallo, 'Diatomées marines de France,' plate iv. fig. 2.

99. *Achnanthidium delicatula*, Kütz. [C.]
100. *Achnanthidium glabrata*, Grun. San Pedro, not rare. [C., M.]
- According to Grunow (Arct. Diat. p. 22) very common in the Pacific, especially on the coast of North and South America. Striæ 12-13 in 0.01 mm. Valve narrow, linear; looks like a small *A. brevipes*, var. *angustata*, of which it might be a variety. Length 0.046 mm.
101. *Achnanthes longipes*, C. Ag. San Pedro, rather rare. [M.]
102. *Rhoicosphenia curvata*, Kütz. San Pedro, rare. [M.]
103. *Epithemia gibba*, Kütz. Northern California, not very rare. [M.]

[To be continued.] — on A. 4. 7. 14

#### MISCELLANEOUS.

*The Locality of the Type of Prionastræa Vaughani, Gregory.*

*To the Editors of the 'Annals and Magazine of Natural History.'*

GENTLEMEN,—In the 'Annals and Magazine of Natural History' for December 1899, pp. 458, 459, figs. 2 a & 2 b, Prof. J. W. Gregory has described and named an Eocene coral from Alabama as *Prionastræa Vaughani*, doing me the honour to use my name in the specific designation. Prof. Gregory makes the following remark under the side-heading "*Affinities*":—"Mr. Vaughan informs me that the precise locality is, no doubt, Huntsville, Ala." I pointed out to Prof. Gregory, when I was in the British Museum (Natural History), that this coral was undescribed and unnamed, and requested him to please name and describe it, but he is mistaken in saying that I told him it came from Huntsville, Alabama. Huntsville, Alabama, is in the extreme northern portion of the State, in Madison County, and is only 18 miles south of the Tennessee line. Geologically, it is situated on rocks near the base of the Subcarboniferous, the Tuscomb limestone (see Eugene A. Smith's Geological Map of Alabama, Ala. Geol. Surv. 1894). I am not sure whence the type of *Prionastræa Vaughani* comes, but I am under the impression that it is from Gregg's Landing, on the Alabama River, in Monroe County. Mr. T. H. Aldrich, of Birmingham, Ala., sent the specimen to the British Museum (Natural History), but, unfortunately, seems to have no other.

Very respectfully yours,

U.S. Geological Survey.  
Jan. 21, 1901.

T. WAYLAND VAUGHAN.



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\* \* It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.



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# BIOLOGIA CENTRALI-AMERICANA.

Edited by F. D. GODMAN.

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## A CATALOGUE OF COLEOPTERA

FROM THE

### JAPANESE ARCHIPELAGO.

By GEORGE LEWIS.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

# THE ANNALS

AND

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XL.—*On the Mutual Relations of the Arctic and the Antarctic Faunas* \*. A Lecture by Professor Dr. GEORG PFEFFER, Custos of the Museum in Hamburg.

IN response to repeated invitations, I have undertaken to deliver this lecture on the relations of the faunas of the higher northern and southern latitudes; and in doing so it is my intention to submit to you not detailed observations but general reflections. I shall therefore bring the subject before you in a setting of general historical geography, but at the same time I shall touch upon all the theories which have been published, without, however, mentioning by name the various authors or giving the text of their conclusions. I have to ask you to take my lecture for what it is intended—an orienting introduction for those who have a practical or general interest in a study which is at present attracting so much attention—the investigation of the highest latitudes of our earth.

### DESCRIPTIVE.

According to temperature, the surface of the ocean may be divided into three natural regions: first, the tropical region, with a high temperature which varies but little throughout

\* Translated by Margaret R. Thomson from "Ueber die gegenseitigen Beziehungen der arktischen und antarktischen Fauna," *Verh. deutsch. zool. Ges.* ix. (1899) pp. 266–287.

the year; second, the polar region, with low temperature and slight variations; thirdly, the temperate region, with moderate temperature and great yearly variations. To these natural thermal zones there correspond similar faunistic regions; but this statement requires certain qualifications, chiefly in regard to what we are here especially considering—the animal life of the ocean-floor, the Benthos of Haeckel.

The arctic fauna shows zonal development, or, as it has been called, circumpolarity, very perfectly; while in the antarctic fauna, with the weak development and the wide separation of the coast-area characteristic of that region, circumpolarity is much less observable.

The tropical fauna is relatively uniform in its representation throughout the whole tropical zone, yet, conditioned by the formation of continents on the one hand, and by the unique horizontal and vertical motion of the water on the western tropical coasts on the other, faunas of a peculiar kind are differentiated on the west coasts of Africa and America.

In the fauna of the temperate zones circumpolarity diminishes considerably, giving place to the development of local faunas. This corresponds to the enormous formation of continents in the north, and the wide separation of coast-regions in the south; and the local occurrence of extraordinary yearly variations of temperature has a similar influence. The parts of the temperate zone which border on the tropics show likeness in many respects to the tropical zones, and those bordering on the polar zones similarly approach these, and we speak therefore of two subtropical faunas, and of a boreal and a notal fauna.

Besides the horizontal decrease in warmth there is a corresponding vertical decrease, inasmuch as—speaking quite generally—the temperature of the ocean, from the surface to the floor, gradually falls, so that all gradations from tropical warm to polar cold water are to be found.

Two regions may be distinguished in the water of the open sea: first, a superficial region, through which light penetrates, and in which both variations of temperature and the movements of the water are felt; and, secondly, a deeper region, reaching to the ocean-floor, constant in temperature and without either light or water-movements. For pelagic animals this division at once suggests a corresponding faunistic division; but, with regard to the dwellers on the ocean-floor, other considerations have to be taken into account; and accordingly the ocean, and the fauna which it

contains, may be divided vertically into the three following regions:—

First: the surface-water,—the warmest of all the vertical zones, with variations in warmth, with movement of the water, with the influence of light, and therefore with plant-growth, with a terrigenous floor consisting of rock, gravel, and sand. This region reaches, according to the locality, from the surface to a depth of from 50–150 fathoms. The expressions “surface-water” and “surface-fauna” are here used as practically equivalent to “littoral zone” and “littoral fauna.”

Second: the subsurface-water,—cool, without variations in warmth, without light, without plant-growth; its floor lies on the slope of the continents and is covered with terrigenous mud. According to locality, this region reaches to a depth of 600–1000 fathoms; its fauna consists only of the mud-eaters, and is therefore economically dependent on supplies from other regions, particularly on the assimilating flora and fauna of the adjoining surface-water. The fauna of this region resembles the fauna of the surface-water of higher latitudes.

Third: the deep water, the deep sea,—resembling the subsurface zone in its lack of variations of warmth, of light, of plant-growth, and water-movement; its floor is the bottom of the ocean, and is covered with fine slimy ooze or clay of pelagic origin; its fauna is economically independent of that of the coasts, because of the great distance between them, but, on the other hand, it is dependent on the pelagic animals, whose dead bodies form its food-supply. Apart from archaic or highly specialized forms, the fauna of this region has an arctic character; that is, it resembles the surface-fauna of the highest latitudes.

Disregarding for the present the nature of the ocean-floor, and considering the water with reference to its temperature alone, we have, first, a tropical warm water occurring only as the surface-water of the tropical zone; second, a cool subsurface-water, which, in the higher temperate zones, gradually passes over into the surface-water of a similar temperature; third, a cold, deep water, which covers the whole ocean-floor, and within the polar zones passes over into equally cold surface-water. Thus the cold water has a universal spatial distribution over the whole earth, the cool water an almost universal distribution over the torrid and temperate zones, while the warm water occurs solely as the surface-water of the tropics.

Corresponding to this there is, first, a warm-water fauna, which is developed only in the surface-water of the tropics;

second, a cool-water fauna, which extends over the whole subsurface-water of the tropics and temperate zone, as well as over the surface-water of the latter; third, a cold-water fauna, spreading over the whole floor of the ocean, and embracing also the surface- and subsurface-water of the polar regions.

The subsurface fauna is certainly not identical with the surface fauna of higher latitudes, nor the deep-water fauna with that of the polar regions; but there is, in the first place, a marked "habit resemblance" between them; and, in the second place, there is really a gradual transition, in the higher and highest latitudes, between the vertically distributed and the horizontally distributed faunas; and, thirdly, a number of northern and southern species do succeed in spreading far in the direction of the equator through the subsurface-water, just as many species of polar animals are found on the ocean-floor at a great distance from their surface-region. The historical aspect of this point will be dealt with farther on.

Herewith we conclude the first and descriptive portion of our study.

#### PROBLEM OF HISTORICAL DEVELOPMENT.

The fundamental idea of present-day science, that whatever exists is intelligible only in the light of its history, its evolution, leads us at once to the second part of our subject—the problem, namely, of the historical development of the present conditions of our ocean-fauna.

The fauna of the present day may be described as the impoverished fauna of the Tertiary period. Though a few genera of the present day reach considerably farther back, yet faunistic pictures from before the Tertiary period wear so unfamiliar an aspect that, for the study before us, which is intended only to interpret present conditions, it seems unwise to follow the roots of our fauna farther back than the Early Tertiary or the Later Cretaceous period.

#### TROPICAL CONDITIONS IN NORTH TEMPERATE LATITUDES.

In the Early Tertiary period there was in our regions a fauna of tropical character reaching at least to the latitude of Copenhagen, and we must therefore assume that, at that period, these latitudes enjoyed a climate of tropical warmth.

The legitimacy of this inference has been doubted by some palæontologists: firstly, because it might be assumed that genera, which now occur only in the tropics, had at that time

different requirements in regard to warmth, and were therefore able to live also in temperate latitudes; secondly, because, if our latitudes enjoyed a climate of tropical warmth in Tertiary times, the torrid zone must have had a hyper-tropical climate, which would have annihilated all life within it.

These objections cannot here be considered in detail, but the most important refutations of them may be brought forward.

(1) Modern biology has long since admitted that the chief factor determining the distribution of plants and of cold-blooded animals, and especially marine animals, is to be sought for in the conditions of temperature. Other conditions of life are, of course, of great influence, but they only accentuate the state of affairs primarily brought about by the temperature. Thus equality of temperature is, *ceteris paribus*, a distribution-bridge, inequality a distribution-barrier. The fauna of our tropical surface-water cannot spread from the tropics into temperate latitudes, and it is contrary to our most firmly established beliefs to assume that a fauna with a habit similar to that of the tropical fauna of to-day, and with, in the main, the same genera, can have lived in a temperate climate in Early Tertiary times. This may be especially illustrated by reference to the reef-corals, which form such a characteristic feature of the tropical fauna of to-day, precisely because of their invariable sensitiveness to less than tropical heat.

Great probability is lent to this view by the more and more pronounced separating-out of the Early Tertiary fauna into zonally disposed faunas, which took place during the Tertiary period. This point will be more fully discussed later on.

This view of the climate of the Tertiary period has been strongly corroborated by the researches of Murray and Irvine, according to which an abundant secretion of lime is only possible in a warm climate. That lime in solution is precipitated only to a slight extent in cold water, but in great abundance in warm water, is in itself only a chemical fact; but the circumstance that the animals of the higher latitudes secrete little lime, while tropical animals secrete it in abundance, at once gives the chemical fact a physiological significance. And, according to it, the formation of coral-reefs is possible only in water of tropical warmth.

We believe, therefore, that no change in the amount of warmth required by marine animals has taken place. The lovers of warm water, which were unable to endure the

cooling of the climate, died, or migrated towards the equator; while those that preferred cooler water, and had till then inhabited the subsurface-water, or, at all events, had not found their optimum of temperature in the surface-water, were now able to distribute themselves unrestrictedly over the whole surface and subsurface-water of their former habitat. There is no ground for the theory that the similarity of the faunas of higher latitudes depends on adaptation; the genera remained unchanged before and after the separation of the faunas, as is proved by the comparison of the successive faunas of Tertiary and recent times.

(2) We have now to consider the question whether science requires us to believe that, in the times when a climate of tropical heat prevailed in our latitudes, the equatorial regions must have possessed a hypertropical climate, which would make life impossible.

In the first place, we have no ground for assuming that the present-day temperature is the highest degree of warmth that tropical animals are capable of enduring, or even that it affords their optimum of warmth. On the contrary, we have observations enough to show that tropical animals can very well endure a temperature considerably higher than that of the tropical surface-water. We know, too, that along the continental west coasts the cold currents extend into the tropical zones, and that, within these, cold deep water wells up, and the warmth of the surface-water is thereby materially lessened. As the causes of these horizontal and vertical water-movements are not local but telluric, they have held good for all ages. We can therefore imagine that, at a time when the surface-water on the east coasts was actually uninhabitable by living beings on account of its great heat, there may have been, in the regions of the continental west coasts, a climate which animals with the same warmth-requirements as our present-day tropical animals could quite well endure.

It has also been shown that it is in no way proved, as many have assumed on *a priori* grounds, that the same difference of temperature must have existed between the temperate latitudes and the equinoctial zones in the Early Tertiary or the Later Cretaceous period as obtains at the present day. This question has been discussed by me from the climatological point of view and by Dubois from the cosmological. These discussions do not, however, lie within the scope of our present problem.



## OTHER VIEWS.

This is perhaps the fittest place to discuss some of the other views which have a bearing on the question before us. A few investigators have admitted that it is necessary to assume a climate of tropical warmth in our latitudes to explain the Early Tertiary fauna; some of these, however, regard it as a local phenomenon, while others call in the aid of cosmic changes on a large scale.

There is on the whole earth no other spot where all the factors which make for the amelioration of the climate and the warming of the surface-water are combined in anything like the same degree as on the Western and North-western coasts of Europe; it seems impossible to find conditions better fitted to bring about this result than those now prevailing; so that in general this objection is hardly entitled to serious consideration.

Other investigators incline to the view that the earth's axis has so altered its position either within the earth itself or in relation to the earth's orbit that the climatic zones of earlier geological times were quite differently arranged, and may have shifted periodically over the earth's surface. But astronomers refuse to admit the possibility of variation on such a scale, and geology and palæontology offer no evidence of it. Moreover, from the palæontological records of the Tertiary period it can be proved that there is no ground for such an assumption, at least in regard to that period, with which we are alone concerned.

We are now in a position to see that there is no argument of any weight against regarding the Early Tertiary fauna as one of tropical habit. We have further seen that a climatological consideration of the problem excludes the theory that the fauna was a local one. Geological-palæontological inquiry yields the same result, inasmuch as the Early Tertiary faunas of tropical habit have been demonstrated from the most different parts of the earth, even from the southern hemisphere. We have accordingly to assume that in those times a climate of tropical warmth, with a fauna of tropical character, extended over the greater portion of the temperate zones.

## ORIGIN OF ZONALLY-DISPOSED FAUNAS.

Now that we have seen that the climatological consideration of the Early Tertiary by reference to its faunistic materials is a scientifically justified standpoint, we have every ground for maintaining this standpoint with regard to the

faunistic variations of the Later Tertiary also. And if palæontology teaches us that towards the close of the Early Tertiary in our latitudes the components of the Early Tertiary fauna of tropical habit disappear, that in the Middle Tertiary in our latitudes a fauna is found which resembles the present Mediterranean fauna in habit, and that, finally, in the more recent Tertiary the character of the fauna approaches more and more closely to that of our present-day fauna, then we may, indeed we must, assume that corresponding climatic changes underlie these faunistic variations.

A gradual shrinking-back of the tropical climate from its former wider domain must have brought about a zonally-disposed separation of the Early Tertiary fauna, inasmuch as only those members of the old fauna as were able to endure the lowering of the temperature could remain behind. The zonal disposition of the marine benthos-fauna of the present day is quite distinctly marked over the whole earth, although the definiteness of this is influenced by the development of local faunas. Then we have every reason to argue retrospectively and to assume that all the zonally disposed faunas of the earth have had the same cause, and that they have all originated through a zonal separating-out of the Early Tertiary fauna.

This theory becomes a certainty when we consider circumboreality. There is a large number of species which occur both in the North Atlantic and the North Pacific Oceans, without, however, extending into the arctic or torrid zones; indeed, there are similar boreal-European, East American, West American, and North Japanese species on the one hand, and, on the other, similar South-European and Japanese species. Now it cannot be seriously maintained that in recent Tertiary or still later times there may have existed in the boreal or warmer temperate zone a connexion between the Atlantic and Pacific through America or Asia; but the theory that similar relics of the Early Tertiary fauna must have remained at places of similar climate at once explains every peculiarity in the palæontological data, and it is quite indifferent whether at the time of the separation of the faunas the different boreal regions of the Atlantic and Pacific side were wholly and impassably separated from each other or not. If we have thoroughly grasped the historical conception of the evolution of faunas, particular cases of notal circumpolarity, such as we find developed at the southern extremities of the continents, at once become intelligible.

Finally, we have to go a step further, and assume, on the authority of palæontological observations, that in the later

Cretaceous period the old fauna with the habits of our present-day tropical fauna extended further northwards than in Early Tertiary times. Our studies have already shown us that we cannot regard such a condition as a purely local one, and so we arrive at the theory that in the middle of the Cretaceous period a climate of tropical warmth must have prevailed over the whole region of the present temperate zones.

#### SURFACE- AND SUBSURFACE-FAUNA IN TERTIARY TIMES.

Up to this point we have characterized the Early Tertiary fauna quite generally as one of tropical habit; this brief designation now requires further analysis. If we make a table of the genera of molluscs (the molluscs form, above all other classes, the material skeleton for all palæontological and zoo-geographical studies of marine fauna) from the Early Tertiary in our latitudes, and note their distribution in the present surface-water, we find among them genera which now occur only in the surface-water of the tropics; but beside these are components of subtropical habit, of the habit of our North Sea forms, and, finally, also boreal and even arctic genera which never occur in the surface-water of warmer regions. But the Early Tertiary fauna cannot be compared with the surface-water fauna of the tropics; it corresponds rather to the surface-water fauna plus the subsurface-water fauna. If, nevertheless, we still characterize it as a fauna of tropical habit, we are justified by the consideration that in the tropics, and nowhere else on earth, warm-water, cool-water, and cold-water animals may occur quite close together, may, indeed, be disposed vertically under one another.

It is a question whether the strict separation between the surface- and the subsurface-fauna obtaining in the tropical fauna of the present day already existed in the fauna of the Early Tertiary; there seems much to be said on both sides. We may, however, leave this question open until exact statistics regarding it are compiled, and this for two reasons. First, supposing that the subsurface-fauna of the Early Tertiary extended into the region of the surface-water and mixed with its fauna, the change of climate during the Tertiary period would have brought about exactly the same consequences so far as the present-day fauna is concerned, as if the separation of the faunas into surface- and subsurface-faunas had taken place before the change of climate. So far as our present study is concerned, it is quite indifferent whether the subsurface-water fauna was actually or only potentially in existence in the Early Tertiary period; in

either case the forms most capable of resisting cold, and therefore best suited to a cooler environment, would remain in their old habitat.

Secondly, although the separation of the surface- and subsurface-water faunas in the warmer regions of the earth appears to be fairly distinct, the Mediterranean forms an exception. Quite half the molluscs of the western shores of Norway and fully a quarter of those of the coasts of arctic Norway occur in the Mediterranean; but it is quite out of the question that in the Mediterranean they live only in the deeper layers of constant temperature. It is of course possible that faunistic displacements occur according to the season, so that Mediterranean animals of northern and arctic character live in the surface-water only in winter; on comparatively steep shores the distance, for many at least, would not be too long. Unfortunately I know of no data on this last point so far as it affects the benthos animals. Nevertheless the state of affairs in the Mediterranean confirms our conclusion that the separation between surface- and subsurface-*fauna*, whether it be actual or only potential, is not of supreme importance.

#### CIRCUMTROPICITY OF THE EARLIER TERTIARY FAUNA.

And now that nothing more stands in the way of the recognition of our Early Tertiary fauna as one of tropical habit, we come to the question of the development of its circumtropicity. The surface-water fauna of our tropics is circumtropical, and this holds true of by far the greater number of genera and even of many of the species. The similarity of many species from the Indo-Pacific and West-Indian seas, and, on the other hand, from the eastern and western shores of Central America, proves to us that the modern separating conditions have not sufficed to efface circumtropicity, and that, if these separations were suddenly to disappear, the circumtropicity would be expressed throughout the whole region to a much more perfect degree.

Thus the surface-water fauna of our present tropics is the remains of the Early Tertiary fauna shrunk back into the equatorial zone; it lives in approximately the same thermal conditions as the ancestral fauna enjoyed in our latitudes. On what possible grounds, then, can it be asserted that circumtropicity was less developed in the Early Tertiary fauna than in the present surface-water fauna of the tropics?

No one doubts that the subsurface-fauna of the Early Tertiary, whether it was actually or only potentially developed, may have been distributed over the whole area of

sufficiently cool water, since this quite agrees with the now prevailing conditions of the subsurface-water fauna.

We must accordingly expect to find in the oldest and earlier middle Tertiary a large number of species identically occurring in the northern and southern hemisphere—for instance, in our own region and in South Australia. If we simply compare the lists that have been drawn up, this certainly does not seem to be quite the case; but if we take account also of the remarks made by the authors, we find that there is a large number of species closely allied to and difficult to distinguish from those of the Antipodes of a similar age. When, further, we recall that the palæontologists of different countries have very often named their species with little or no reference to the work of their colleagues, we have to admit that the circumtropicity of the earlier Tertiary faunas was so strongly marked that it extended not only to the great majority of genera, but, in a great many cases (whose number future studies will probably increase), even to species. And thus it is certain that the Early Tertiary fauna had an approximately similar uniform expression or representation throughout the whole region of its distribution.

#### “UNIVERSAL” FAUNAS.

The palæontologists of the newer school are for the most part strongly opposed to the theory of faunas of cosmopolitan or universal character. Of course, if by a fauna of universally or uniformly similar character any person means one which exhibits in every locality throughout its region a similar combination of genera and species, he is asking more from Nature than it is reasonable to expect, and neither zoologist nor palæontologist can agree with him. We have, however, on the earth at the present day two universal or uniformly differentiated surface-water faunas which we know thoroughly—the arctic and the tropical—and through these we can best learn to recognize the characters of a uniformly differentiated or “universal” fauna. In the arctic fauna circumpolarity is exhibited by a large percentage of species, and we get the impression that it has hitherto been prevented in a considerable percentage more by some hindrance or other, and that if all distribution-barriers were swept away circumpolarity, and therefore universality, would reach the highest possible degree of development within the arctic zone. Even in the arctic fauna, notwithstanding its pronounced circumpolarity, local differentiations have developed, and also local varieties and races; but it seems quite certain that, if the local causes

were removed, these would be extinguished, and would merge themselves into the general circumpolarity.

The case is the same with the tropical surface-water fauna; the faunas of the West Indies and of Panama were not always separate, as they are now, for in pre-Miocene times the West Indian overlapped that of Panama and has left its traces there to this day. Thus we see that the absolute circumpolarity of the tropical surface-water fauna is present but latent, and that it is exhibited as soon as a possibility of wider distribution arises. And if we consider aright the enormously wide distribution of the uniform tropical fauna from the east coast of Africa to the Pacific Islands, we see that, if the continent of Africa were to sink, or to be broken up into a tropical archipelago, the tropical fauna would spread itself over that region also. All that we learn from the tropical fauna goes to show that the local gradations, even those exhibited by West Africa and tropical West America, would disappear if the distribution-barriers were removed. And therein the "universality" of a fauna lies—not in the development of an absolutely similar combination at every spot in its region, but in the fact that the potentiality to this exists, and becomes a reality as soon as the hindering causes disappear. The development of local faunas in no way affects the existence of a contemporaneous and coextensive "universal" fauna.

Besides these two surface-water faunas there is a universally developed subsurface-water and deep-sea fauna, both of which we know less thoroughly than those already treated of. There is also a universally differentiated pelagic fauna of the warmer seas. The works of Keller and Brandt on the Suez Canal and the Baltic Canal show us the rapidity with which the spreading of a fauna takes place in similar climatic conditions after the removal of the barriers to distribution. Furthermore, the forward and backward displacements of the northern and arctic faunas during the Glacial periods are well known.

There are certainly palæontologists who do not agree to the limitation of the conception of a universal fauna which I have here proposed; but these must remember one thing—so long as they look on fossils as stones they may have an opinion with regard to their distribution founded only on their observations, but as soon as they begin to see in the fossils the living beings of an earlier epoch they must take the standpoint of modern biology—that is to say, they must work along with biologists and rely upon the well-established results of biological observation.

Further, the supporters of the theory of the permanency of climatic faunas must remember that it is plainly irreconcilable with the modern doctrine of evolution. If the individual climatic faunas had developed each for itself from the very beginning of the world, the types, wherever arising, could never have spread over the whole earth; each faunistic region would have had its own phylogenetic history from the oldest pre-Cambrian times till now. This, however, does not accord with any palæontological picture whatever, nor with that afforded by recent zoology and botany.

We have hitherto based the theory of the universal character of the Early Tertiary fauna on palæontological data, and on the relations of that fauna to the present tropical surface-water fauna. We now come to a third consideration.

#### BIPOLARITY.

Nearly all authors who have worked at the fauna of the higher southern latitudes speak of the great "habit-resemblance" of this fauna to that of the higher northern latitudes. This likeness is, however, impaired by the fact that the South-American and Australian faunas send their southern stragglers into these regions; further, the extraordinarily slight development of circumpolarity renders the presentment of a complete picture of the fauna as a zonally disposed whole extremely difficult; and, lastly, we know nothing of the fauna of the real antarctic.

In the year 1890 I attempted a sketch of the surface-water fauna of the higher southern latitudes compared with that of the higher northern latitudes, which, apart from the errors and inaccuracies involved in statistics of that nature, presents a fairly complete picture of the scientific data at that time, for it is based on the collected literature and on the works of authoritative writers.

This work brings out two points which are of essential importance in judging of the resemblances—first, the resemblances in the various divisions of the animal kingdom are very unequally expressed, being in some cases quite surprising and in others hardly noticeable; secondly, even the absence of many families and genera distributed over the warmer seas contributes to increase the habit-resemblance of the two faunas of the higher latitudes. For the theory we are now occupied with, that all the climatic faunas have arisen from a separating-out of the Early Tertiary or pre-Tertiary fauna—that is, through a kind of selection—a negative resemblance is quite as important as a positive one, though it is less evident.

In 1896 Sir John Murray published a very minute investigation into the distribution of all the species occurring in the Kerguelen region, and his results agree entirely with mine. On that occasion he also collected the remarks of various writers on this subject, and showed how strongly the likeness between the forms of the higher southern and higher northern latitudes has impressed many.

On the publication of the 'Ergebnisse der Magelhaensischen Sammelreise' the editors expressed their sense of the importance of this point by the request that every worker at a group should take account of its arctic-antarctic relations. Schaudinn and Römer expressed the same wish in the programme for the publication of the results of their Spitzbergen expedition.

The papers which appeared in the 'Ergebnisse der Magelhaensischen Sammelreise' and in the publication of the results of Plate, Nordenskiöld, and some others on the animals of higher southern latitudes have not altered in its essential features the picture which I sketched in 1890. The same holds true of other hitherto unpublished investigations, which have been communicated to me verbally, and, further, of my own work, which for some time has never been interrupted, on the rich material of the Hamburg Museum, which every year receives new and important contributions from the southern point of South America. One thing can be affirmed with decision—that the theory of the great similarity of the faunas of higher northern and southern latitudes receives new support from the working out of nearly all groups; and the accord between the two faunas extends to hundreds of genera.

Of the genera which occur as members both of the arctic-boreal and subantarctic-notal faunas, a number are found within the equatorial regions either in the surface- or subsurface-water, but a considerable number are absent from this region. Of the numerous species occurring *both* in the higher northern and southern latitudes, on the other hand, only a few are distributed through the tropics. In my paper of 1890 I have called those species and genera which are absent from the equinoctial zone, and which, owing to the discontinuity of their representation, especially demand explanation, "bipolar," and their mode of distribution "bipolarity."

Let us now return to a point which we reached earlier in our study—namely, that palæontological records show a great accord between the Early and Middle Tertiary of Central Europe on the one hand, and of South Australia and the great Australian islands on the other. This similarity extends, among Mollusca probably, among Bryozoa



certainly, in some cases even to species. If we find the Early Tertiary fauna, whose composition was "universal," developed as far as the latitude of Copenhagen in our hemisphere, there can hardly be any objection to the assumption that in the southern hemisphere it was developed to similar latitudes, and in that case it must have embraced all the localities which now make up the area of the so-called subantarctic fauna. When, owing to the gradual cooling of the climate in the course of the Tertiary period, the components of the old fauna of tropical habit withdrew from the higher latitudes, and those remaining in the old place formed a zonally-disposed relict-fauna, according to their power of resistance to low temperature, identical or similar forms of course remained behind in the corresponding northern and southern latitudes, and not similar genera only but similar species. Both from our own and from the Australian Mid-Tertiary we know a number of species which have persisted to the present day. In the same way quite a considerable number of species have remained unaltered on the east and west coasts of Central America since the Miocene period; and there is nothing to prevent our assuming that, in the higher northern and southern latitudes also, a number of species may have remained unaltered from the Mid-Tertiary till now, and this could take place as well in the north as in the south, so that, at the present day, identical species occur in the northern and southern latitudes.

If the components of the Early Tertiary faunas of tropical habit withdrew from our latitudes towards the end of the Early Tertiary, this process of selection or separating-out must have taken place in higher latitudes proportionately earlier, in the true polar zone certainly in the Cretaceous period, if not before it. Now, no one assumes that animal species (here I exclude the Protozoa) have remained unchanged from the earliest Cretaceous period, or farther back, until the present day. And if certain species actually occur in higher southern latitudes which are also known from the Arctic fauna, it is simplest to assume that these animals did not remain behind in the polar zone in Mesozoic times, but that they remained in the cooler temperate region in Tertiary times, and thence extended their distribution towards the pole.

It may here be mentioned that it is not necessary to picture the corresponding stages of the separation of the faunas as quite simultaneous in both hemispheres; the result is the same though corresponding phases in north and south may not have taken place at exactly the same geological time.

## DEEP-SEA FAUNA.

Reasons of a theoretical kind, which I have elsewhere analyzed, make it probable that the peopling of the deep sea with living creatures first took place from the polar zone in Mesozoic times. Observation shows us that, even now, animals from higher latitudes—by no means all, but very many—descend to the deep sea. The peopling of the deep sea from the polar zone has thus been an uninterrupted process from the Mesozoic age till now. Therefore we find in the deep sea a mingling of either archaic or highly adapted—*i. e.* certainly very old—forms with those of the same habit as our present polar animals. Of an *Eryon*-like Crustacean or a *Salenia* I can say with certainty that it belongs to the old immigrants, and with probability I can say the same of those quite peculiarly adapted deep-sea fishes of the families of the Ophidiidæ, Macruridæ, Murænidæ, and so on. But I cannot affirm it of a *Leda* or *Nææra*, for these genera date from the Palæozoic or Mesozoic age and are still living; the species in question or their ancestors may belong to the oldest or most recent migrants to the deep sea.

If I find a species in the deep sea in the northern hemisphere which still lives in the surface-water of the arctic or boreal zone and there only, I can say that the immigration is of comparatively recent date; but if the species is already known from the Mid-Tertiary, I am forced to say—and with the greatest probability—that the immigration dates from the middle of the Tertiary period; for there is no reason why a species which descends to the deep sea to-day should not have so descended at any period of its existence. The probability that the deep-sea species of arctic origin did not migrate in the present-day period is increased by the fact that now, by suboceanic upheavals, the polar zone in the Pacific Ocean is absolutely, and in the Atlantic almost entirely, shut off from the deep sea of the temperate zone.

The age of the great majority of marine species dates back to the Tertiary, perhaps even to the Mid-Tertiary period. We may therefore assume, even in the case of species whose palæontological age we do not know, that the process of their migration into the deep sea occurred in Tertiary times, and that this process has certainly gone on in the south uninterruptedly to the present day, while in the north it has now become considerably restricted.

Now, for *Mid*-Tertiary times the similarity of species in our latitudes and in South Australia is established by palæontological research. If we find one of these species in the deep sea

we cannot say whether it has migrated from the north or from the south; but as every migration demands time, we can assume with some probability that those occurring in the temperate zone of the northern hemisphere have come from the north, and those in the southern from the south. But if it were the case that the time which a species requires to migrate over the whole deep sea from one polar zone to the other were trifling in comparison with the length of its sojourn in the deep sea, one could no longer say that an example found near Scotland came from the north, and one found near South Georgia came from the south. But this is not at all how matters stand. Murray has compiled exact statistics of distribution for the Kerguelen region; I myself have extended these for the whole earth, though they are still far from being complete. But one thing seems fairly well established, that practically all the unipolar surface and subsurface animals of the higher north and south, which descended into the deep sea, have penetrated to the borders of the tropics or into the tropical zone, but not beyond it into the opposite hemisphere. An example known to most zoologists is furnished by the genus *Serolis*, of which many species are developed in the notal surface-water, and a still greater number in the deep sea, yet its range, apparently, does not extend beyond the equator.

It would seem, therefore, that the time which has elapsed since the present surface-water species of the higher north and south descended to the depths has not sufficed for a migration beyond the equator to the opposite hemisphere; the exceptions to this rule disappear almost wholly, if not wholly, on closer consideration, although for certain species of Sponges, Worms, and Bryozoa we must assume an age extending beyond the middle Tertiary period—and this is in no way at variance with the facts.

#### SUBSURFACE-FAUNA.

We have now to deal in a few words with the subsurface, in the same way as we have dealt with the deeper water. We know that in Early Tertiary times a universally homogeneous fauna extended over the tropics and the temperate zones. Thus the similar species of north and south had a continuous connexion through the tropical zone. This continuity through the tropical zone was probably kept up in part through the deep water. As within the tropical zone at the present day, the fauna of northern habit is found exclusively in the subsurface-water (we shall have to consider later the peculiar conditions of Western America), nothing is more obvious than that there

exists even now a continuous connexion through the subsurface-water of the tropics between the identical genera and species of the higher latitudes. Curiously enough, this is corroborated by actual observations only in part as regards genera, and not at all as regards species. And so it seems certain, just as in the case of the deep sea, that the species occurring alike in the surface-water of the higher northern and southern latitudes have in general in the tropics an interrupted discontinuous distribution, notwithstanding the fact that it must have been continuous up to *Mid-Tertiary* times.

The remarkably poor development of the fauna of the tropical subsurface-water, as revealed by deep-sea investigations, gives us a hint as to the cause of this phenomenon. The reason of this retrogression may lie in the extraordinary development in the tropics of reef-facies, which, absorbing almost all the supplies of the surface-water, may have overwhelmed the other members of the old fauna, or crowded them into the deeper water: the forms adapted to the region of light perished, the mud-eaters went down to the deep sea. Thus the subsurface-water fauna by no means corresponds to the surface-fauna of higher latitudes, but only to the mud-eating portion of it. The change in the internal economic conditions of this community, the gradually enforced economic dependence on an altered surface-water fauna, and the change of the mud-bottom to one of coral-mud, must assuredly have worked towards the impoverishment of the fauna; but a still stronger influence must have been exerted by the probable scantiness of nutrition in the coral-mud, which had already passed through the food-canal of fishes as pieces of lime, and of echinoderms as coral-sand.

Now the coral-reefs are not developed on the west coasts of Africa and America, so that we might expect to find there the continuity in distribution of at least some bipolar species, which is rendered difficult, if not altogether suppressed, within the coral-region. But the state of the subsurface-water fauna of Africa is practically unknown; though Von Maltzan mentions the stunted growth of the Senegambian forms of *Pleurotoma* as compared with the same species from the Mediterranean\*. We have gained some knowledge of tropical West

\* Professor Chun, in his admirable work on the German Deep-sea Expedition ('Aus den Tiefen des Weltmeers,' Jena, 1900, p. 75), says concerning the nature of the West-African coast:—"We were less satisfied with the results of the trawling operations, which we made to depths of 4900 m. The bottom of the deep sea in these regions is covered with a disagreable, viscous, blackish ooze, apparently mixed with the mud

America through the researches of the 'Albatross,' but there still remains too much to be worked up to allow us to suggest reasons why a subsurface-water connexion between the similar forms of north and south has not been discovered on the western shores of tropical America. Possibly such a connexion may some day be established for one or other group of animals. If, personally, I doubt this, it is for two reasons. In the Panama province there is certainly no coral-reef formation, but there is a surface-water fauna of tropical character, and in times not very long gone by there was really coral-formation. The reasons for a more or less marked suppression of the subsurface-water fauna by the tropical surface-fauna may hold good in this case also to a greater or less degree.

Secondly, corresponding to the remarkably equable climate, we find, on the west coast of America from the temperate southern to the temperate northern zone, a fauna of nearly homogeneous character, interrupted only in the narrow province of Panama. In general character it may be described as a cool-water fauna, but it has undergone quite remarkable local differentiation. This fauna springs, apparently, from the southern hemisphere; and thus, probably in ancient days, possibly before the time of the separation of the faunas, this fauna of southern origin gradually conquered its present region—that is to say, it crowded out more or less the members of the universal fauna.

Thirdly, Agassiz expressly mentions the poverty of the depths examined by him on the 'Albatross.' He accounts for this by the fact that the currents on the tropical shores of West America waft in a comparatively limited quantity of pelagic organisms, which would afford food for the inhabitants of the deep sea. As the animal world of the deep sea is wholly, and that on the slopes of the continents partly, dependent economically on the pelagic fauna, we have here a reason of great importance, and one which would apply in the main to West Africa also. In the same way, it must be taken into account that the extreme narrowness of the continental slope affords anywhere the opportunity for an interruption of faunal continuity.

I cannot omit to refer here to a fact which may be brought

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carried out by the great African rivers." Probably the bottom of the continental slope shows these river-deposits in a still higher degree, so that we may have a similar state of affairs as, for instance, on the east coast of temperate South America, where the mouths of the Rio Negro and Rio La Plata form barriers between the South Brazilian and the Patagonian littoral and continental faunas.

forward in connexion with the discontinuity of the cool-water fauna in the subsurface-water of the tropics—namely, the influx of subterranean rivers. As most subsurface animals may dispense with pelagic larval stages, submarine river-mouths would possibly form barriers to distribution. And in general I wish to call attention to the fact that all the conditions which may have contributed to the impoverishment of the tropical subsurface-fauna need not extend over the whole area to bring about this result.

#### PELAGIC FAUNA.

Finally, I should like to touch, in a few words, on the bipolarity of the pelagic animals, although this does not really form part of our present theme. The theory has been promulgated, on the strength of isolated results, that the bipolar plankton species only seem to be bipolar, but really have a continuous distribution either through the deeper water (Chun) or in the surface-water (Lohmann) of the tropics. No objection can be offered to either assumption in itself; the Early Tertiary condition would have persisted till the present day, just as has occurred exceptionally among benthos forms. Moreover, all the objections which have been cited above against a general meeting of northern and southern forms in the subsurface-water of the tropics refer to conditions which affect the benthos animals alone. But it is certain that a connexion through the deeper water is scarcely possible for the plankton plants and the animals directly dependent on these. Therefore this theory yields no general principle of explanation applicable to the whole of the conditions. But we know enough to be justified in assuming that there was in Early Tertiary times a pelagic fauna of almost universal distribution and composition, and that, therefore, the presence of similar genera and species of plankton animals and plants in the higher latitudes of the earth must date back to the Tertiary period. The pelagic fauna of higher latitudes may therefore be looked upon as a relic of the Early Tertiary fauna, and the connexions now existing through the tropics offer no explanation of the existing plankton conditions of higher latitudes, but are to be regarded either as likewise relics of the Early Tertiary fauna or as local and relatively transitory pushings forward of the fauna of higher latitudes.

#### OBJECTIONS TO THE THEORY OF BIPOLARITY.

The position we have reached is thus as follows:—There

is in the tropical zone a considerable discontinuity in the distribution-region of several hundreds of genera of surface-water animals occurring in the higher northern and southern latitudes, and also in the distribution of very many—in any case far more than a hundred—species of higher latitudes. Either the discontinuity is really present in the tropical zone, or it appears to be so because of the present incomplete state of our knowledge. The reasons for the first supposition we have already discussed. Reasons in favour of the second case undoubtedly exist also, and I believe that, with the further progress of our knowledge, some regions of distribution which are now believed to be discontinuous will be found to be continuous. But that this may prove so in all cases is an assumption which receives no justification either from general considerations of probability or from the present state of our knowledge. And it is not only our right, but our duty to base our theoretical assumptions on the state of knowledge at the time. But even if we go the length of assuming that all bipolar genera and species may disappear from science, will that affect a single point in our theories of the relation of the arctic and antarctic faunas? The Early Tertiary roots of our present fauna remain the same whether bipolarity exists or not; and the similarity between the faunas of higher latitudes also remains the same, whether the distribution-regions of the genera or species be continuous or not.

The possibility, however, that a continuous distribution through the deeper waters of the tropics may be demonstrated for all the coeval surface-water inhabitants of the higher northern and southern latitudes is simply not to be thought of. The marine plant-world of the higher latitudes exhibits quite a pronounced bipolarity; and the idea that this should extend through the lightless layers of the tropical subsurface-water beyond the equator cannot be entertained. The same, of course, holds true of all animals which are directly dependent on the plant-world. So that, as a general principle of explanation, we may dismiss the hypothesis that the surface-water animals of higher latitudes have a continuous distribution through the deeper layers of the subsurface-water of the tropics. This, of course, does not prevent us from supposing that the assumed connexion, which must have existed at one time, does actually occur in some cases at the present day, both in the deeper strata and in the surface-water.

There is still another possible way in which the examples of bipolar genera and species, which have hitherto been present in literature, may disappear from science; that is, by

the breaking-up of the genera and species in question into two or more. But what precise extension is given to the terms genera and species is purely a matter of taste; the actual facts are in no way affected. Further, whether we have to do with actual or assumed continuity in time and space, the warrant for the conception of species disappears: for historical-geographical considerations it is too contradictory; the ideas of species as something separating, and of development in time and space, are incommensurable. Thirdly, for the purpose of our present study it does not matter at all whether the representatives are regarded as identical species, or as different forms of the same species, or as nearly related species. The point is in the evidence of close relationship, and it does not matter much what systematic expression we give to this fact.

#### CONCLUSION.

We have now reached the end of our study. We have seen that the faunas of higher latitudes represent the coeval relics of the almost uniformly developed and almost universally distributed Early Tertiary faunas, as they have been evolved under the influence of the cooling of the climate, by a process of separating out and selection. The similarity of the operating causes secured that the same components of the old fauna remained behind in both north and south; and thus has arisen the great and still well-marked similarity of the two faunas.

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XLI.—*On a Collection of Spiders from the Bahama Islands made by J. L. Bonhote, Esq.; with Characters of a new Genus and Species of Mygalomorphæ.* By F. O. PICKARD  
CAMBRIDGE, B.A.

[Plate VII.]

A SMALL but valuable collection of Arachnida was made in the neighbourhood of Nassau by Mr. Bonhote and presented to the British Museum. Amongst other interesting forms were two adult males of the family Theraphosidæ, large hairy spiders locally termed Tarantulas. For these a new genus has been made, and the species is also new: it is characterized by the presence of stridulating-spines on the trochanters of the first pair of legs and the palpus.



Should this paper fall into the hands of anyone interested in the natural history of their surroundings, situated in any of the islands of the Antilles, I would like to urge that collections, however small, are always valuable when brought from adjacent islands forming a large group, more especially if a number of examples of the commoner and more obvious forms be sent also.

In this way alone can we determine the identity of the many forms which have been described from different islands as distinct species; and by securing sufficient material we may be able to trace the gradual transition of a species through successive islands until it passes into some extreme form which has hitherto perhaps been regarded as a distinct species.

Given a sufficient lapse of time, each island may produce, from the same original form common to the whole district before its separation into groups of isolated islands, a species, or at all events a local race, peculiar to itself, diverging under different conditions, prevented by physical obstacles from interbreeding with those of neighbouring islands, and thus at last perhaps becoming a true species, physiologically distinct as well as geographically separated; for in dealing with forms in which the male and female are each highly specialized individuals of different sexes the distinctness of two species must depend on whether they will cross-breed or not normally, as a rule, under natural conditions of life. If they interbreed freely they cannot be distinct species, while if they interbreed occasionally, but not as a general rule, the two forms may be gradually becoming divergent, and finally become physiologically distinct.

A variety is held to be an individual variation of either sex where these sexes interbreed freely. A local race is composed of individuals all of whose members differ slightly but constantly from those of apparently the same species in another locality more or less isolated from the first. The question as to what is a species, a local race, and a variety is impossible to settle definitely so long as the natural process of the separating into groups and the elimination of intermediates is in progress.

Thus it is of very great interest to learn how far forms which have probably been geographically separated for centuries have passed through the stage of individual variation, have reached the status of local races, or have already become physiologically distinct species.

The conditions for the observation of these phenomena ought to be exceedingly favourable throughout the numerous

islands of the Greater and Lesser Antilles and the more adjacent regions of the mainland all round.

If it be asked what are the final tests of a distinct species of spider, one can only say that a long course of experimental interbreeding under perfectly natural conditions, settling which would breed together and which not, might solve the problem. Such an investigation being impossible, one has to fall back on the comparative anatomy of the genitalia. If these are identical in a number of individuals of different sexes, the latter are held to belong to one and the same species. If not structurally identical, then the forms are regarded as distinct species, on the supposition that two different forms of male organ are not adapted to the fertilization of one form of the female organ.

### Fam. Theraphosidæ.

#### LYROSCELUS, gen. nov.

Femur iv. not scopulate on inner side. Tarsal pads not divided; scopula interspersed with a few scattered hairs only towards the base. Protarsus i. scopulate to base, with a single spine on inner side only at the base. Apex of tibia i. bicalcarate. Protarsus iv. scopulate at extreme apex only. Legs spinulose, especially iii. and iv. Apical third of labium and inner anterior angle of coxa of pedipalp spinulose. Trochanter of leg i. with 10–12 stout clavate stridulating-spines on the inner side, extending over the upper two thirds of the segment; opposed to these are 15–16 long, stout, slightly clavate spines, situated on the outer side of the trochanter of the pedipalp, extending over the central half of the segment.

#### *Lyrosceles Bonhotei*, sp. n. (Pl. VII. figs. 6, 6 a.)

*Colour.* Carapace clothed with a very pale bronze covering of shaggy hair. Mandibles brown, with a basal dorsal clothing of the same pale bronze hairs. Legs clothed with coffee-brown hairs, interspersed on the protarsi and tarsi with long scattered rufous hairs. Femora and patellæ of legs, especially i. and ii., clothed with golden-bronze hairs over the dorsal and externo-lateral areas.

Abdomen clothed with darker coffee-brown hairs, interspersed, especially towards the spinners, with long rufous hairs.

Sternum and coxæ of legs coffee-brown; coxæ of pedipalp and fringe on fang-groove of mandibles bright rufous.

*Measurements.*—Carapace 18 × 15 millim.; pat. + tib. i. and

iv. 20 millim.; protarsus i. 13 millim.; protarsus iv. 18 millim.

Tibia of pedipalp with a low convex tubercle on the outer side towards the apex. Bulb short, piriform, aculeate, its apex (from in front) only slightly directed outwards.

Tibia of leg i. with two stout spurs at apex, the outer long and strongly curved upward and inward, with a stout coalescent spine at its apex on the inner side. The inner spur much shorter, broad, with a stout almost coalescent spine on its inner side.

Two adult males of this fine species were taken at Nassau in the Bahamas by Mr. J. L. Bonhote. The position of the stridulating-spines is a new one, for although the form of the spines is similar to that in *Citharoscclus*, Poc., yet they occur on different segments of the two appendages, namely, in the latter on the coxa, in the former on the trochanter. *Citharoscclus*, moreover, belongs to a different group, having the protarsus i. scopulate only halfway to the base.

#### Fam. Filistatidæ.

##### *Filistata hibernalis*, Hentz.

Adults of both sexes of this species, which is abundant in other islands of the Antilles as well as in North, Central, and South America, were taken in the Bahamas.

#### Fam. Heteropodidæ.

##### *Heteropoda venatoria* (Linn.).

Two very richly coloured adult males from Nassau.

#### Fam. Argyropidæ.

##### *Nephila clavipes* (Linn.). (Pl. VII. figs. 1-4.)

Two adult females and an adult male were taken by Mr. Bonhote at Nassau of a species of *Nephila* which is most probably identical with that figured in Browne's 'History of Jamaica.' This figure is the type of *Araneus clavipes* of Linnæus, which has usually been distinguished from *N. cornuta* (Pallas) (Pl. VII. figs. 5, 5 a) by the absence of the two small horns on the carapace.

Another character distinguishing various examples of *Nephila* lies in the tufts of hair on the legs. Some have them very distinct and large on the tibiæ and femora of legs i. and ii. and the tibiæ of iii. and iv., while in others they are

much less evident and almost or entirely absent on the femora.

Several of these forms have been described as different species by various authors, the differences being based on the presence or absence of the horns on the carapace and the nature of the tufts on the legs.

I am, however, myself not able to confirm the distinction of species on these characters, and strongly suspect that in reality there is only one species embracing all these forms. It is therefore very important that we should be able to examine males and females of these large and easily recognizable spiders from as many of the islands of the Greater and Lesser Antilles as possible, and especially from Jamaica, for it was in this island that the type of *Ar. clavipes* of Linnæus was taken.

At first sight it might be supposed that there were either *two* species, one with and the other without the cephalic horns, and two varieties of each of these, one with the legs thickly tufted and the other with the legs much less densely clothed with hairs; or that there were *four species*, two of each group of horned and not-horned forms, based on the differences in the leg-tufts.

There is another possibility that the horns are not of specific importance, while the tufts on the legs are. This would give us two species, the presence or absence of horns being ignored.

One is, however, strongly urged to the conclusion that neither of these characters is of specific importance, because after comparing many examples of the forms known as *clavipes*, Linn., and *cornuta*, Pallas, of both sexes, it is seen that the males of both these forms are inseparable; the palpal organs are identical in form. That is to say, that the *males* of the pure *clavipes*, whose females are without tubercles on the carapace and have dense tufts on the femora and tibiæ of i. and ii. and on tibia iv., cannot be distinguished from the males of the pure *cornuta*, whose females have two distinct tubercles on the carapace and scarcely any fringing hairs on legs i., ii., and iv. However, there is not sufficient material to be absolutely sure that this is the case, though of the former there are adult males and females in Mr. Bonhote's collection, and also others in the British Museum; while of the latter I have myself taken many examples on the Lower Amazons, and one pair actually in copulation.

Of the females, then, there are four distinct forms:—

- i. Hairs on the legs tufted and the femoral tuft also very distinct.  
*a.* Carapace with tubercles.  
*b.* Carapace without tubercles ..... *clavipes*, Linn.
- ii. Hairs on the legs not tufted and femoral fingers almost obsolete.  
*a'.* Carapace with tubercles ..... *cornuta*, Pallas.  
*b'.* Carapace without tubercles.

Of the males I am able so far to identify only one form undoubtedly assignable to each of the two species above designated as *clavipes* and *cornuta*.

Examples from various localities in the British Museum collection are referable as follows:—

*The Bahama Islands.*—Examples of the female sex have tufted legs, without cephalic tubercles: *i. b.*

*St. Domingo.*—Females without tubercles and without tufted legs: *ii. b'.*

*Bermuda.*—Females with tufted legs and without tubercles: *i. b.*

*Trinidad.*—Females with tufted legs and with cephalic tubercles: *i. a.*

*Venezuela.*—Females with tufted legs and strong cephalic tubercles: *i. a.*

*Caraccas.*—Females with tufted legs, but tubercles almost obsolete: *i. a.*

*Demerara.*—Females with tubercles, without leg-tufts: *ii. a'.*

*Pernambuco.*—Females with tubercles, with leg-tufts: *i. a.*

*Amazons.*—Females with tubercles, without tufted legs: *ii. a'.*

*New Granada.*—Females with small tubercles and both forms of legs: *i. a, ii. a'.*

*Mexico.*—Females with tufted legs and without tubercles: *i. b.*

*California.*—Females with tufted legs and without tubercles: *i. b.*

Neither of these two characters therefore appears to be constant; the tufts on the legs vary in length and extent, while the tubercles range from nothing upwards; and since the males of the extreme forms cannot be separated, it is highly probable that all these females are varieties of one species.

I would therefore urge upon those who have leisure in any of these islands to send home at any rate a few examples of the females as well as of the males of these gigantic spiders. Both sexes may be found in the proper season in the large wheel-like orb-web which forms so conspicuous a feature in tropical and subtropical gardens, open spaces, and forest; but the male is a minute and very different-looking spider from the female.

#### GASTERACANTHA, Sundevall, 1833.

The subjoined are the more important forms of this genus occurring in the Central-American and Antillesian region.

Though the species are very variable individually, they may be recognized by the following characters:—

A. Abdomen with four spines only, median and posterior.

1. Spines short, triangular, and equal in length. Colour variable. Carapace and legs varying from bright orange-red, the latter annulate, to black throughout; in this case there are deep cyanine reflections. Abdomen black or yellow, with black margins and blotches. Sternum and ventral area of abdomen black, the latter often with more or less yellow round the spinners and with yellow spots near posterior margin

*tetracantha*, Linn.

2. Spines longer and more conical, unequal in length. Medians longer and stouter than the posterior spines. Colour variable. Carapace and legs bright orange-red, the latter annulate or entirely black. Abdomen entirely yellow or entirely black; spines orange-red or black

*Canestrinii*, O. P. Camb.

B. Abdomen with six spines.

1. Abdomen (not including spines) about one fourth broader than long. Spines unequal, anterior smaller than median, often obsolescent. Lateral spines longer than the posterior. Colour very variable. Carapace and legs bright orange-red, latter annulate or entirely black. Abdomen entirely black or entirely yellow, or yellow more or less variegated with black or *vice versa*. Ventral area of abdomen usually black, spotted throughout with yellow. Spines orange-red or black

? *cancriformis*, Linn.

2. Abdomen (not including spines) about one half broader than long. Spines equal (anterior and median), posteriors larger. Anterior and median spines very small and sharp. Colour similarly variable. Anterior angles at the base of the spines and base of medians often with a large rounded blotch, black on yellow. Ventral area black, often lined with yellow, but not spotted

*Kochii*, Butler.

*Gasteracantha tetracantha* (Linn.).

*Aranea tetracantha*, Linn. Syst. Nat. ii. p. 1037. no. 45.—St. Thomas.

*Gasteracantha pallida*, C. K. (Marx), Die Arach. xi. p. 60, fig. 881.—California.

*G. quadridens*, C. K., t. c. p. 59, fig. 880.—St. Thomas.

*G. pallida*, McCook, Amer. Spid. iii. p. 209, pl. xiv. fig. 8.—California.  
*G. preciosa*, McCook, Amer. Spid. iii. p. 211, pl. xiv. fig. 7.—California.

The species *pallida* and *preciosa* are in all probability identical, and may be eventually regarded as subspecies of Linnæus's species from St. Thomas. I have no doubt, however, that *quadridens*, C. K., is identical with *tetracantha*. Two other forms—one from St. Vincent, with carapace, legs, sternum, and ventral area entirely black; the other from Beguia, Canonan and Union Islands, with carapace and legs bright orange-red, sternum and ventral area black, the latter spotted with yellow—may be added to the varieties of this species. The form with the red carapace is obviously the typical one, though I have no material from the Island of St. Thomas, for Linnæus's description runs:—"Cap. rufum, pedes sanguinei."

The species as recognized above has been recorded from the Antilles, St. Thomas; St. Vincent (*Simon*); Beguia; Canonan and Union Islands; California, Mohave Desert (*Marx*).

*Gasteracantha cancriformis* (Linn.). (Pl. VII. fig. 11.)

*Aranea cancriformis*, Linn. Syst. Nat. ii. p. 1037. no. 46 (misprinted 45).  
—Jamaica.

*Ar. hexacantha*, Fabr. Mantissa Insectorum, p. 344. no. 29.

*Ar. hexacantha*, Fabr. Ent. Syst. t. ii. p. 417. no. 39.—Jamaica.

Abbott, Spiders of Georgia, fig. 118.—Georgia.

*Epeira cancer*, Hentz, Sp. U. S. p. 126, pl. xiv. fig. 13.—Florida.

*Plectana cancriformis*, Wlk. Ins. Apt. ii. p. 151.

*P. ellipsoides*, Wlk.—Georgia.

*Gasteracantha picca*, C. K., Die Arach. xi. p. 61, fig. 882.—Brazil.

*G. velitaris*, C. K., *op. cit.* iv. p. 33, fig. 269.—Brazil.

*G. rubiginosa*, C. K., *op. cit.* xi. p. 55, fig. 878.—Haiti.

*G. atlantica*, Wlk. Ins. Apt. ii. p. 167.—Haiti.

*G. conchata*, Mart. (sec. Walck.).

*G. callida*, O. P. Cambr. P. Z. S., March 1879, p. 284, pl. xxvi. fig. 7.—Trinidad.

*G. vittata*, Thor.—California.

*G. cancriformis*, McCook, Amer. Sp. iii. p. 211, pl. xiv. fig. 9.—United States.

The type of *A. cancriformis*, Linn., is the figure in Sloane's 'Jamaica,' ii. p. 197, t. 235. fig. 4. Linnæus also quotes Browne, Hist. Jamaica, p. 419, t. xlv. fig. 5. (These figures have been reproduced in our Pl. VII. figs. 9 & 8.)

The type of *A. hexacantha*, Fabr., is the figure in Browne's Hist. Jamaica, t. xlv. fig. 5. Fabricius does not mention "Dom. Banks" in either of the places where he quotes and describes *Ar. hexacantha*; and although there is a specimen labelled with this name as "type" in Coll. Banks Brit. Mus., it cannot be accepted as the type of Fabricius's species.

In spite of Walckenaer's decision to the contrary, it is very evident that the figures in Sloane and Browne represent the same species, being also from the same locality. The difference in the length of the spines, which Walckenaer lays special stress upon, is no criterion whatever, while the number of sigilla between the anterior spines is the same in all members of the genus. Although Walckenaer says that he compared the types of the two forms described by Fabricius as *canceriformis* and *hexacantha*, and that they were certainly not identical, yet the characters he mentions as distinguishing the two are of little value. Fabricius, too, quotes Browne's figure t. xlv. fig. 5 (it is misprinted in one place t. xiv.) under both these species, and it is difficult to understand on what grounds this author gave it another name.

*A. hexacantha*, Fabr., therefore becomes a synonym of *canceriformis*, Linn.

Although I have not any examples of this six-spined form from Jamaica, there are many from other islands in the Antilles (Haiti, Trinidad, &c.) in the British Museum collection, and also from Georgia and Venezuela. There are also examples identified by Keyserling as *vittata*, Thor., which are most probably a small form of *canceriformis*, being also almost identical with another series from the Bahamas. In these the anterior spines are obsolescent. The length of these spines varies considerably even in the few examples from the Bahamas, and we may look for many varieties of this spider from different localities. It is possible that some of these forms may have to be recognized as subspecies, and I cannot, with only the present material at hand, be sure whether this or the form *Kochii* is the true *canceriformis*, Linn.

In addition to the localities mentioned above, this species has been recorded from Texas, North Carolina, New Mexico, Florida, Alabama, Arizona, and Mr. Bonhote has taken it in the Bahamas.

*Gasteracantha Canestrinii*, O. P. Cambr. (Pl. VII. fig. 12.)

*Gasteracantha Canestrinii*, O. P. Cambr. P. Z. S. 1879, p. 293, pl. xxvi. fig. 2.—Antigua.

This species has but four spines, the anterior pair being absent. Otherwise it is very like smaller examples of *canceriformis*, especially those from the Bahamas, in which the anterior spines are obsolescent.

Examples in the British Museum are from Antigua (*Forest*) and Dominica (*Dr. Nicholls*).



*Gasteracantha Kochii*, A. G. Butler. (Pl. VII. fig. 10.)

*Gasteracantha Kochii*, Butler. Type in Coll. B. M. *Hab.* Pará. *Nom.* nov. for *hexacantha*, C. K., *Trans. Ent. Soc. Lond.* 1873, p. 169. no. 66.

This is obviously identical with *G. hexacantha*, C. K. (non *hexacantha*, Fabr.).

There are many examples of this form from various parts of America in the Museum collection. In the Keyserling collection from Taguava, Mexico, Bogotá, and Rio Grande do Sul. Also from Upper Surinam, San José (Costa Rica), Ecuador (*Rosenberg*). Colombia, Lower Amazons, Pará, collected by the author; I have taken it also in the forest near Santarem.

It may be recognized by the shape of the abdomen being rectangular, much broader than long; the anterior and lateral (or median) spines are very short and of equal length, the posterior spines larger.

The examples from Ecuador are very stout and convex below, others from other regions are much more compressed. They vary also very much in coloration. These great differences, however, in examples of the same species will be quite familiar to those who have ever collected a large series of any species of the genus in their natural habitat. I have often myself, in picking them with the fingers out of their webs, felt some of them nearly flat and others quite convex, and been surprised that they were not different species.

*Gasteracantha insulana*, Thor.

*Gasteracantha insulana*, Thor.—Galapagos Islands.

If the example from this locality in the British Museum collection be rightly identified, this form is probably identical with *Kochii*, Butler, but one cannot be sure without a larger series of specimens.

It is possible that *G. sexserrata* (Wlk.), *Ins. Apt.* ii. p. 157, Cayenne; *G. quinque-serrata* (Wlk.), ii. p. 157, Guyana; *G. triserrata* (Wlk.), ii. p. 158; and *G. Servillii* (Wlk.), ii. p. 159, Brazil, are all *G. Kochii*, Butler; and if so, the last name will go as a synonym of *sexserrata*. Possibly *G. mammosa*, C. K., xi. p. 57, Brazil, is *canceriformis*, Linn.; but what *G. lata* (Wlk.), ii. p. 165, from Guadaloupe, may be, is very doubtful.

*Argyropeira argyra* (Walck.) (sec. Simon, St. Vincent).

*Argyropeira argyra* (Walck.), Ins. Apt. ii, p. 219.

A single adult female, Nassau.

This example is identical with Simon's named specimens from St. Vincent.

*Uloborus geniculatus*, Oliver.

*Uloborus geniculatus*, Oliver, Encycl. Méthod. ii, p. 214.

A single adult female. This species is found all over the tropical world, occurring in abundance in the windows of outhouses, where the delicate pink many-cornered cocoons may be seen hanging in the web.

Nassau.

*Uloborus americanus*, Walck.

*Uloborus americanus*, Walck. Ins. Apt. ii, p. 229.

This species may instantly be distinguished from the above by the tuft of hairs on each side of tibia i. near the apex.

A single adult female from Nassau.

*Alcimosphenus licinus*, Simon. (Pl. VII. fig. 7.)

*Alcimosphenus licinus*, Simon, Hist. Nat. Ar. ii. t. i. p. 931, and P. Z. S. Nov. 16, 1897, p. 871.

Several adult females of this fine spider were obtained at Nassau. The figure on the Plate is taken from one of the syntypes of the form originally described by Simon from St. Vincent.

#### EXPLANATION OF PLATE VII.

Fig. 1. *Nephila clavipes* (Linn.), ♀. 1 a. Carapace in profile; 1 b. Abdomen, showing pattern.

Fig. 2. Ditto, ♂.

Fig. 3. Ditto, ♂. Palpus.

Fig. 4. Ditto, ♂. Palpal bulb and spine.

Fig. 5. *Nephila cornuta* (Pallas), ♀. Leg i. 5 a. Carapace in profile.

Fig. 6. *Lyrosceles Bonhoti*, sp. n., ♂. Trochanter of male palpus from the outside. 6 a. Bulb of palpus.

Fig. 7. *Alcimosphenus licinus*, Simon, ♀.

Fig. 8. Browne, Hist. Jam. t. xlv. fig. 5.

Fig. 9. Sloane, Voy. Jam. t. 235. fig. 4.

Fig. 10. *Gasteracantha Kochii*, Butler.—Santarem.

Fig. 11. *Gasteracantha cancriformis* (Linn.) ?—Bahamas.

Fig. 12. *Gasteracantha Canestrinii*, O. P. Cambr.—Antigua.

## XLII.—Contributions from the New Mexico Biological Station.

## —XI. New and little-known Insects from New Mexico.

By T. D. A. COCKERELL.

## Coccidæ.

*Aspidiotus graminellus*, sp. n.

♀.—Scale slightly convex, about 1 millim. diam., white, with pale yellow exuvia, which are covered, and surmounted by a white boss.

♂.—Scale white, elongate, *Diaspis*-like in outline, convex, shiny, not in the least keeled, with the wholly covered pale yellow exuvia at one end.

♀.—Yellow; after boiling in potash colourless, mouth-parts and caudal end remaining brown; anal orifice oval, about  $21\ \mu$  long and  $36\ \mu$  from bases of median lobes; dorsal glands comparatively few, in four longitudinal rows on each side; no circumgenital glands; three pairs of lobes, the median ones large, rounded, well apart; second and third lobes low and broad, the inner side perpendicular, the outer long and gently sloping, the apex rounded; chitinous thickenings at the bases of the lobes.

Embryo in female about  $280\ \mu$  long.

*Hab.* On leaves of grass, producing purple blotches; Las Vegas, N. M., Jan. 6, 1901; first found by Wilmatte P. Cockerell.

The scale is quite after the manner of *A. Gutierrezæ*, but the female insect is different. It differs from *Gutierrezæ* in the rounded, wide apart, median lobes, the much larger blunt second and third lobes, and the dorsal glands, which are few and in rows, instead of being numerous and scattered. The anal orifice in *Gutierrezæ* is scarcely  $12\ \mu$  long.

*Orthezia occidentalis*, Douglas.

Beulah, N. M., March 1900; common on a very damp hillside. New to New Mexico.

*Antonina graminis*, Parrott.

Las Vegas, N. M.; on grass, limestone-ledges by the Gallinas River, Jan. 12, 1901 (*W. P. & T. D. A. Ckll.*). New to New Mexico.

*Dactylopius neomexicanus* (Tinsley).

Described as a variety of *D. Kingii*, but it is probably a valid species.

Las Vegas, N. M., Jan. 6, 1901, on roots of grass; in ovisacs and producing young.

During the summer the species is tended by *Lasius americanus*, but in winter the ants go far underground, and leave it to its own devices. Its habit of reproducing during the winter must be an advantageous one, since it is then free from the attacks of Chalcidid parasites. The Las Vegas females are rather large, 3 millim. long, colour pale brown, varying to pale grey and pale pink. Antennal formula 8 (1 2) 3 7 (4 5 6).

*Phenacoccus calcitectus*, sp. n.

♀.—About 3 millim. long, at least 4 with the secretion. Wholly covered by a dense chalk-white secretion, which gives it the appearance of an *Orthezia*; this secretion is segmented and forms a broad low ridge down the middle of the body, with two ridges on each side of it; in addition, there is a fringe consisting of thick plates of secretion, very broad anteriorly, becoming narrow and elongated behind.

♀.—Boiled in caustic potash gives a very slight pink colour. Legs and antennæ very dark brown; claw with a denticle on inner side; only bristles in place of digitules; tarsal bristles very short, about 20  $\mu$  long, about a dozen in a row; bristles of anal ring six, about 230  $\mu$  long; body densely beset with small round glands and small brown spines, which make it look almost like a hedgehog; each segment has a large brown patch on each side. Antennal formula 9 3 2 5 4 1 (6 8) 7, with some variation. Measurements in  $\mu$ :—Antennal joints: (1) 84–120, (2) 120–130, (3) 135–160, (4) 99–150, (5) 99–140, (6) 72–78, (7) 66–72, (8) 78–81, (9) 144–170. Middle legs: coxa 300; femur + trochanter 600; tibia 600; tarsus 240; claw 80.

♂.—Length about 3 millim., filaments 9 millim. Grey, somewhat covered with white secretion; antennæ and legs dark slate-colour; wings dusky, somewhat iridescent, with dark veins; two long white caudal filaments.

*Hab.* Beulah, N. M., about 8000 feet alt., July 27, 1900 (*T. D. A. & W. P. Cockerell*). The females were found on the heads of grasses (*Koeleria* and *Phleum*), which they had climbed presumably to attract the males, which were flying around.

*P. calcitectus* belongs to the group of *P. yuccæ*, but differs

greatly from *yuccæ* in its dense chalk-like secretion, wherein it closely resembles *P. bahiæ*, Ehrhorn. It differs from *bahiæ* in its much longer and more slender antennæ and the much shorter tarsal bristles. The antennæ closely resemble those of *yuccæ*, but differ in the uniformly longer second joint and the shorter sixth, seventh, and eighth. Prof. J. D. Tinsley has kindly lent me his series of measurements of *P. yuccæ* for comparison. He has examined that species from California and Mexico, as well as the var. *Barberi* from the West Indies.

### Tenthredinidæ.

#### *Euura Cooperæ*, sp. n.

♀.—Length 5 millim. Clypeus with a broad rounded emargination; ridges of ocellar area distinct; frontal crest low but distinct, the lateral portions somewhat more prominent than the middle; antennæ about as long as head and thorax, third and fourth joints equal, fifth a little shorter; outer veins of discal cells in hind wings not interstitial; stigma large, not greatly tapering to the point; sheath of ovipositor rounded at apex. Black and reddish testaceous or honey-colour; antennæ black at base, the apical three or four joints brown; front, middle of vertex, and occiput black or nearly so; face below antennæ, orbits very narrowly in front, very broadly behind, honey-colour; thorax black, lateral lobes of prothorax and sometimes the anterior half of the pleura honey-colour; wings dull hyaline, hairy, nervures and posterior half of stigma dark brown, basal half of stigma whitish; abdomen honey-colour, with the basal half dorsally black, the black extending further backwards in the middle than at the sides; sheath black; cerci black at ends; legs honey-colour, the hind tarsi infuscated.

Described from four specimens.

Gall an oval abrupt lateral swelling on the twigs of *Salix* sp. (a species with very narrow leaves), about 10 millim. long and 7 broad, pale and roughened.

*Hab.* Vicinity of Las Vegas, N. M., flies emerging April 5 and 9 (*Mary Cooper*).

The gall is similar to that of *Euura salicis-ovum*, Walsh, and it had been assumed that it was the product of that insect. Now that Miss Cooper has bred the flies, however, they are manifestly different. *E. mexicana*, Cameron, from Northern Sonora, is similar in colour to *E. salicis-ovum*, and also evidently different from *E. Cooperæ*.

*Euura salicis-nodus*, Walsh.

*Hab.* Vicinity of Las Vegas, N. M., fly emerging April 4 (*Mary Cooper*).

I have only a single fly, and that is headless; but I think the identity is reasonably certain, as the galls agree, and the willow is, I believe, the same species as that from which Walsh obtained his species. The colour of the galls is red. From these galls were also bred two females of a *Prosopis* which is probably a variety of *P. mesillæ*, but may prove distinct when the male is obtained. It lacks the clypeal mark of *mesillæ*, and yet has the form of that insect rather than of *P. pygmæa*.

## Apidæ.

*Osmia fulgida*, Cresson.

*Hab.* Beulah, July 16, 1900 (*T. D. A. & W. P. Ckll.*).  
New to New Mexico.

*Osmia armaticeps*, Cresson, var. *sapellonis*, var. n.

♀.—Length 12 millim.

Agrees with the description of *armaticeps*, except that the cheeks, instead of being "sparsely and finely punctured," are very strongly and quite closely punctured; and the mesothorax, instead of being "sparsely punctured and polished," is very strongly and densely punctured, the punctures being as close as it is possible for them to be. Probably a distinct species.

*Hab.* Hill above Beulah, Aug. 19 (*Ckll.*).

It has a superficial resemblance to *Monumetha argentifrons*.

*Cælioxys Sayi*, Robertson.

*Hab.* Las Vegas, at flowers of white hollyhock, July 10, 1900, 1 ♀ (*Ckll.*).

New to the local fauna.

*Monumetha argentifrons*, Cresson.

This species is usually called *M. borealis*, but the name *argentifrons* has priority of place. The female varies considerably in size.

*Hab.* West Fork, Gila River, July 12, ♀ (*Townsend*); Beulah, Aug. 16, &c. (*W. Porter*). I have also both sexes from Olympia, Washington State, collected by Mr. Trevor Kincaid; one of the males was collected July 3, on flowers of *Epilobium spicatum*.

*Stelis permaculata* (Ckll.).

*Stelis lateralis*, var. *permaculata*, Ckll., Entomologist, July 1898, p. 167.

*Hab.* Santa Fé, N. M.

I have now before me the genuine *S. lateralis*, collected by Mr. J. C. Bridwell at Baldwin, Kansas, in June. It is evident that *permaculata* is a perfectly distinct species, easily distinguished by the characters given at the place cited.

*Melissodes obliqua* (Say).

*Hab.* Las Vegas, July 10, at flowers of *Cleome serrulata*, 1 ♂ (*N. Stern*); July 20, at *Helianthus*, 1 ♂ (*W. Porter*); July 20–24, at flowers of *Lepachys columnaris*, 5 ♀ (*Ckll.*, *W. Porter*); Santa Fé, August, at *Lepachys*, 2 ♀ (*Ckll.*); Mesilla, July 25, at *Grindelia squarrosa*, 1 ♀ (*Ckll.*).

East Las Vegas, New Mexico, U.S.A.,  
February 7, 1901.

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XLIII.—*Diagnoses of some new Species of Spiders from Mashonaland.* By R. I. POCOCK.

*Ischnothele mashonica*, sp. n.

♀.—*Colour.* Carapace and sternum deep brown; abdomen black above, covered scantily with greyish-white hairs and ornamented with symmetrically arranged white spots; legs banded.

*Carapace* a little longer than wide, as long as patella and tibia of fourth leg and as patella, tibia, and half protarsus of first.

♂.—*Tarsus* of palp a little longer than the tibia; bulb oval, the spine very long and slender throughout and lightly curved.

Total length (♀) 13 millim.; carapace 6; first leg 12·5, fourth 17.

*Loc.* Mazoe (*J. ff. Darling*).

*Agelena rhodesiæ*, sp. n.

*Colour* of integument of legs and carapace varying from testaceous to deep mahogany-brown, approaching black upon the sternum and femora; upperside of abdomen with a paler reddish median stripe, frequently ornamented in front of the

middle with a pair of yellow spots (hairy clothing mostly removed, where visible whitish).

*Vulva* consisting of a pair of smooth sclerites, impressed in front with a semicircular pit and separated in the middle line by a bar which gradually narrows posteriorly.

Total length 16 millim.; carapace 7; first leg 22, fourth leg 27.

*Loc.* Umtali and Mazoe (*J. ff. Darling*).

*Lycosa Cecilii*, sp. n.

♀.—Closely resembling and allied to *L. Darlingi*, Poc., but distinctly differing in the form of the vulva and also in colouring, the legs being reddish brown instead of nearly black, and the hairs upon them whitish grey instead of olive-grey; the legs, moreover, are not banded below, except for the presence of two bands on the tibia of the fourth; underside of abdomen, sternum, and coxæ black, as in *L. Darlingi*, but upperside of abdomen greyish yellow, with a double median black spot in front and narrow black stripes behind.

*Mandible* clothed above in front with hairs of a dirty greyish yellow, not fiery red.

*Eyes* of posterior ocular quadrangle larger, the medians being a little less than their own diameter above the edge of the clypeus (in *L. Darlingi* the distance exceeds the diameter), and they are scarcely more than half a diameter apart (in *L. Darlingi* they are three fourths of a diameter apart).

Total length (abdomen shrivelled) 16 millim.; carapace 9·8; first leg 23·5, fourth leg 28.

*Loc.* Salisbury (*G. A. K. Marshall*).

*Lycosa Marshalli*, sp. n.

♀.—Differs from *L. transvaalica*, *Darlingi*, and *Cecilii* in having the underside of the abdomen fiery red in its posterior half and jet-black in its anterior half.

*Carapace* about as long as patella and tibia of first leg and as protarsus of fourth; cephalic region elevated; eyes of anterior line procurved, the laterals a little larger and nearly equidistant from the edge of the clypeus and from the eyes of the second row; eyes of second row wider than those of first by about half the diameter on each side.

*Vulva* without distinct hammer-shaped median sclerite, the space occupied by a somewhat oblong sclerite, marked near the middle of each side with a deep notch.

Total length 21 millim.; carapace 11; first leg 29, fourth leg 36·5.

*Loc.* Umfuli River (*G. A. K. Marshall*).



*Micrommata Darlingi*, sp. n.

♀.—*Colour*. Integument of legs and carapace yellowish brown, speckled with black and mottled with a mixture of yellowish and blackish hairs; ventral surface of carapace paler; upperside of abdomen covered with a coating of blackish and fiery yellow hairs mixed, lower side pale yellowish grey.

*Carapace* a little shorter than patella and tibia of first leg, much shorter than those of fourth.

*Eyes* of anterior line somewhat strongly recurved by their centres, the medians much smaller than laterals and with their inferior edges a little below the level of those of the latter; eyes of posterior line slightly procurved.

*Vulva* consisting of a large horny plate, impressed with a deep and longitudinally oval pit, closed in front and opening behind, where the vulva terminates in a pair of lobes separated by a median tongue-shaped process.

Total length 12 millim.; carapace 5; first leg 14, second 16, third 14, fourth 17.

*Loc.* Mazoe (*J. ff. Darling*).

*Sparassus claviger*, sp. n.

♂.—Resembling *S. Krügeri*, Sim. (Ann. Soc. Ent. Fr. lxx. p. 488, 1897), in colour and size, but apparently differing at least in the form of the tibial apophysis of the male, which is directed obliquely downwards and forwards, and ends in a sharp point, its upper or anterior edge being sinuous and its inferior edge produced in its basal half into a semi-circularly rounded lobe; at the base of the apophysis on the outer side the tibia bears a subquadrate lobe, which is hollowed beneath and forms the postero-external wall of a cavity for the reception of part of the palpal organ; this organ is furnished behind with a large, internally directed, striate, clavate process.

Total length 9 millim.; carapace 4; second leg 23, fourth 20.

*Loc.* Salisbury (*G. A. K. Marshall*).

*Sparassus Darlingi*, sp. n.

♂.—Closely allied to *S. claviger* and *S. Krügeri*, but with the distal half of the tibial apophysis bent downwards at a right angle to the proximal half, with its upper and lower edges evenly arched, the pale external prominence on the tibia smaller than in *S. claviger*, but the ridge bounding the inferior excavation stronger and semicircular, the outwardly

directed process on the palpal organ fusiform and apically pointed, not clavate, and with its posterior edge not incurved.

Total length 9 millim.; carapace 4; second leg 23, fourth 19.

Loc. Enkeldoorn (*J. ff. Darling*).

*Sparassus spinipalpis*, sp. n.

♂.—Differing from the preceding two species in having the tibia of the first and second legs armed inferiorly with three pairs of spines and especially in the structure of the palpus. Palpus with patella armed externally with a pair of very long sinuous spines, which run forward in contact with each other, reaching almost to the tip of the tibia; tibia longer than wide, subcylindrical, without external prominence or inferior excavation; the apophysis short, subsuperior, oblong, with its external distal angle produced into a short process; tarsus of palp and palpal organ much resembling that of *Sarotesius melanognathus*, Poc., from Nyasaland (*Ann. & Mag. Nat. Hist.* (7) ii. p. 443, 1898, pl. xiii. fig. 6).

Length of carapace 5 millim., of second leg 22, of fourth leg 20.

Loc. Salisbury (*G. A. K. Marshall*).

*Thomisus spiculosus*, sp. n.

Allied to *T. anthobius*, Poc., but with the carapace and legs much more coarsely tubercular and more bristly, and with the bridge separating the two pits of the vulva long and narrow, though expanding at each end.

Total length 10.5 millim.; carapace 4.2; length of first leg 12.5, of fourth 9.

Loc. Salisbury (*G. A. K. Marshall*).

XLIV.—*Note on the Eliomys of Sardinia.*

By G. E. H. BARRETT-HAMILTON.

I HAVE just had an opportunity of examining a few specimens of *Eliomys* taken in Sardinia. They are distinct enough from any other known form to deserve a separate name. Accordingly I propose that the Sardinian dormouse be known as *Eliomys sardus*, the consideration of its exact status as a species or subspecies being reserved until we know more about the genus.

*Eliomys sardus* is like *E. quercinus* in colour and other characters, but may be distinguished by its tail, which is

rather short, and the black band of which runs completely round its circumference. The basal third or half is therefore grizzled fulvous grey above and whitish below, then passing into deep black above and below, only about half an inch at the extreme tip being white.

From *E. amori*, Graells, of Spain, which has a similar coloration of the tail, *E. sardus* may be distinguished by its much smaller size, in regard to which it slightly exceeds *E. mumbyanus* (Pomel) of Morocco. In the latter form, however, so far as can be ascertained from the few specimens available, the tail resembles that of *E. quercinus*. *E. pallidus* of Sicily, another black-banded form, is recognizable by the unusually light coloration of its whole body.

The principal dimensions\* of a skin and skull, which I propose to make the type of *E. sardus*, are as follows (in millimetres):—

Head and body .....	142
Tail (excluding terminal hairs).....	105
Hind foot (without claws).....	26
Ear .....	20 (approx.).
Greatest length of skull .....	35
Length of nasals (along central line) .....	13
Length of upper molar crowns .....	5
Length of lower molar crowns .....	5

*Hab.* Sardinia. Type from Tricoli, Cagliastra. Other specimens from Lanusei. .

*Type.* Female. B.M. no. 0. 3. 8. 1. Collected 5th November, 1900, by G. Meloni. Presented by Mr. Oldfield Thomas. Four specimens examined.

These dimensions may be compared with those of *E. quercinus* †, *E. mumbyanus*, and *E. pallidus*, mihi, as given in my paper on the Sicilian dormice of the genera *Eliomys* and *Glis*, published in the 'Annals' for March 1899, pp. 226–228. In the present note I do not propose to do more than briefly indicate the distinctive characters of *E. sardus*, but hope to return to it on a future occasion.

The name *sardus* is particularly appropriate for the Sardinian *Eliomys*, owing to the fact that "Rata sarda" is the local name of its congener in the Balearic Islands and Catalonia.

\* Not taken in the flesh.

† Note, however, that *E. quercinus* of Seville should now be known as *E. amori*.

XLV.—On the *Martens* of the *Mustela flavigula* Group.

By J. L. BONHOTE, B.A.

AMONG the martens that have hitherto been considered as *Mustela flavigula* several well-marked geographic subspecies may be distinguished, and one of the forms (*M. Gwatkinsii*) that has been united with them is apparently a distinct and easily recognizable species, only found in the peninsula of India. The synonymy of this group is somewhat lengthy, and when I began to work it out so many small errors and misquotations appeared to have been given, that I have thoroughly studied the subject and have personally verified all the references given.

The first mention of this animal was made by Pennant, who described it under the name of "White-checked Weesel," from a menagerie specimen whose origin was unknown. There can be little doubt, however, that the specimen belonged to the form found in Nepal, Assam, and southward to Burma, as Pennant stated that the head was black—a character typical of that race.

Boddaert, in his 'Elenchus Animalium,' was the first to bestow on Pennant's specimen the name of *Mustela flavigula*, and several other names were also based on the same description, which materially helped to confuse the synonymy; *Galidictis chrysogaster* is, however, the only one to which attention need be drawn. This animal is said to be very dark on the back, head, and legs, with white cheeks and a golden-yellow breast and underparts, and is described from a specimen shot at Mussorie in the Himalayas by Mr. R. Gwatkins. A few years later Horsfield, in his 'Catalogue of the East India Collection,' describes, under the name *Martes Gwatkinsii*, a specimen collected in Madras by Mr. (afterwards Sir) Walter Elliot, and states in addition that it belongs to the same species as Mr. Gwatkins' Mussorie specimen; this, however, is not the case, for, as will be seen later on, the Mussorie specimen, being only an individual of the typical *M. flavigula* in summer, is specifically distinct from that from Madras. As Horsfield gives a detailed description of the South-Indian form, comparing it with the typical *M. flavigula*, and as the specimen from which the description was taken is still in existence in the British Museum, it seems to me necessary to retain the name *Gwatkinsii* for the South-Indian species, of which Elliot's specimen would be the type.

The following species and races (which may be easily recognized) are referred to this group:—

- |  | Hab.                   |
|--|------------------------|
| I. (a) <i>Mustela flavigula typica</i> . | Nepal, Assam to Burma. |
| (b) ——— <i>borealis</i> . . .            | Amurland & E. Siberia. |
| (c) ——— <i>peninsularis</i> .            | Malay Peninsula.       |
| (d) ——— <i>Henricii</i> . . .            | Java, Sumatra, Borneo. |
| (e) ——— <i>kuatunensis</i> .             | Kuatun, N.W. Fokien.   |
| (f) ——— <i>xanthospila</i> .             | Formosa.               |
| II. <i>Mustela Gwatkinsii</i> . . . .    | Madras.                |

### Key to the Group.

#### A. Soles of feet hairy.

- a<sup>1</sup>. Head dark brown (seal-brown, Ridg. \*).  
 a<sup>2</sup>. Shoulders light.  
 a<sup>3</sup>. Smaller; back brownish (clay, Ridg.).  
 a<sup>4</sup>. Underparts light (ecru-drab, Ridg.) . . . . . *Mustela flavigula typica*.  
 b<sup>4</sup>. Underparts darker (drab, Ridg.) . . . . . *M. f. kuatunensis*.  
 b<sup>3</sup>. Larger; back yellowish (gallstone-yellow, Ridg.) . . . . . *M. f. borealis*.  
 b<sup>2</sup>. Shoulders dark brown (seal-brown, Ridg.) . . . . . *M. Gwatkinsii*.  
 b<sup>1</sup>. Head light brown (bistre, Ridg.) . . . . . *M. f. xanthospila*.

#### B. Soles of feet naked.

- a. Shoulders conspicuously lighter than rest of back . . . . . *M. f. peninsularis*.  
 b. Shoulders not conspicuously lighter than rest of back . . . . . *M. f. Henricii*.

### *Mustela flavigula*, Bodd.

*The White-checked Weasel*, Pennant, Quad. ii. p. 331 (1781); id. 3rd ed. ii. p. 52 (1792).

*Mustela flavigula*, Bodd. Elench. Anim. p. 88 (ex Penn.) (1785); Schinz, Synops. Mamm. p. 319 (1825); Fischer, Synops. Mamm. p. 218 (1829); Bennett, Gard. & Menag. Zool. Soc. p. 225, fig. (1830); Shore, Zool. Journ. v. p. 271 (1835), suppl. plate xlv.; S. Müller, Over de Zoog. van den Ind. Archip. p. 30 (1839-44); Schreber, Säugeth. Suppl. 2, p. 224 (1841); Giebel, Säugeth. p. 774 (1859); Thos. P. Z. S. 1886, p. 67; Blanf. Faun. Br. Ind., Mamm. p. 158 (1891); Jent. Cat. Mamm. Mus. des P.-B. p. 140 (1892); Flower, P. Z. S. 1900, p. 333.

*Mustela melina*, Kerr, An. King. p. 183 (1792).

*Viverra quadricolor*, Shaw, Gen. Zool., Mamm. i. 2, p. 429 (1800).

*Mustela leucotis*, Bechst. Uebers. vierf. Thiere, ii. p. 375 (1800).

*Marte à gorge dorée*, Desm. Mamm. p. 185. no. 4 (1820).

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\* Ridgway, 'Nomenclature of Colours' (1886). These determinations must be taken only as approximate.

*Mustela leucotis* (Temm.) \*, Ham. Smith, Griff., Cuv. An. King., Mamm. vol. ii. p. 297 (1827), pl. ; id. Jard. Nat. Lib. xv. (Mamm. i.) p. 188 (1842).

*Mustela Hardwickei*, Horsf. Zool. Journ. iv. p. 239, pl. xxviii. (1834) ; Ham. Smith, Jard. Nat. Lib. xv. (Mamm. i.) p. 187 (1842) ; Less. Compl. des Œuvres de Buffon, vol. v. p. 301 (1847) ; Jent. Cat. Ost. Mamm. des P.-B. p. 112 (1887) ; id. Cat. Mamm. Mus. des P.-B. p. 140 (1892).

*Martes flavigula* (Bodd.), Hodgson, J. A. S. B. vi. p. 560 (1837) ; id. *op. cit.* x. p. 909 (1841) ; id. *op. cit.* xi. p. 281 (1842) ; Gray, List Mamm. B. M. p. 64 (1843) ; Hodgs. Calc. Journ. N. H. iv. p. 287 (1844) ; Gray, Cat. Hodgs. Coll. p. 12 (1846) ; Horsf. Cat. E. Ind. Coll. p. 98 (1851) ; Blyth, J. A. S. B. xxvi. p. 316 (1858) ; Adams, P. Z. S. 1858, p. 516 ; Blyth, P. Z. S. 1864, p. 485 ; Jerd. Mamm. Ind. p. 82 (1867) ; Gray, Cat. Carn. B. M. p. 86 (1869) ; Blyth, Cat. Mamm. Burmah, J. A. S. B. xliv. extr. no. p. 29 (1875) ; W. Sclater, Cat. Mamm. Calc. Mus. i. p. 273 (1891).

*Galidictis chryso-gaster*, Ham. Smith, Jard. Nat. Lib. xv. (Mamm. i.) p. 167, pl. vii. (1842).

### Subsp. *typica*.

The fur is long, dense, and soft. Head, sides of the face, nape, feet, tail, and hind-quarters very dark brown. Chin white ; underside of neck golden yellow, shading into very pale brown on the underparts. The whole of the back light clay, gradually shading into brown on the hind-quarters. Ears hairy and of the same colour as the head, with a conspicuous light margin. Soles of the feet hairy.

*Skull*.—The skull of this species may be distinguished at a glance from all other species of the genus (*M. Gwatkinsii* excepted) by the narrowness of the inner lobe of the posterior molar, which is of the same width throughout and is in no way widened or flattened on its innermost margin. It is also a large and stoutly built skull, that of *M. zibellina* being the only one which approaches it in size ; the skull of this last-named is easily distinguishable by its longer and more pointed muzzle. The muzzle of *M. flavigula* is proportionately the shortest of the genus, its greater bulk being almost entirely due to an increase in the size of the brain-case. In general shape it resembles that of *M. foina* most closely, for instead of falling away in front in a direct slope from the anterior end of the brain-case, as is the case in most species, the slope is gradual till on a line with the supraorbital processes, when it falls away more directly.

Except in size the skulls of the various races do not differ materially from the one which has just been described.

\* This is evidently a mistake, as Temminck never, so far as I know, published the description of a marten under that name.

Dimensions (from a Nepal skin):—Head and body 500 millim.; tail 475; hind foot 101; ear 34.

*Skull.*

	Greatest length.	Basal length.	Zygomatic breadth.	Least breadth at post-orbital constriction.	Length of palate from hensenion.	Least breadth between carnassials.
<i>M. flavigula</i> (Nepal) . . . . .	100	89	60	21	43	15
<i>M. zibellina</i> (Kamschatka) ..	95	83	53	15	45	11
<i>M. foina</i> (France) . . . . .	84	74	51	18	40	14
<i>M. martes</i> (Sweden) . . . . .	90	80	50	20	44	12

*Hab.* N. India, Nepal, Assam, and southward to Burma.

With regard to the difference of summer and winter pelage in this race I am unable to say much personally, as the skins to which I have had access are sadly deficient in the necessary data. Mr. Adams (P. Z. S. 1858, p. 516) points out that it has a seasonal change, being much darker in summer; this fact had been already indicated in the Zool. Journ. vol. v. by Capt. Shore, and a plate given, representing a specimen then living in the Zoological Society's Gardens. Mr. Blyth (P. Z. S. 1864, p. 482), in some notes relating to this species, also remarks on its change of pelage, stating that in summer its appearance is very similar to *M. Gwatkinsii*, and he then goes on to point out that *Galidictis chrysogaster* is an individual of *M. flavigula* in summer dress. Mr. Hodgson, in his unpublished drawings, now in the Zoological Society's Library, gives two figures of *M. flavigula*, illustrating the different pelages, and the summer phase undoubtedly represents an animal of the same species as that figured under the name *G. chrysogaster*.

*Mustela flavigula borealis*, Radde.

*Mustela flavigula*, var. *borealis*, Radde, Reis. Ost-Sib. i. p. 19, Taf. i. fig. (1-5) (1862).

This form, described by Radde from Amurland, is rather larger than the typical *flavigula*; the colour of the head, sides of face, nape, feet, tail, and hind-quarters is dark brown, as in the preceding form, but the light colour of the back is much lighter, being yellowish (gallstone-yellow, Ridgw.) instead of brownish. The yellow on the throat is also very pale.

Dimensions (of type, from Radde):—Head and body 610 millim.; tail (with hairs) 460 millim.

*Hab.* Amurland and E. Siberia.

The above description is taken from a specimen from Amurland in the Museum.

*Mustela flavigula peninsularis*, subsp. n.

*Mustela flavigula*, Cantor, J. A. S. B. xv. p. 194 (1846); Blanford, J. A. S. B. xlvii. pt. 2, p. 156 (1878) (nec Bodd.).

*Martes flavigula*, Blyth, J. A. S. B. xxvi. p. 316 (1858).

The race which inhabits the Malay Peninsula has long been recognized as a clearly distinguishable form of the true *M. flavigula*, although it does not appear to have been given a special name.

The hair is short and close on all parts of the body and the soles of the feet are naked. The face and crown of the head are light brown (Prout's brown, Ridgw.), and two dark stripes, about 40 millim. in length and of a slightly darker shade, extend backward on either side of the neck, starting from immediately behind the ears. On the nape and across the shoulders the colour is of a brownish fulvous (tawny olive, Ridgw.), gradually shading into dark brown on the hinder part of the body. The chin is dirty white and the throat and fore chest golden fulvous; the remainder of the underparts (with the exception of a small patch on the vent) are brown, of a slightly lighter shade than the back. Feet and tail dark brown.

The skull is only to be distinguished from that of the true *flavigula* by its slightly smaller size.

Dimensions (of type from skin):—Head and body 475 millim.; tail 425.

Skull: zygomatic breadth 60; least breadth at postorbital constriction 23; length of palate from henselion 44; least palatal breadth between carnassials 15.

*Hab.* Malay Peninsula and South Burma.

*Type* ♂, B.M. 85. 8. 1. 66. Bankasun, Tenasserim. Collected on the 20th June, 1877, by Mr. W. Davison and presented by Mr. A. O. Hume.

The short fur, naked soles, and dark underparts will enable this form to be easily distinguished from the typical *M. flavigula*.

*Mustela flavigula Henricii*, Westerman.

*Mustela Henricii*, Westerman, Bijdragen tot de Dierkunde, i. p. 13 (1849); Jentink, Cat. Ost. Mus. des P.-B. p. 112 (1887); id. Cat. Mamm. Mus. des P.-B. p. 140 (1892).



*Mustela flavigula*, Bodd., Gray, Voy. of 'Samarang,' p. 17 (1850);  
Hose, Mamm. Borneo, p. 26 (1891).

*Mustela lusiotis*, Temm., MS., Jent. Cat. Mamm. Mus. des P.-B. p. 140  
(1892).

In the shortness of the fur and the naked soles to the feet this form, described by Westerman from a specimen taken at Padang, Sumatra, resembles the preceding.

The general colour throughout, with the exception of the chin, throat, fore chest, and a patch on the vent, is dark brown, darkest on the tail and feet and lightest on the nape and shoulders, the underparts not being in any way lighter than the back. The lines on either side behind the ear noticed in the last form are similar in this race and well marked. The chin is white, the throat and fore chest pale yellow, and the vent-patch dull white.

The skull differs only in being slightly smaller than in all the preceding forms.

Dimensions (from skin):—Head and body 450 millim.; tail 450.

Skull: greatest length 92; basal length 81; zygomatic breadth 53; length of palate 41; least breadth at postorbital constriction 21; least breadth of palate between carnassials 15.

*Hab.* Sumatra, Java, Borneo.

This race is most nearly allied, as might be expected, to the Malay form, but is very much darker in colour, which renders it easily distinguishable.

#### *Mustela flavigula xanthospila* (Swinhoe).

*Martes flavigula*, var. *xanthospila*, Swinhoe, P. Z. S. 1870, p. 623.

I have examined the Formosan form of *M. flavigula* described by Swinhoe, of which the type is the only specimen; it is, as one would expect, an intermediate link between the two southern forms on the one hand, and the Chinese form, which I propose to describe next, on the other. In size it is much the same as Bornean examples—that is to say, small—although Swinhoe's measurements, quoted below, make it as large as my measurements of the Nepal form. These latter, however, being made from the dried skin cannot be considered accurate, and the measurements of the skulls, always a much safer test, show it to be rather smaller.

The hair on the body is of moderate length, although not so long as in the mainland race, and the soles of the feet hairy. The crown of the head, sides of the face, and nape are light brown (bistre, Ridg.), the hairs on the nape having white tips; the dark stripes extending backwards from the

ears are clear and distinct, as in the southern forms. The shoulders and anterior part of the body are of a clear golden fulvous, shading gradually to a dark brown on the hind-quarters. The feet and tail are dark brown, the underparts, except for a patch on the vent, pale brown, rather lighter than in *M. f. Henricii*. Chin, fore chest, and patch on the vent white; the throat deep yellow.

The skull does not differ in any material respect from that of the other forms.

Dimensions (in the flesh, after Swinhoe):—Head and body 500 millim.; tail 350; hind foot 87; ear 31.

Skull: greatest length 91; basal length 76; zygomatic breadth 50; length of palate 40; least breadth at interorbital constriction 24; least breadth of palate between carnassials 14.

*Hab.* Formosa.

*Type* B.M. 70. 2. 10. 97. Presented by Mr. Swinhoe.

*Mustela flavigula kuantunensis*, subsp. n.

The hairs are long and soft and the soles of the feet hairy, as in *M. flavigula typica*. Head, sides of the face, nape, feet, and tail very dark brown; remainder of the upper parts yellowish brown (clay, Ridg.), shading gradually to dark brown on the hind-quarters. The hairs towards the edge of the dark colour on the nape have fulvous tips, and the backward lines from the ears are only noticeable by the absence of these tips. The whole of the underparts from the fore chest backwards are of a uniform pale brown (drab, Ridg.). Chin snow-white; throat and fore chest bright orange-yellow (orange-ochraceous, Ridg.).

Skull as in the preceding forms.

Dimensions (from skin):—Head and body 350 millim.; tail 350.

Skull: greatest length 94; basal length 85; zygomatic breadth 52; length of palate 41; least breadth at postorbital constriction 22; least breadth between carnassials 13.

*Hab.* Kuantun, N.W. Fokien, China.

*Type* B.M. 98. 11. 1. 7. 6th May, 1898. Presented by Mr. J. de La Touche.

This form resembles the typical race in the general colour of the upper parts, the long hair, and hairy soles, while in size and the brown underparts it shows affinities through the Formosan race to the Southern forms.

*Mustela Gwatkinsii* (Horsf.).

*Martes Gwatkinsii*, Horsf. Cat. E. Ind. Coll. p. 99 (1851); Blyth, J. A. S. B. vol. xxvi. p. 316 (1858).

The whole animal, except the chin and throat, very dark brown. Hair long and coarse, soles of the feet hairy; the ears are wanting in the light margin characteristic of the other species. Chin white, throat deep yellow; there is on either side a dark spot in line with the mouth and about midway between its corner and the base of the ear.

The skull differs in several points from that of *M. flavigula*, although it is clearly allied to that species and agrees with it in the shape of the posterior molar.

In its general shape it is greatly flattened, especially over the eyes, and it hardly rises at all over the brain-case; the auditory bullæ are also somewhat flattened, and the meatus in consequence rather shorter and less conspicuous.

It further differs from the skulls of all the other species in the absence of the first premolar, and, judging by the distance between the second premolar and the canine, this does not seem to be an individual variation.

There is a second skull in the Museum collected in the Nilgiris by Mr. Davison which agrees in every respect with the type.

Dimensions (from skin):—Head and body 350 millim.; tail 300.

Skull: greatest length 82; basal length 78; zygomatic breadth 50; least breadth at postorbital constriction 22; least palatal breadth between carnassials 13.

*Hab.* Peninsula of India.

*Type* ♀ ad., B.M. 79. 11. 21. 621. Madras. Collected by Sir W. Elliot, and presented through Col. Sykes to the Indian Museum.

XLVI.—*Descriptions of Genera and Species of Coleoptera from South Africa.* By H. S. GORHAM, F.Z.S. &c.

[Continued from vol. v. p. 94.]

SINCE the first part of this paper was printed I have received a further collection from Mr. Guy A. K. Marshall, in which are many interesting species not contained in his first collection, of which I now give an account, as well as of the other families (the Coccinellidæ &c.) sent to me. Of some of the

obscurer species of this family I have had the advantage of Herr J. Weise's opinion, which is referred to in its proper place.

Some of the Melyridæ here described cannot be at once referred to their proper genera. The South-African members of this subfamily, including those described by former authors, will require entire revision, the reception of them into existing genera, as *Anthocomus* and *Attalus*, being always a matter of doubt.

The following are the localities referred to under the numbers given in the first part of this paper:—

*Dolichopsis auronitens*, Gorh. Ann. & Mag. Nat. Hist. 1900, v. p. 74.

Mashonaland, Salisbury (sweeping Jan. 1895).

*Opetiopalpus rubricollis*, Kl., Gorh. tom. cit. p. 75.

Natal, Frere (under dried cow-dung).

*Ichthyurus* sp.?, Gorh. tom. cit. p. 85.

Mashonaland, Salisbury (not Natal).

*Promecolanguria Marshalli*, Gorh. tom. cit. p. 87.

Natal, Frere.

*Promecolanguria trogositoides*, Gorh. loc. cit.

Mashonaland, Umgesi Spruit, near Charter.

*Amblyscelis nigrinus*, Gorh. tom. cit. p. 88.

The two higher numbers, Mashonaland, Salisbury (in fungi).

*Ancylopus nigrofuscus*, Gorh. tom. cit. p. 93.

Mashonaland, Salisbury, Makabusi River (under flood-rubbish). Not Natal.

*Lycus rostratus*, Linn.

Mashonaland, Salisbury.

*Lycus subtrabeatus*, Bourg.

Mashonaland, Salisbury (*Marshall*).

*Lycus* sp., Gorh. tom. cit. p. 84.

Cape Colony, Uitenhage.

*Calopteron ruficolle*, Bohem. Ins. Caffr. i. fasc. ii. p. 438.

*Hab.* Natal, Malvern, Karkloof (*Marshall*).

*Telephorus teter*, sp. n.

Niger, opacus, pube brevi cinerea vestitus; antennis corporis longitiline; prothoracæ subquadrato, basin versus patello angustato, late canaliculato; elytris subtiliter crebre rugosis, subcoriaceis. Long. 5.5 millim.

*Hab.* Natal, Malvern (*Marshall*).

Antennæ in the male (?) a little longer than the body, very thin, the basal joint stout, equal in length to the third, the second very short, the fourth to the eleventh about equal in length and nearly twice as long as the third. In the female the antennæ are shorter by about the length of a joint.

That this species is very near to *Cantharis nigrina*, Bohem., I have no doubt, but the description of the thorax as "by half shorter than its breadth" in that insect seems to me to point to a different species, as here the length and breadth are about equal; moreover, Boheman makes no mention of the distinct but broad impression which runs the whole length of the thorax. The front angles are a little thickened and plicate, the sides very narrowly reflexed; the front margin is little reflexed. The elytra are a little more shining than the head and thorax. The whole insect is deep black, including the palpi, which Boheman says in *C. nigrina* are "nigropiceis."

Two examples.

## Fam. Cleridæ.

Subfam. *TILLIDES*.[*Clerus*] *sanguinalis*, Westw.

[*Clerus*] *sanguinalis*, Westw. P. Z. S. 1852, p. 36, t. xxv. fig. 7.

The genus of this insect is doubtful. It is placed under "*Lissaulicus*" in Lohde's Catalogue, but has little in common with *L. lævis*, Waterh.

I believe it to be the same as *Macrotelus sanguineus*, Th., and *Aphelochroa carneipennis*, Quedenf., is perhaps a synonym. But our insect has the apex of the antennæ concolorous and the femora all red except at the knees, and therefore does not altogether agree with Westwood's description.

*Hab.* Mashonaland, Salisbury.

## GRAPTOCLERUS, gen. nov.

Tarsi sat lati, articulo primo brevi superne discreto, haud bilobato, articulis secundo, tertio et quarto bilobatis valde lamellatis,

unguiculis simplicibus, basi vix dentatis; capite prothoraceque rugose punctatis, hoc in medio subdilatato. Oculi modice granulati, vix emarginati, transversi. Antennæ graciles; clava triarticulata, laxè formata; articulis haud transversis, ultimo ovato, apice compresso acuminato. Palpi maxillares apice subulato, labiales articulo ultimo securiformi.

Corpus longius pilosum.

I propose the above for several species of South-African Cleridæ, some of which have been described by Boheman and others as "*Clerus*," but which differ entirely from the American species now referred to that name. They belong to the subfamily of Tillides, the joints of the tarsi being all visible from above. They are not *Philocali*, differing in the form of the antennæ and of the thorax. With *Thanasimus* they have much in common in general appearance, but to any one comparing this insect with *T. formicarius* the most radical differences (apart from the critical one of the basal joint of the tarsi) will appear, notably the short antennæ with abrupt three-jointed lax club, the thorax with subtubercular smooth interspaces, the elytra uniformly punctured from the base to apex, the fasciæ not clothed with scales, &c.; the claws scarcely widened at their bases nor dentate, and feebler.

For type I propose to take the species I now describe as *Groptoclerus signatus*, and I provisionally associate with it two other species which Mr. G. A. K. Marshall has sent.

*Groptoclerus signatus*, sp. n.

Niger, capite prothoraceque obscure sanguineis, creberrime subrugose punctatis, hoc antice posticeque constricto, disco hic illic lævi, spatiis lævibus parum tumidis; elytris fasciis duabus albis haud eburatis, anteriore paullo arcuata et obliqua, prope basin nec suturam nec marginem attingente, posteriore communi, pone medium, recta, integra; antennis rufis, basin versus et apice ipso dilutioribus.

Long. 7·5 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*).

The head is thickly, confluent, and subrugosely punctured, obscurely red, covered with long hairs, and the eyes have hairs. The thorax is nearly as wide as the elytra and of equal width with the eyes; it is constricted in the usual way in front and much rounded in to the base, which is margined; its disk is rugosely punctured and there are smooth uneven spaces a little raised. The whole of the elytra are densely and confluent punctured, without any series, and the yellow-white fasciæ are equally punctured.

*Graptoclerus equestris*.

"*Clerus*" *equestris*, Boheman, Ins. Caffr. i. fasc. ii. p. 498.

*Hab.* Mashonaland, Salisbury (*Marshall*).

Two specimens agree with the description of this insect. I had not seen it before; with the following species and several others it will require a new genus for its reception.

They were found at Salisbury in September 1898 "on Mosasa."

Although this is a very much smoother insect than the one I describe as *G. signatus*, it will be properly placed in the same genus. The general characters of the antennæ, tarsi, and claws, the form of the thorax and its smooth interspaces, and the punctuation of the elytra without series are the same.

*Graptoclerus quadripunctatus*, sp. n.

Ochraceus, crebre, confluent, elytris distinctius punctatis, his maculis duabus in singulis, nec suturam nec marginem attingentibus, nigris.

Long. 6 millim.

*Hab.* Natal, Malvern, Umkomaas River (*Marshall*).

This insect so much resembles *Opilo* (*Clerus*) *nodicollis*, Bohem., that it might readily be confounded with it. The form of the thorax, however, is quite different. The head and thorax are closely and rugosely though not very coarsely granulate-punctate, and hence appear dull. The thorax is broader than long, much rounded behind, and margined at its base; behind the anterior constriction there is a smooth, slightly elevated ridge, interrupted in the middle, and other smooth interspaces further back, especially in the middle, one before the base forms a sort of imperfect carina. The elytra are thickly and confluent and more coarsely punctured. There is a black transverse spot before the middle, and another rounder and larger one about one quarter before the apex.

The antennæ are thin, as in *G. signatus*, their third to eighth joints elongate-fusiform, gradually shortening; the ninth to eleventh form a lax elongate club, of which the ninth joint is elongate, the tenth is obconic, not much longer than wide, the apical joint is ovate, acuminate, and compressed at the tip. The maxillary palpi have the apical joint transversely cup-shaped and obliquely articulated.

Two specimens, and one received from M. Thery without special locality.

## PROSYMNUS, Laporte de Castelnau.

*Prosymnus*, Laporte de Castelnau, Silb. Rev. vol. iv. 1836, p. 51.  
*Ryparus*, Spin. Mon. Cler. ii. p. 73 (1844).

*Prosymnus villosus*, sp. n.

Brunneus; capite prothoraceque creberrime, subrugose, confluer, elytris grosse rugose punctatis, omnium longius tomentosis; antennis capituli prothoracisque longitudine; ore, corpore subtus femoribusque nigro-brunneis; antennarum articulis tertio et quarto quam secundus sesqui longioribus, articulis 5-8 secundo subæqualibus, tribus ultimis clavam laxam prebentibus, ultimo ovato. Long. 6-8 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*).

Obscure brown above, the thorax a shade more darkly so than the elytra; the head and thorax are so densely clothed with long upright hairs that the punctuation is seen with difficulty, except where the pubescence is worn off; it is then seen to be quite thick, granular, and often confluent; the interstices are shining. The thorax is nearly as broad as the elytra at their base; its sides are finely margined and reflexed, but this can only be seen when the hairs are worn off. The elytra are evenly covered with large variolose pits, with rugose interstices, often confluent, without arrangement. The underside is darker, pitchy brown, obsoletely and not deeply punctured; the femora are dark, but the trochanters and parts of the abdomen, the trophi, the tibiæ, and tarsi are ferruginous. In two examples all the body and the whole of the legs are pale rusty red.

Three examples.

That this insect is allied to *Ryparus tomentosus*, Spin., is obvious; that it is distinct is, I think, equally certain. The colour, the length of the joints of the antennæ, and the punctuation are different both from the description and the figure; in the latter the third joint of the antennæ is shown as rather shorter than the second, whereas in *P. villosus* it and the fourth are half as long again, while the whole antenna is much longer proportionally in our insect. Besides this, numerous points of difference exist. That it is different from *Prosymnus cribripennis*, Lap., it would be impossible from his short description, or that in Klug (Cler. p. 394), to tell; but the difference in locality justifies me in the belief that it will be found to be so.

In the Munich Catalogue and in Lohde's Catalogue recently published these names are given as synonyms, on what ground I know not, as the insects are of great rarity in



collections. Spinola did not think his species would prove even congeneric, but he relied on the grooving of the femora, a very common character which occurs in a greater or less degree in other genera of *Necrobiides* and *Enopliides*, and would very probably have not been mentioned by Laporte.

It is, however, more probable that the species are distinct. Before makers of catalogues place specific names as synonyms, they should satisfy themselves that some competent specialist has had both insects before him and at the same time.

*Hydnocera punctipennis*, Bohem.

*Hydnocera punctipennis*, Bohem. Ins. Caffr. i. fasc. ii. p. 511.

I have already (Trans. Ent. Soc. 1877, p. 260) remarked that *Hydnocera* is an essentially American genus. The Eastern species prove on examination to have a wholly different antennal structure, and have been separated under the name *Neohydnius*; and while I admit that I cannot at present discover good characters by which the present insect might be generically separated, yet I feel confident such will be found, unless the insect can be considered not truly endemic.

Two examples sent by Mr. Marshall appear to be identical with this; but the tarsi are darker than Boheman's description would lead one to expect, and in one at least are nearly black.

I believe they were captured at Salisbury; 4990, 6896.

*Opetiopalpus rubricollis*, Kl.

*Opetiopalpus rubricollis*, Kl., Gorb. Ann. & Mag. Nat. Hist. 1900, v. p. 75.

The locality for these examples is Natal, Frere, under dried cow-dung.

*Opetiopalpus caffrarius*, sp. n.

Niger, elytris cyaneis, antennis pedibusque testaceis, tarsis ad apicem infuscatis; capite prothoraceque creberrime, minute, elytris a basi ultra medium fortiter seriatim fere grosse punctatis, inde lævibus.

Long. 3 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*).

The head and thorax are black, inclining to be pitchy, and with the whole body are densely covered with floccose pile; they are densely punctured, so as to be dull; the elytra are shining, dark blue, and with series of very large oblong

punctures reaching from the base beyond the middle. The antennæ are fairly long for this genus, entirely yellow, and the legs are also yellow, only the tarsi being infuscate.

Two examples of this species were sent. It is not very like any *Opetiopalpus* known to me.

Fam. Melyridæ.

*Attalus ridens*, sp. n.

*Attalum ornatipennem* referens, latior, elytrorum lateribus magis explanatis. Læte flavus, elytris basi et lunula postica lata nigris. ♂. Long. 4 millim.

*Mas*, elytris ad apicem lamina elevata hamata instructis, apice ipso invaginato et emarginato.

*Hab.* Natal, Old Umtali (*Marshall*).

The head, prothorax, legs, and apex of the elytra and abdomen are of a rich ferruginous red; the margin of the thorax from the front angles and at the base is a little expanded and is whitish yellow; the head is shining; the antennæ red and serrate, as in *A. ornatipennis*. The elytra are expanded and obsolete bicostate, more distinctly punctured than in *A. ornatipennis*, the lateral margins a little thickened and reflexed. The humeral callus is raised and prolonged obliquely backwards as an indistinct carina. The broad basal spot on each is contracted at the suture and the margin; the posterior lunule is wide and reaches to the reflex edge of both the suture and margin.

Two specimens, both males.

*Obs.* This species is easily discriminated by the red head and by the posterior lunule showing no sign of forming a ring.

*Attalus? albofasciatus*, sp. n.

Elongatus, piceus, submetallico-nitens, nigro-pubescens, ore, antennarum basi, tibiis tarsisque sordide flavis; elytris fascia communi ante medium apiceque albidis. Caput sat magnum, oblongum, antice profunde foveolato-canaliculatum, palpis nigris; antennis filiformibus, capitis prothoracisque longitudine, hoc quam caput haud latiore, basi paullo producto, margine reflexo albescente; pedes longi, tarsis longis (feminæ?), quinque-articulatis.

Long. 2·25 millim.

*Hab.* Natal, Malvern (*Marshall*).

This insect is probably not an *Attalus*; but the two examples before me being apparently females, they may conveniently be placed there till the sexes are known. They differ from the type of that genus in being hairy all over. The

antennæ are not long and are scarcely serrate, fuscous, with the basal half pale, but touched with fuscous above for the first two or three joints. The head is large and long for the size of the insect and the mouth produced. The thorax is long and narrow, the base obviously produced, so as to lap over the base of the elytra, yet not as in *Charopus*; its surface is uneven and there is a vague fovea in the middle of its base. The elytra are very thickly set with long black hairs, but are yet quite shining, irregularly and thickly punctate, subcoriaceous, soft in texture; in one example white at their apex, in the other the apex is concolorous. The white fascia extends a little on both sides, at the margins, and suture. The femora and tibiæ are clothed with long pubescence. The body beneath is fuscous, the tip of the abdomen (where it is not covered by the elytra) is rusty red.

I consider it better to describe this insect than to leave it undescribed, because (1) I cannot be certain that one or both are not males, (2) because by the characters given it is easily to be recognized, (3) because it is, as I think, plainly not described by Boheman, nor to be placed in either of the genera quoted by him.

*Attalus? lugens*, sp. n.

Elongatus, totus niger, nitens; elytris pube brevi cinerea vestitis; ore producto; capitis fronte depressa, inter oculos breviter profunde canaliculata; prothorace oblongo-quadrato, basi haud producto, marginibus reflexis; elytris perobsolete subcoriaceis.  
Long. 2.25 millim.

*Hab.* Mashonaland, Salisbury (on Mosasa, *Marshall*).

This little insect is in form similar to *A. albofasciatus*, and, like it, is doubtfully of this genus; it is, however, clearly congeneric with that species, but is less hairy. At first sight it is very like a small *Malthodes*, and, indeed, at first I was inclined to believe it to be a member of the Telephoridae. The antennæ are, however, inserted well in front, almost at the apex of the rostrate part of the head. The tarsi are very thin, and apparently the claws are simple and without pads. The small size and entirely black colour, if the exception is made of the pitchy second joint of the antennæ, will cause this species to be easily recognized.

Three examples.

*Anthocomus felix*, sp. n.

Statura *A. ridentis*, late flavus; capitis basi, prothoracis vitta (maris latiore), elytrorum basi et macula subapicali subquadrata, meso-

et metasterno pedibusque posticis nigris, his geniculis tarsisque flavescens.

Long. 4·5 millim. ♂ ♀.

*Hab.* Mashonaland, Salisbury, Aug. and Sept., on Mosasa (*Marshall*).

*Mas*, occipite carinula V simulante impressa pone carinulam fossulatam; antennis acute serratis.

*Femina*, antennis brevioribus subserratis; fronte plana.

Head black in the male, except the mouth and portion in front of the eyes; in the female only the base behind the eyes black; antennæ yellow, becoming slightly fuscous at the tip. Thorax with the front margin straight, the sides and base rounded in one uniform curve, the margin very narrowly reflexed, with a black obconic vitta, with its vertex on the base in the male (in the female this is only represented by an indefinite line), impressed with a wide and rather irregular fossa in front, which in the female is very indefinite. The elytra are rather broad, evenly rounded at the apex, and with no difference in the sexes, except that in the male they do not cover the last three segments of the abdomen, each with two blue-black spots, the basal one irregular on the apical side and occupying the whole base, the subapical one is large and squarish, but yet rounded on its apical side. The breast is black, but the abdomen and head beneath are red. The apical segments of the abdomen in the female in the middle, the extreme apex in the male, are black above. The legs are yellow, but the posterior pair are black, with only the trochanters and knees pale.

Two specimens.

This pretty *Anthocomus* is coloured something like *Attalus ridens* here described; the absence of the overlapping joint of the tarsus in the male will prevent its being taken for a member of that genus.

*Challicorus? formicarius*, sp. n.

Niger, antennarum basi, tibiis tarsisque anticis et intermediis flavis, illis basi infuscatis; prothorace elongato, basi valde constricto depressoque, antice convexo, nigro, basi albido-flavo; elytris ovatis valde convexis, parce griseo pilosis, profunde seriatim punctatis, nitidis.

Long. 2 millim.

*Hab.* Natal, Malvern (*Marshall*).

Head with the eyes wider than the thorax, minutely but distinctly punctured; antennæ filiform, fuscous at the apex,

yellow for about four joints at the base; palpi black; thorax compressed laterally, nodiform, much constricted and depressed at the base, the basal portion white; elytra inflated, very deeply and rather coarsely impressed, with elongate punctures, and with very widely scattered but long upright hairs. Legs long, tarsi all five-jointed, the hinder tarsi especially long.

I have placed this species provisionally as a *Chalichorus* because it is clearly allied to and congeneric with *Chalichorus collaris*, Boheman; but I have not yet seen any species agreeing with the insect described by Erichson as *C. vinulus*, which appears to have the elytra not inflated, and therefore I think it doubtful if Boheman's species are to be associated with it.

This very curious little species is almost as perfect an ant-mimic as the Ceylonese *Myrmecospectra*. It has altogether the facies of a small ant. The illusion is heightened when the insect is viewed laterally, the pale portion of the thorax then appearing to be a node.

Three specimens were sent me by Mr. Marshall, of which I cannot state the sex.

*Hapalochrus mashunus*, sp. n.

Niger, superne obscure cyaneus, parum nitidus, cinereo-pubescentis; capite parcius punctato, nitido; antennis nigris, paullo serratis; prothorace nitido, ad latera obsolete punctato, ante basin transversim impresso; elytris creberrime coriaceo-punctatis, corpore infra cum pedibus nigro.

Long. vix 5 millim. ♂ ♀.

Mas, tibiis anticis apicem versus excisis, intermediis valde incrassatis, infra medium profunde excisis.

*Hab.* Mashonaland, Salisbury (*Marshall*).

This *Hapalochrus* is at once distinguished from any described species by the size, colour, and black antennæ and legs. Very similar species (undescribed) are in my collection from Mozambique and Zanzibar, but differ in not being clothed, as this is, with pubescence, and in the punctuation. The antennæ are simply serrate and are nearly alike in both sexes.

Three specimens, two of them males, were obtained by Mr. Marshall by sweeping in December 1898.

*Hapalochrus ærosus*, sp. n.

Niger, superne æneus vel cupreo-micans, parcius pubescens; elytris cupreis vel æneo-viridibus; capite crebre, prothorace ad basin et

ad latera crebre punctatis; elytris crebre, distincte, subcoriace punctatis; antennis, pedibus et corpore infra nigris.

Long. 5 millim. ♂ ♀.

Mas, tibiis anticis ad apicem excisis et torquatis, intermediis infra medium incrassatis et excisis.

*Hab.* Mashonaland, Lesapi River (*Marshall*).

Allied to *H. mashunus*; a very little larger, and appears a little more robustly built. The head is very much more coarsely but yet closely punctured; the antennæ are similar, but more robust; they are feebly serrate, and alike in both sexes. The thorax is like that of *H. mashunus*, but more coarsely punctured; in both species it is wider than long. The elytra are also similar, but more coarsely punctured, the punctures are often confluent and are evenly spread over the whole surface; the pubescence is grey and not distinct, unless viewed sideways.

Three examples were sent, obtained in November 1897.

### *Hedybius variicornis*, Bohem.

*Hedybius variicornis*, Bohem. Ins. Caffr. i. fasc. ii. p. 467.

*Hab.* Mashonaland, Salisbury (*Marshall*).

Two examples (a male and a female) are probably to be referred to this; but the measurements given by Boheman seem too small; our male measures 5 millim. and the female  $4\frac{1}{2}$ . The structure of the head is also not well expressed if our insect be identical, as it is not only "uneven, with the front deeply impressed on each side," but it has the buccal portion yellow, raised into a semicircular ridge in front of the eyes, and with an elevation projecting backwards into the cavity; the whole occiput, which is black, is excavated, and with two or three black, setiform, elevated spines. The antennæ have the first two joints spotted with black above and the third to the sixth joints yellow, the remainder fuscous. The head of the female is bifossulate; only the second joint is spotted, the fifth to the end joints fuscous, and the whole antenna shorter than in the male; the tarsi in the female are also blackish.

Notwithstanding these slight discrepancies I think this insect is *H. variicornis*, Bohem.

### *Hedybius albipennis*, sp. n.

Pallide flavus, antennarum articulis tertio ad apicalem superne fusco-lineatis (maris tribus ultimis fuscis); prothorace valde transverso, lateribus subangulatis, immaculato; elytris albis,

nigro-pilosellis, crebre, fortiter et confluentur punctatis; corpore subtus cum pedibus flavo; epimeris, meso- et metathoracis nigro-maculatis.

Long. 6.5-7 millim. ♂ ♀.

*Mas*, antennis sesquolongioribus, ad apicem magis infuscatis; capitis vertice lamina transversa irregulari utrinque subinvoluta, occipite ab oculis fortiter excavato, in medio quasi bicarinato, postice elevato plano.

*Femina*, antennis brevioribus, occipite plano magis nitido.

*Hab.* Mashonaland, Salisbury (*Marshall*).

This very curiously coloured *Hedybius* is wholly unlike any described from South Africa, but is allied and very similar to *H. lividus*, Gorham, from Abyssinia. The structure of the head is unlike that of either of the three species described by me in these 'Annals' (cf. *tom. cit.* pp. 80, 81), but is similar to that of the Abyssinian species, but is less strongly pronounced; this structure is so very peculiar and difficult to describe, that reference should be made to the description of *H. lividus* as well. The elytra are similar, but appear more ivory-white in Mr. Marshall's specimens owing to their better preservation. They are much more strongly and deeply punctured than in the blue wing-cased species, and are also larger and longer in proportion. The head and thorax in the male are more opaque than in the female. The extreme base of the head (which in the specimens before me is sunk in the thorax) appears to be blackish, showing through the transparent front of the thorax, but the pronotum is unspotted in itself.

*Obs.* It has been suggested that *H. anceps*, described on p. 81 (*t. c.*), is a synonym of *H. superciliosus* of Boheman. It is possible that that may prove to be so; but, apart from the fact that the three species I have distinguished are so closely allied that it would be perhaps impossible to say which of them should be referred to Boheman's insect from description alone, I beg here to protest against hasty assumptions on synonymy, especially by persons who have a very limited acquaintance with the group. I had, of course, studied Boheman before describing any of the Malachiidæ, and the conclusion I came to was that I could *not* identify either of our insects with the species referred to.

Some other suggestions made prove on examination to be so wide of the mark, that I need only remark that they betray a want of acquaintance with the elements of the subject or a want of acumen in appreciating even crucial differences.

*Melyris rufiventris*, Bohem.

*Melyris rufiventris*, Bohem. Ins. Caffr. i. fasc. ii. p. 479.

*Hab.* Mashonaland, Salisbury (*Marshall*).

Very close to *M. corrosa*, Reiche, and *M. festiva*, Reiche. Specimens which I have from Natal and these from Salisbury seem to differ in having the thorax more even, with the lateral carinæ straighter and not sinuate or interrupted in the middle, and by the interstices of the elytra being less rugosely reticulate. The antennæ have the apical four joints wholly black; the three preceding these have the inner produced sides black, but are red externally, as the bases are. The legs with their coxæ are red, the claws alone being black.

Species of *Melyris* often occur in profusion when they are found; the four examples sent by Mr. Marshall were found on flowers of *Protea*.

## Fam. Erotylidæ.

*Promecolanguria natalensis*, sp. n.

Sordide flava, elytris dilutioribus; antennis brevibus, articulis septem flavis subæqualibus, quatuor apicalibus nigricantibus; prothorace oblongo, convexo, lateribus sinuatis, basi bistrigato inter strigas transversim impresso; capite profunde, prothorace minutius et minus crebre punctatis.

Long. vix 6 millim.

*Hab.* Natal, Malvern, by beating *Eugenia* (*Marshall*).

Of the same size and very similar in general appearance to *P. trogositoides*, G., this insect is to be distinguished by several important characters. The head is rusty red; the antennæ are shorter, with only four or five joints at the apex black; the punctuation of the head is much deeper and more distinct than in that species. The thorax is quite of a different shape, being more convex, with depressed front angles, being, in fact, of the form common to *Anadastus*, and with deep short basal strigæ, and transversely impressed between them. At present I have not referred species from Africa to *Anadastus*, but it is possible this insect may have to be transferred to that genus.

*Episcaphula picturata*, sp. n.

Oblonga, subparallela, nigra; capite prothoraceque creberrime punctatis, hoc transverso, antice paullo angustato, angulis anticis et posticis acutis, maculis duabus, ad marginem anticam annexis, linearibus, undulatis, rufis; elytris brevissime pubescentibus,



strigis duabus basalibus, una humerali, una juxta medium, fascisque tribus valde undulatis, tenuibus, nec marginem nec suturam attingentibus, prima humerum subcingente, secunda pone medium, tertia subapicali rufis, his rufo-pubescentibus; antennarum articulis tertio ad octavum fusiformibus, subæqualibus, tertio parum elongato, clava elongata, articulis duobus ultimis subquadratis.

Long. 11-13 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*).

The general form of this insect is quite that of the first section of the genus *Episcapha*, and the thin antennæ with long joints in the funiculus, which also are pubescent, and an elongate club, of which the basal joint is obconic and the two following not wider than long, as well as the structure of the body beneath, quite confirm the opinion that it should be placed in *Episcapha* or *Episcaphula*. But it differs from all known African *Episcaphulæ* by the pattern, which on the elytra is almost exactly that of *Triplatomia Gestroi*, and also by not having the yellow abdomen, and by its short but rather thick pubescence.

The head is rather small, coarsely punctured, the eyes not much prominent, the canthus scarcely thickened nor conspicuous, their facets granular and rather coarse; the antennæ are as long as the head and thorax taken together, with the mouth, palpi, &c. wholly black. Thorax wider at the base than in front, opaque, confluent punctured, the sides narrow from the base, but are more suddenly narrowed at one third from the front angles, so as to seem almost angulated at that point; their surface is on the whole even, but there is a wide depression on each side of the middle before the base; the basal margin is gently sinuate, the front almost truncate, with, however, slightly projecting acute angles; the base and front are not margined and the sides very finely so. The scutellum is triangular and transverse, finely punctured. The elytra are much more finely but closely and uniformly punctured, without series; very obsolete subsulcate towards the extremities.

The general but superficial resemblance to some species of *Triplatomia* is heightened by the two short hamate streaks on the front of the thorax, and the markings of the elytra are so similar to those of *T. Gestroi* as at once to suggest that insect to one acquainted with Eastern Erotylidæ. It is to be noticed, however, that while the pubescence on the elytra generally is black, that on the red markings is of the same colour with them. The punctuation of the thorax beneath is very coarse, especially at the sides; the prosternal process is broad and emarginate at its tip, it is not compressed nor mucronate in

front; the punctuation of the meso- and metasterna is finer and sparser, as is that also of the abdomen. The legs are long and thin.

Only two specimens were sent me by Mr. G. A. Marshall. They were captured at Edmond's Farm, Salisbury, under bark, in October 1898.

*Episcaphula aulacochiloides*, Crotch.

*Episcaphula aulacochiloides*, Crotch, Rev. Erotyl., Cist. Ent. i. 1876, p. 412.

*Hab.* Natal, Durban (*Marshall*).

*Episcaphula interrupta*, Lac.

*Episcaphula interrupta*, Lac. Mon. Erot. p. 56.

*Hab.* Natal, Malvern, Umfuli River (*Marshall*).

*Amblyscelis natalensis*, Crotch.

*Amblyscelis natalensis*, Crotch, Rev. Erotyl., Cist. Ent. i. 1876, p. 435 (*Amblyopus*).

*Hab.* Mashonaland, Salisbury (*Marshall*).

I have received this from Natal. Crotch records what is perhaps a distinct species from Lake Ngami.

It is best recognized by the elongate form and by being wholly yellow with the exception of the black elytra and black club of the antennæ.

*Amblyscelis nigrinus*, Gorh.

*Amblyscelis nigrinus*, Gorh. Ann. & Mag. Nat. Hist. 1900, v. p. 83.

The habitat of the specimens labelled 7252-3 should be Mashonaland, Salisbury, in fungi.

*Triplax vittipennis*, Gorh.

*Triplax vittipennis*, Gorh. Proc. Zool. Soc. 1889, p. 614, pl. lxi. fig. 3.

*Hab.* Mashonaland, Salisbury, by sweeping, Nov. 1897 and Dec. 1898 (*Marshall*).

Four beautifully mounted examples of this insect are sent by Mr. Marshall. It was described from a specimen from Zanzibar. The Mashonaland examples are rather larger, two of them being respectively 6.5 and 7 millim. The yellow vitta is sometimes paler in colour than in the type and rather

wider. The tibiæ are expanded sufficiently to bring the insect into the genus *Amblyscelis*; the type of that genus is *A. Kelleni*, a West-African species which has the three apical joints of the antennæ forming a connate club, with the joints transverse. As this insect with others, such as *A. natalensis*, has a long lax club, some further subdivision may be required. At present I regard the latter insect as forming a section of *Amblyscelis* only (cf. 'Notes from Leyden Mus.' 1888, p. 144). The coarseness or fineness of the eyes is a much better character for the subdivision than the structure of the club, and is that which to a great extent differentiates *Amblyscelis* from *Amblyopus*, and which will also separate the Madagascar insects referred hitherto to *Triplax* (see also Gestro, Espl. del Giuba, Ann. Mus. Civ. Genova, 1895, p. 473).

*Dacne capensis*, Crotch.

*Dacne capensis*, Crotch, Rev. Erotyl., Cist. Ent. i. 1876, p. 397.

*Hab.* Mashonaland, Salisbury ("under bark," *Marshall*).

I possess this insect also from Natal, from Zanzibar, and several examples from the Upper Congo.

Crotch first mentions it under *D. æquinoctialis*, his opinion then being that it was "not a true *Dacne*"; but his description made subsequently of *D. capensis* appears rather enigmatically immediately below, and by an oversight he omitted to mention the four red spots on the elytra. I have, however, examined the type, and it is the present insect, and of the same size, form, and general appearance of other small *Dacnes*. I see no reason for separating it.

*Aulacochilus capensis*, Lac.

*Aulacochilus capensis*, Lac. Mon. Erot. p. 251; Bedel, Ann. S. E. Fr. 1871, p. 284; Crotch, Rev. Erotyl., Cist. Ent. i. 1876, p. 480.

*Hab.* Mashonaland, Salisbury, in fungus (*Marshall*).

This interesting species, so closely allied to the other blue species which occur in Europe, N. Africa, and various parts of Asia, seems widely dispersed in South Africa. I have seen it from the Cape Colony (*Drège*), from Natal, and Zululand. It is (see Lac. *l. c.*) the *Triplax capensis* of Dej. Cat. 3rd ed. p. 453.

[To be continued.]

XLVII.—*New Species of Saccopteryx, Sciurus, Rhipidomys, and Tatu from South America.* By OLDFIELD THOMAS.

*Saccopteryx canescens*, sp. n.

Closely allied to *S. leptura* and agreeing with it in all important respects, in size (or, perhaps, rather smaller), position of wing-sac, insertion of wing-membrane on the ankle, and the main characters of the skull and dentition.

But the ears are narrower, their inner margin above being faintly concave instead of being evenly convex throughout; the tragus is also slightly smaller and narrower.

The main difference, however, is in colour. *S. leptura* is dull chestnut-brown all over, with the exception of the two whitish lines which run down the back. *S. canescens*, on the other hand, is light greyish olivaceous, the part between the lines darker than that outside them; this colour results from the hairs being pale brown, finely tipped with buffy; the lines themselves are prominent and begin rather further up the body, almost on the neck. The head is greyish, with two fairly distinct whitish lines running along over each eye. Under surface soiled buffy, the hairs being plumbeous basally and buffy terminally. Interfemoral, as in *S. leptura*, hairy to the exertion of the tail.

The skull is rather smaller and more delicately built, the postorbital processes are short and blunt, and the teeth are extremely small and delicate. The upper canines are particularly slender and weak, and the distance between their tips in the type is only 2·4 millim. instead of 2·7 millim.

Dimensions of the type:—

Forearm 39 millim.

Skull: extreme length 13·2; basal length 10·8; zygomatic breadth 8·2; interorbital breadth 3·1; breadth between tips of postorbital processes 4·2; intertemporal breadth 2·1; breadth of brain-case on squamosals 6·5; combined length of upper molars 2·8; length of lower tooth-row exclusive of incisors 5·1.

A spirit-specimen (♂) measures:—Forearm 36 millim.; head and body 38; tail 13; tail free from membrane 3; ear 11; tibia 16; hind foot, s. u. 5·6, c. u. 6·5; calcar 15.

*Hab.* (of type). Obidos, on the Amazon. Other specimens in the Museum from the Orinoco and Surinam.

*Type* (apparently female). B.M. no. 99. 11. 2. 2. Collected 21st May, 1898, and presented by J. Trumbull, Esq.

In spite of its close identity in all essential characters with

*S. leptura*, I cannot believe that this very differently coloured bat, which more resembles *Rhynchonycteris naso* in its general appearance, should be assigned to that species. Schreber's animal is figured as dark brown, without any trace of supra-orbital white streaks, and is therefore clearly the darker coloured of the two forms.

*Saccopteryx gymnura*, sp. n.

Size about as in *S. leptura*. Ears narrow, generally shaped as in *S. leptura*, but with a slight concavity at the upper third of the inner margin, as in *S. canescens*. Tragus of median length, its inner and outer margins straight, its tip rounded off. Nostrils and lips as in *S. leptura*. Feet quite different from those of the other members of the subgenus *Saccopteryx*, for instead of being long and wholly free of the membranes, they are short, stumpy, and involved in the membranes, the wing-membrane being attached towards the distal end of the metatarsus and the calcar being bound to the foot nearly up to the base of the fifth toe. Wing-sac as in the restricted *Saccopteryx*. Base of interfemoral membrane practically naked above, contrasting in this respect with the other species; there are a few fine hairs on this part, but they are almost imperceptible.

Colour apparently, so far as can be judged by a spirit-specimen, dark throughout, as in the true *S. leptura*. The centre of the back has unfortunately lost its fur, so that I cannot say if light stripes were present; in all probability they were.

Skull in its size and delicate build closely similar to that of *S. canescens*, but the postorbital processes are very much more developed, standing boldly out to the level of the zygomatica (see measurements).

Dimensions of the type (in spirit):—

Forearm 35 millim.

Head and body 37; tail 14·5; ear 13; tragus (on inner edge) 2·5; tibia 13; hind foot, s. u. 4, c. u. 4·5; calcar 11.

Skull: extreme length 12·7; basal length 10·4; zygomatic breadth 8; interorbital breadth 3·3; tip to tip of post-orbital processes 5·9; intertemporal breadth 1·7; breadth of brain-case 6·1; length of upper molars 2·7; front of lower canine to back of  $m_3$  5.

*Hab.* Santarem, on the Amazon.

*Type.* Female. B.M. no. 75. 10. 22. 2. Specimen *c* of *S. leptura* in Dobson's Catalogue. Collected by Mr. Wickham.

The marked difference in the structure of the feet, in which

it approaches the subgenus *Centronycteris*, and the nakedness of the interfemoral will readily distinguish this bat from any of its allies.

*Sciurus Ingrami*, sp. n.

Size about as in "*S. astuans cuscinus*" and *S. irroratus*, larger than in the true *S. astuans*. Fur longer and looser than in *S. astuans*, hairs on back about 12 millim. in length. General colour above finely grizzled olivaceous grey, varying somewhat towards brownish; the individual hairs blackish, with yellow subterminal rings. Head like back. Eyes surrounded by whitish rings. Ears rather more fulvous, the hairs dark basally, with fulvous tips. But little or no trace of a yellowish postauricular patch. Chin and throat white. Chest and belly pale buffy, varying almost to white, the hairs sometimes plumbeous basally, sometimes buffy to the roots; line of demarcation on sides not sharply defined. Outer side of limbs and upper surfaces of hands and feet like back, the digits tending rather more towards yellowish. Inner side of limbs buffy, like the belly. Tail-hairs broadly ringed for their basal two thirds with dull fulvous and black, their distal thirds black subterminally and yellowish white distally, the two latter colours giving the general tone of grizzled black washed with yellowish to the tail as a whole. Mammæ 8, one pair in or close behind the axillæ, two pairs on the belly, and one in the groin\*. (Three females examined.)

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

Head and body 190 millim.; tail 185; hind foot, s. u. 44, c. u. 48; ear 21.

Skull: greatest length 49; basilar length 37; greatest breadth 28; nasals 15 (diagonally)  $\times$  6.5; interorbital breadth 16; palate from hensenion 21.7; diastema 13; length of upper tooth-series 7.3.

*Hab.* Tunnel, Southern Minas Geraes: alt. 1200 m. (Two specimens.) Two other specimens from Cruzeiro, São Paulo: alt. 530 m.

*Type.* Female. Original number 433. Collected 7th December, 1900, by Mr. Alphonse Robert.

This species is no doubt the "*Sciurus astuans*" of Wagner, Burmeister, Hensel, Pelzeln, Winge, and other writers on Brazilian mammals; but Linnæus's description is based on the squirrel of Surinam, which is decidedly smaller and both in colour and other characters is clearly a different animal. Shaw's "*Myoxus guerlingus*" is also Guianan in origin.

\* One specimen has an additional anterior mamma on the right side.

The nearest allies of *S. Ingrami* appear to be the group of Andean squirrels to which the names of *S. irroratus*, Gray (Upper Ucayali), *S. aestuans cuscinus*, Thos. (S.E. Peru), and *S. leucogaster*, Gray (Bolivia), have been given. But these Andean forms are all a darker olivaceous, less greyish in tone, their bellies are all tinged, whether strongly or feebly, with yellowish or orange instead of buffy, and they all have only three pairs of mammæ—one axillary, one ventral, and one inguinal—instead of the four pairs found in *S. Ingrami*.

It has been by the generous assistance of Sir William Ingram, Bart., that Mr. Robert has been enabled to undertake a collecting trip to Southern Brazil; and it is therefore with very great pleasure that I have connected his name with this interesting squirrel, whose study clears up an error in determination of very long standing.

*Rhipidomys benevolens*, sp. n.

Closely allied to, and of the same rich fulvous general colour as, the N. Ecuadorean *R. dryas*, Thos. Size slightly larger than in that species. Face and sides of shoulders markedly greyer than the crown and nape, which are rich fulvous like the back. Ears with their anterior coronal surface brown, their postero-internal yellowish, about as in *R. dryas*, the former not contrasting strongly with the colour of the head, as is the case in *R. phæotis*. Under surface white, the hairs white to the roots, the line of demarcation not very sharply defined, but with a clearer fulvous line edging the two colours. Hands and feet whitish fulvous above, the digits quite white. Tail uniformly blackish brown, pencilled as usual in the genus, though not heavily so.

Skull, as compared to those of *R. phæotis* and *dryas*, just intermediate in size, but without any very special characters of its own beyond what may be gathered from the measurements below. Nasals narrow. Palatal foramina not reaching level of molars.

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

Head and body 110 millim.; tail 112; hind foot, s. u. 20, c. u. 21·5; ear 16.

Skull: greatest length 29; basilar length 22·7; greatest breadth 15·5; nasals 10·5 × 3·1; interorbital breadth 4·5; breadth of brain-case 12·5; interparietal 3·4 × 9·8; palate from henselion 12; diastema 7·3; palatal foramina 5 × 2·3; length of upper molar series 4.

*Hab.* Chimate, Upper Beni River, Bolivia, 68° W., 15° S.: alt. 700 m.

*Type.* Male. B.M. no. 1. 2. 1. 14. Original number

1234. Collected 22nd September, 1900, by Perry O. Simons. Three specimens obtained.

This species may be distinguished from *R. dryas* by its markedly larger size, skulls with worn teeth of the latter being considerably smaller than the three skulls of the new form, all rather younger. From *R. phœotis* again it may be separated by its smaller size and less darkened ears and feet. *R. microtis*, Thos., from Bogota, has smaller ears, longer palatal foramina, broader nasals, and larger molars.

*Tatu pastasæ*, sp. n.

*Tatusia Kappleri*, Thos. P. Z. S. 1880, p. 402 (in part).

Size and general appearance very much as in *T. Kappleri*, Krauss, of which there are two typical specimens in the Museum collection. But in a general way the scales are larger, so that there are fewer in each row. Thus in the single specimen there are 58 scales bordering the shoulder-shield posteriorly, as against 66 and 68 in the two specimens of *Kappleri*; 60 along the anterior and lateral edges of the same shield, as against 65 and 67; 54 in the third movable band, as against 56 and 56; 52 along the outer and posterior edges of the pelvic shield, as against 59 and 57: and similarly on the tail there are only 28 scales in the second ring, instead of 33 and 31. On the pelvic shield the scales are of less uniform size and smoothness, the larger scales standing up more prominently above the level of the smaller ones.

On the other hand, the tail-scales, especially proximally, are smoother and flatter, the centre line of each, although slightly keeled, not being raised into a prominent outwardly directed point, as is the case in *T. Kappleri*.

Manus in the single specimen with a distinct claw to the fifth digit, there thus being five claws instead of the normal four.

Back, and especially the pelvic shield, slightly, though very slightly, more hairy than in the allied species.

Other external characters apparently much as in *T. Kappleri*.

Skull closely similar in its characters to that of *T. Kappleri*, as figured by Krauss and Gray, with the following exceptions:—The lateral occipital prominences are more developed, surpassing the median ridge posteriorly. The malar bones are broader in lateral view, projecting further downwards, so that a line drawn from the lower edge of one to that of the other is just at the level of the palatal edge, instead of being surpassed below by the latter. But the chief difference lies



in the posterior palate: in *T. Kappleri* it is deeply hollowed out, and its edges rise up as sharp bony ridges some 4-5 millim. higher than its general level; in *T. pastasæ*, on the other hand, the ridges are but little developed, barely 2 millim. high in one specimen, and less than that in the other. Finally, at the posterior end of the palatal ridges the lateral walls of the choanæ are hollow and considerably inflated, while in *T. pastasæ* there is no inflation whatever and the bones appear to be fairly solid.

Dimensions of the type (measured in the dry condition):—

Length of carapace, from nape to middle line above tail (movable bands contracted), 358 millim.; length of shoulder-shoulder in middle line 117, of pelvic ditto 162; length of middle bands over their curve across the back 444; length of tail (approximate) 400.

Skull: extreme length in middle line 126; basal length 103.5; greatest breadth 50; nasals 44.3; breadth of muzzle anteriorly 12.6; interorbital breadth 26.5; palate length 88.

*Hab.* Sarayacu, Upper Pastasa River, Oriente of Ecuador.

*Type.* B.M. no. 80. 5. 6. 71. Collected by Mr. Clarence Buckley. One skin and two skulls examined.

This species is the *T. Kappleri* of my paper on Buckley's Mammals (*l. c.*), but owing to the fact that the second skull was wrongly assigned to a skin which afterwards proved to be *T. novemcinctus*, that skin was thought to be the same form, and the characters therefore considered to be variable.

With this mistake corrected, a renewed examination shows that the Ecuadorean animal differs so much from the typical Surinam *T. Kappleri* that it should unquestionably be separated specifically.

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XLVIII.—On a new "Bipolar" Schizopod.

By AXEL OHLIN, Ph.D., University of Lund.

WHEN examining the Decapoda and Schizopoda collected during the last Swedish Arctic Expeditions to Spitzbergen and East Greenland in the years 1898, 1899, and 1900, I found, to my great surprise, amongst a number of that magnificent deep-sea Mysidan *Boreomysis scyphops*, G. O. Sars, also one of the few "bipolar" animals, a nearly related form, which I must, after a careful examination, identify with *Amblyops crozetii*, Willemoes Suhm, MS., described and figured by Sars in his report on the 'Challenger' Schizopoda. My specimens—five in number, four of which are males—were

obtained at Station 29 of the expedition of 1900, between East Greenland and Jan Mayen, lat.  $72^{\circ} 42'$  N., long.  $14^{\circ} 49'$  W.; depth 2000 m.; *Globigerina*-ooze; August 27, 1900.

The specimen which was first recorded by Willemoes Suhm as a new species, and later on described by Sars, was taken off the Crozet Islands, lat.  $46^{\circ} 16'$  S., long.  $48^{\circ} 27'$  E.; depth 1600 fathoms; diatom-ooze.

In even the slightest details my examples agree so perfectly with Sars's specimen, that I cannot hesitate for a moment to identify them. As the cases of bipolarity must be regarded as the most interesting points in marine zoogeography of the present day, I thought it appropriate at once to communicate the present instance.

In his paper "On the Deep- and Shallow-water Marine Fauna of the Kerguelen Region of the Great Southern Ocean"\* Sir John Murray enumerates nearly one hundred species belonging to different classes of animals which are supposed to be identical, and occurring both in the Arctic and Antarctic Oceans, but not in the tropical seas.

In a critical revision of the forms quoted by Murray, Professor d'Arcy W. Thompson, in a paper "On a supposed Resemblance between the Marine Faunas of the Arctic and Antarctic Regions" †, comes to the conclusion that in regard to more than one third of the species mentioned by Murray "grave doubt as to their identification was expressed by the original describers. . . . In somewhat more than another third the evidence of identity is inconclusive or even inadmissible. . . .

"Of the remaining forms, about a dozen find their northern representatives in the Japanese seas, where they form part of a fauna predominantly southern in its relations. . . .

". . . the remnant of equal number that are quoted as occurring in the North Atlantic as well as in or near the Southern Ocean are, for the most part, deep-water species."

This remnant of the long original list of bipolar animals, as to the occurrence of which in both hemispheres no doubt can exist, comprises the following species:—

? *Harpacticus fulvus*, Fischer (brackish).

*Terebellides Strömii*, M. Sars.

*Janthina rotundata*, Leach.

*Calanus finmarchicus*, Gunnerus.

\* Trans. Roy. Soc. Edinb. xxxviii. 1895.

† Proc. Roy. Soc. Edinb. 1898.

*Elpidia glacialis*, Théel.  
*Euphronides depressa*, Théel.  
*Ophioglypha bullata*, Wyville-Thomson.  
*Ophiocten hastatum*, Lyman.  
*Ophiernus vallincola*, Lyman.  
*Pontaster forcipatus*, Sladen.  
*Dytaster exilis*, Sladen.  
*Kinetoskias cyathus*, Wyville-Thomson.  
*Boreomysis scyphops*, G. O. Sars.  
*Lophogaster typicus*, M. Sars.  
*Stomias boa*, Cuvier.  
*Halosaurus macrochir*, Günther.

To this list must be added the following species:—

*Echinus norvegicus*, Danielsen & Koren\*.  
*Phascolosoma margaritaceum*, M. Sars †.  
*Priapulid caudatus*, Lamarck †.  
*Nephtys longisetosa*, Örsted †. ["Die Bestimmung nicht ganz zuverlässig."—Ehlers, *l. c.* p. 25.]  
*Glycera americana*, Leidy †.  
*Scolecoplepis vulgaris*, Johnston?, M. Sars †. ["Mit der von M. Sars unter der obigen Benennung beschriebene Spionide fällt vielleicht ein Wurm zusammen, von dem nur die vordere Körperstrecke erhalten ist."—Ehlers, *l. c.* p. 86.]  
*Arenicola assimilis*, Ehlers †. [Also occurring off California.—Ehlers, *l. c.* p. 104.]  
*Notomastus latericeus*, M. Sars †.

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*Eurytenes gryllus* (Mandt) = *Lysianassa magellanica*, Milne-Edwards §.

*Sagitta* (*Krohnia*) *hamata*, Möbius ||.  
*Fritillaria borealis*, Lohmann ||.  
*Diphyes arctica*, Chun ¶.

As seen by this list, the number of hitherto recognized

\* Meissner, "Echinoideen," Hamburg. Mag. Sammelreise, 1900.

† Michaelsen, "Gephyreen von Süd-Georgien," Jahrb. Hamburg. Wiss. Anst. vi. 1889; Fischer, "Gephyreen," Hamburg. Mag. Sammelreise, 1896.

‡ Ehlers, "Polychaeten," Hamburg. Mag. Sammelreise, 1897.

§ Stebbing, "Report on the Amphipoda," Challenger Rep., Zool. vol. xxix. p. 225.

|| Chun, "Die Beziehungen zwischen dem arktischen und antarktischen Plankton": Stuttgart, 1897.

¶ Chun, "Aus den Tiefen des Weltmeeres," 1901.

littoral species which must be regarded as undoubtedly "bipolar" is exceedingly limited, and that of abyssal and pelagic forms is also very restricted.

Without entering in this brief notice upon a discussion of the different views as to the cause of the "bipolarity," I wish only, when recording a new "bipolar" crustacean, to express my agreement with Chun, when he says \* :—"Wenn wir auch bis jetzt nur ein sicher beglaubdigtes Beispiel anzuföhren vermögen, dass identische Arten beider polaren Gebiete durch die ganze Breite des Oceans die tieferen und kühlere Regionen bevölkern, so wird man immerhin nicht umhin können, die Beweiskraft desselben anzuerkennen und mir zuzugeben, dass heute noch ein Austausch zwischen den polaren Faunengebieten stattfindet. Ich bin fest überzeugt, dass eine fleissige Ausnutzung der Schliessnetze auf späteren Expeditionen nicht nur neue Beispiele für einen Zusammenhang der kalten Gebieten eigentümlichen pelagischen Organismen liefern, sondern auch noch manchen Fund von allgemeiner Tragweite darbieten wird."

It is only to be expected that "die Deutsche Tiefsee-Expedition," the leader of which was Professor Chun, will yield important facts in this respect; and it is therefore that everyone who is interested in these questions looks forward with the utmost curiosity to the scientific results of that great expedition.

Lund,  
March 2, 1901.

XLIX.—*Descriptions of Seventeen new Genera of Ichneumonidæ from India and One from Australia.* By P. CAMERON.

[Continued from p. 284.]

PACHYJOPPA, gen. nov.

Antennæ in both sexes longer than the body, in the female distinctly narrowed at the apex, in the male pilose, serrate towards the apex. Areolet oblique, the nervures united above; the apex of the wings with a cloud. Clypeus convex, not separated from the face by a suture. Labrum broad, projecting. Mandibles with two unequal teeth, the upper longer and sharper than the lower. Occiput sharply margined.

\* "Die Beziehungen &c.," p. 62.

Scutellum convex, its top broadly rounded. Median segment sharply and widely depressed at the base, not areolated except in the middle, which is bordered by two stout keels; the apex has a sharply oblique slope; on the top at the sides is a stout tooth. Abdomen bluntly pointed at the apex; there are eight segments in both sexes, the last is small; the ventral fold is stout and extends to the apex of the fourth segment in both sexes. Legs stout, the tarsi bare.

The abdominal segments are closely but not strongly punctured, and do not angularly project at the apex laterally; the sides of the median segments are bordered by stout keels; the head is obliquely narrowed behind the eyes; the lower sides of the pleuræ are not broadly rounded; the part of the mesopleuræ above the middle broadly and roundly projects, the part immediately under the wings being depressed; below the raised part of the scutellum is a stout keel, which also extends round the apex, but is narrower there than on the sides; its apex has a rather steep slope; the front is deeply and widely depressed; the clypeus is more distinctly convex than usual. The abdomen is not much longer than the thorax.

Has the coloration of *Gathetus*, *Facydes*, and *Dimætha*. The first-named is readily known from it by the flat scutellum, by the much shorter, more distinctly dilated antennæ, and by the striated abdomen. *Facydes* and *Dimætha* have also the antennæ shorter and more distinctly dilated, and have the sides of the abdominal segments angularly projecting, and both have the clypeus flat, while *Dimætha* has also the abdomen much longer, the postpetiole much narrower, the legs longer, and the scutellum not pyramidal.

*Pachyjoppa tibialis*, sp. n.

Rufa; antennis, geniculis, tibiis tarsisque posticis nigris; alis flavo-hyalinis, apice fusco-violaceo. ♀.  
Long. 15 mm.

Antennæ stout, the flagellum almost bare, the scape rufous beneath, thickly covered with short pale hair. The inner orbits and the base of the mandibles are obscure yellowish; the face closely punctured, more coarsely in the middle; thickly covered with short fuscous hair; the clypeus obliquely projecting, more strongly punctured and more thickly covered with longer fuscous hair; its apex transverse; the mandibular teeth are black; the palpi thick, rufous. Front depressed, smooth, shining, glabrous; the vertex smooth and shining, bare; the ocelli surrounded by a shallow furrow. The meso-

notum darker than the pleuræ, especially in the middle; closely punctured, thickly covered with depressed fulvous pubescence. Scutellum pyramidal, the top shining, sparsely covered with large punctures and clothed with long fuscous hair; the keels broad, extending from the base of the depression to the middle behind, becoming narrower as they do so; below the keels the scutellum is closely punctured. Post-scutellum not much depressed at the base, stoutly longitudinally striated. The base of the median segment is obliquely depressed in the middle, irregularly rugose, the bottom smooth and shining; there are only the two central area—the basal is slightly narrowed towards the apex and irregularly marked with stout keels, the apical area is narrowed at the base and stoutly irregularly striolated; the sides are stoutly carinate, except at the base, where the keels are somewhat indistinct; the tooth very stout and prominent. The propleuræ strongly punctured, especially behind, the lower parts obscurely striated, and with a stout keel behind the central depression. Meso-pleuræ strongly punctured; under the wings is a large projection, roundly narrowed at the base and apex; the basal part of the metapleuræ strongly punctured, bordered at the top with a stout keel; the apex is coarsely, rugosely, irregularly reticulated. The anterior coxæ slightly, the posterior coarsely, punctured. Areolet oblique; the first transverse cubital nervure is straight, oblique, the second more curved; they unite at the top; the recurrent nervure is received shortly beyond the middle; the transverse basal nervure is almost interstitial. Petiole smooth and shining; the sides tuberculate at the spiracles; the apical half of the dilated part laterally depressed, the depression becoming gradually wider towards the apex. The second and following segments are closely punctured, the third and following segments infuscated; the gastrocœli large, deep, the base smooth, the apex aciculated, the outer edge obscurely striated.

#### LAGENESTA, gen. nov.

Antennæ stout, dilated beyond the middle. Labrum largely projecting. Apex of clypeus transverse. Mandibles bidentate, the apical tooth the larger. Scutellum flat, its sides not carinate. Median segment without areæ, all the keels being obliterated. Areolet large, five-sided, wide at the top. Legs stout, the tarsi spinose. Abdomen with seven segments, neither punctured nor striated; the ventral fold distinct on the second and third segments, less distinct on the fourth and fifth.

The head is large, not much narrowed behind the eyes, behind roundly concave, the occiput margined. Median segment transversely punctured, its apical slope below the middle with a stout wrinkled keel. Areolet large, five-sided, not much narrowed at the top; the recurrent nervure received in the middle. Apical abscissa of radius roundly curved upwards. Apical third of petiole widely dilated. Gastrocœli large, not deep, stoutly striated. Legs stout, the tarsal joints spinose, broad, narrowed at the base; the hinder femora reach to the fourth segment. Abdomen smooth, impunctate, its segments not angularly produced at the apices laterally.

Does not fit well into any of Kriechbaumer's groups of the Hemijoppinæ.

*Lagenesta ferruginea*, sp. n.

Ferruginea, nigro-maculata; abdominis apice late nigro; alis fusco-violaceis, nervis nigris. ♀.

Long. 22 mm.

Antennæ rufous, broadly black beyond the middle. The ocellar region black; the lower inner orbits and the labrum yellowish. Front and vertex aciculate, rougher below the ocelli, smoother near the eyes, which are sharply margined. Face and clypeus punctured, but not very closely or deeply, the latter more sparsely than the face; both are covered with white hair. Labrum smooth and fringed with long golden hair. Mesonotum closely punctured, its base and sides bordered with black, the black colour extending on to the parapsidal furrows, which are distinctly indicated at the base. Scutellum sparsely and slightly punctured; post-scutellum smooth. Metanotum transversely rugosely punctured, towards the apex thickly covered with fulvous hair; the keel bordering the apex broadly projects in the middle at the sides. Pleuræ closely punctured; a broad band in the centre of the pro-, the base and upper edge of the meso-, and the base and lower edge of the metapleuræ black. Wings uniformly fuscous-violaceous, distinctly iridescent; the first transverse cubital nervure is bullated at the top, the second below the middle; there are two bullæ on the recurrent nervure. Legs coloured like the body; the apex of the metatarsus and the four apical joints black. The basal two segments of the abdomen and the sides of the third are ferruginous, the rest deep black; the petiole above finely transversely striated, its sides more strongly and slightly obliquely striated. Gastrocœli distinctly striated, the striæ distinctly separated, the space between them irregularly transversely

rugose; the black apical segments are smooth; the apical segments are fringed with longish black hair.

ZANTHOJOPPA, gen. nov.

Scutellum pyramidal, with an oblique slope at the base and apex, its sides on the basal slope keeled. Median segment with a small basal and a large apical area; the sides with a large leaf-like tooth. Antennæ longish, dilated and compressed beyond the middle. Labrum distinctly projecting. Areolet 5-angled, wide at the top. Abdomen with seven segments, the ventral fold extending to the base of the ovipositor. Abdominal segments finely and closely punctured. Gastrocœli narrow. The sheaths of the ovipositor are longer than usual and project.

The head is well developed behind the eyes and obliquely narrowed; the occiput is margined; the eyes large. The colour is yellowish, marked with black; the dilated apical part of the antennæ is black; the apex of the abdomen is sharply pointed, it becoming gradually narrowed from the base of the fourth segment.

*Zanthojoppa trilineata*, sp. n.

Flava; lineis 3 mesonoti, linea metanoti trochanteribusque posticis nigris; alis fulvo-hyalinis, stigmatibus fulvo. ♀.

Long. 14 mm.

Antennæ nearly as long as the body; the basal fourteen to fifteen joints fulvous, the rest dilated, much attenuated at the apex; black, brownish beneath; the scape sparsely covered with short white hair; the flagellum almost bare. Head yellow, the front and vertex with a triangular black line on each; the black narrowed in the centre, the broad end of the mark on the vertex at the top, on the lower side at the bottom, the two being united and forming an hourglass-shaped mark; the black is continued down the back in the centre; the lower part of the head behind is broadly black. The face and clypeus closely punctured, sparsely covered with short white microscopic hair; the front and vertex closely punctured, except over the antennæ, where it is quite smooth and shining; the mandibular teeth are black. The lower part of the pronotum all round, three broad lines on the mesonotum (the central originating at the base and reaching to the middle, the lateral originating in front of the tegulæ and reaching to the scutellum), its sides along the tegulæ, the scutellar keels, the depression at the base of the scutellum,



the parts at the sides of the scutellum and postscutellum, a semicircular mark on the supramedian area, continued down the posterior median area to the apex of the segment, a broad band in the middle of the propleuræ, a complete band on the top of the mesopleuræ, the base and lower side of the meta-pleuræ, the apex of the mesosternum, and the metasternum, black. Scutellum pyramidal, the base and apex with an oblique slope, strongly and closely punctured, thickly covered with short fuscous hair; the postscutellum with an oblique slope to the base and apex; punctured, covered with short glistening white hair; the depression at its side wide, strongly striated. The base of the median segment has an obliquely rounded slope, black; the black dilated backwards in the middle; the supramedian area is broadly rounded at the base, slightly longer than broad, its apex bounded by a stout keel, which bulges slightly backwards; the other areae are not defined; the teeth are large, longer than broad, rounded at the apex. The pleuræ closely punctured, the meta- more coarsely than the others. Areolet wide at the top, not much narrower than the space bounded by the recurrent and the second transverse cubital nervures; the recurrent is broadly curved and is received shortly beyond the middle; the transverse median nervure is received distinctly in front of the transverse basal. The legs are uniformly coloured yellow, except for the posterior trochanters, which are black; the tarsi are closely and strongly spinose. The base of the petiole is smooth, shining, impunctate, the apex closely punctured; there is a black longitudinal line down its middle; the base of the second segment broadly, of the third more narrowly, black; closely punctured; the gastrocœli shallow, distant from the base of the segment, finely punctured, rufous in the middle.

#### XESTOJOPPA, gen. nov.

Antennæ short, thick, dilated and compressed beyond the middle; the joints of the flagellum not much longer than broad. The central area of the median segment commencing at the middle of the segment. Labrum projecting. Scutellum not much raised, its sides not keeled. Occiput margined. Areolet 4-, or indistinctly 5-angled; the recurrent nervure is received between the middle and apex. Abdomen with seven segments, smooth and shining; gastrocœli shallow. Legs stout, the apices of the tarsal joints spinose. Colour yellow, marked with black.

This genus comes very close to *Zanthojoppa*, but is easily

separated from it by the antennæ being much shorter and thicker, by the median area on the metanotum originating at the middle of the segment—not at the base—and by the much flatter scutellum. The body is stouter, as are also the legs; the head is well developed behind the eyes and is there obliquely narrowed; the metanotal spines are not much developed; the mandibles have two unequal apical teeth; the clypeus is indistinctly separated from the face; the apical abscissa of the radius is roundly curved upwards.

*Xestojoppa olivacea*, sp. n.

Olivacea, apice antennarum lineisque mesothoracis nigris; alis fulvo-hyalinis, stigmatate fusco. ♀.

Long. 16–17 mm.

The twenty-one to twenty-two basal joints of the antennæ whitish yellow, stout, dilated beyond the middle, the apex distinctly attenuated, bearing an obscure, short, white pubescence; the scape smooth, except for a few obscure punctures; the ocellar region, a short line behind them, a narrower line down the front, and the occiput black. The front and vertex smooth, impunctate, the front ocellus surrounded by a deep furrow; there is a shallower furrow down the front; the face and clypeus with a few scattered punctures, shining; the clypeus with a few long fuscous hairs; the apex of the clypeus transverse, of the labrum rounded and sparsely covered with long hair; the mandibular teeth black. Mesonotum closely and rather strongly punctured; thickly covered with short pale hair; the sides narrowly at the base, the rest broadly black, but the black does not touch the edge; the scutellar depression black. Scutellum flat, very smooth and shining; the apex sparsely covered with fuscous hair. Postscutellum shining, obscurely and finely punctured; the depression at its base wide and deep, almost divided into two by the centre being raised. The depression at the sides of the scutellum wide, smooth, except for a few striations; in front of the base of the hinder wings the sides project into a blunt somewhat triangular tooth. The basal half of the median segment is entirely without keels, and consequently there are no areæ, the base is coarsely punctured, the centre broadly raised; the apex has an oblique slope and has in the centre a broad area (the posterior median?) in the middle; this is rounded at the base and bounded by a stout keel, which is larger and more distinct at the base; the area inside is smooth at the base, the apex finely transversely striated, the rest filled up with three rough, stout, irregular, longitudinal keels. The propleuræ

are black down the middle, punctured, the lower part finely striated, finely at the base, much more strongly at the apex; at the top of the central hollow is a stout oblique keel. The mesopleural tubercles are large, leaf-like, and extend from the base to shortly beyond the middle; the part between the tubercles and the middle is raised and sparsely punctured, the part above the raised part depressed and black, the rest closely punctured except at the base, for the most part closely obliquely striated; the apical furrow deep black and marked with stout widely separated keels. The central furrow on the mesosternum shallow, black, wider at the apex, where it is bounded by a stout transverse partition. Metapleuræ coarsely and closely punctured. Legs stout, the hinder tarsi thickly spined. Areolet broad at the top, being there wider than the space bounded by the recurrent and the second transverse cubital nervures; the recurrent nervure is received beyond the middle almost at the base of the apical third. Petiole smooth, shining, impunctate, the middle infuscated, the apex not clearly separated. The second and following segments finely punctured. Gastrocœli deep, smooth on the outer side, triangularly narrowed at the base on the inner, this part having two stout sharp keels on the outer edge, the rest being irregularly but strongly striated. The lower part of the petiole black, closely punctured, the centre stoutly, the sides more narrowly keeled.

AGLAOJOPPA, gen. nov.

♀. Antennæ thickened and compressed beyond the middle. Apex of clypeus transverse; the labrum large, projecting. Mandibles with a large upper, clearly separated, conical tooth. Scutellum flat, not bordered. Median segment distinctly areolated all over, its apex with a gradually rounded slope. Spiracles large, linear. Areolet narrowed at the top, the transverse cubital nervures almost touching there; the transverse basal nervure is almost interstitial. Tarsi spinose; the apex of the hinder femora reaches to the middle of the third abdominal segment. The ventral keel is distinct on the second and third segments; the last segment is largely developed all round and is two thirds the length of the penultimate, its base reaches to the origin of the ovipositor.

The head is well developed behind the eyes and is obliquely narrowed there; the occiput is margined; there is a distinct fovea above the sides of the clypeus, from which a furrow runs obliquely upwards; the postscutellum has a large deep fovea on either side at the base; the base of the median

segment is obliquely roundly raised; the gastrocoeli are deep, large; the second and third abdominal segments are closely longitudinally striated; the bases of the segments are narrowed compared with the apices of those behind. There are seven segments.

The male has the antennæ longer and serrate; the last abdominal segment is nearly as long as the preceding; the ventral keel is on the second and third segments as in the female.

All the species are black, with the thorax and abdomen largely marked with yellow; the wings are infuscated towards the apex and to a less extent at the base. In the female the aciculation on the abdomen extends to the fourth segment, in the male it is much stronger and extends to the fifth; in the male, too, the abdominal segments project more acutely at their apices. The median segment is more completely areolated than it is with most *Joppini*; it, however, possesses the characteristic oblique depression at the base, and the areola is represented by a smooth, raised, flat tubercle, which becomes gradually widened towards the apex, where it is transverse.

*Aglaojoppa flavomaculata*, sp. n.

Nigra, flavo-maculata; antennis nigris, medio albo annulato; pedibus flavis; dimidio basali femorum posticorum et basi apiceque tibiæ posticarum nigris; alis fusco-hyalinis. ♀.

Long. 13-14 mm.

Antennæ dilated and compressed before the apex; the scape and the tenth to sixteenth joints white beneath; the scape finely punctured, sparsely covered with short fulvous pubescence; the flagellum bare. Head lemon-yellow, shining, smooth; the face sparsely covered with short white pubescence; the occiput, a broad oblique line behind the eyes near the top, the front and vertex broadly in the middle, the middle more narrowly and the front more broadly than the vertex, the middle of the face more broadly below, and a narrower line round the top of the clypeus, and its apex in the middle narrowly, black. The face and clypeus sparsely punctured; the clypeal foveæ deep; the labrum fringed with long fulvous hair; the middle finely transversely striated. Thorax black; the edge of the pronotum broadly, its base in the middle, both marks being roundly incised in the middle, two lines on the mesonotum, narrowed at the base and not reaching to the apex, the scutellum, the scutellar keels, the lateral two areæ on the median segment, a mark on the lower

part of the propleuræ, the prosternum, the tubercles, a mark broader than long and dilated on the lower side at the apex, a longer oblique mark not reaching to the apex, a small mark under the hinder wings on the metapleuræ, and a large oblique one, rounded at the top, lemon-yellow. Mesonotum shining, almost impunctate, except slightly behind. Scutellum flat, rounded behind; the postscutellum finely punctured. The base of the median segment smooth, raised and oblique in the middle; the supramedian area obsolete, not bounded by keels, somewhat triangular at the base; the posterior median area rounded at the base, closely and rather strongly transversely striated, as are also the apical lateral area; the spiracular area transversely striated, the striæ stronger and more widely separated than on the posterior median area. Pro- and mesopleuræ shining, sparsely punctured, the former striated on the lower half; the metapleuræ sparsely punctured, the depression at the top deep. The mesosternum flat, its furrow transversely striated. Wings with a fuscous-violaceous tinge; the nervures and stigma black; the areolet narrower at the top, being there slightly less in length than the space bounded by the recurrent and the second transverse cubital nervures; the recurrent is received shortly beyond the middle. Legs lemon-yellow like the thorax; the base of the hinder coxæ, the base of the four anterior trochanters, the hinder trochanters entirely, the basal half of the femora, with a narrow line in the centre of the apical half of the anterior pair, and the base and apex of the tibiæ black; the tarsi more or less fuscous. Abdomen black; on the sides of the first, second, third, and fourth segments are large lemon-yellow marks; the apex of the petiole and of the second and third segments longitudinally striated in the middle; the gastrocœli smooth, not striated, deep; the apical segments have a bluish tinge.

The male is similarly coloured, but with the yellow marks if anything larger, and the wings are much more deeply and distinctly smoky violaceous.

The yellow markings on the thorax and abdomen probably vary in size and number; the lateral marks on the median segment may become confluent; in this case the dividing keel is yellow.

#### CHARITJOPPA, gen. nov.

Antennæ stout, dilated and compressed beyond the middle. Scutellum pyramidal, its sides at the base below the raised part keeled. Head largely developed below and behind the eyes; the occiput sharply margined. Clypeus not separated

from the face, foveate at the sides above; labrum hidden. Mandibles stout; the apical two teeth large, the upper the larger and blunter at the apex. Meso- and metanotum stoutly reticulated; the suprmedian area smooth, open at the apex, the keels continued to the apex of the segment, roundly diverging as they do so. Legs stout, the penultimate joint of the hinder tarsi spined. Areolet three-angled, the transverse cubital nervures uniting at the top; there is hardly an angle formed by the recurrent nervure and the cubital; the apical abscissa of the radius is roundly curved upwards at the base; the transverse median nervure is received distinctly in front of the transverse basal. The base of the petiole narrow, the apex broadly dilated. Gastrocœli large, deep. Abdomen (♀) with eight segments; the ventral fold extends to the apex of the third segment; the second and third segments are closely longitudinally striated. Eyes widely distant from the base of the mandibles, hardly reaching to the top of the clypeus.

This genus is closely related to *Magrettia*, which differs from it in having the scutellum flat, not pyramidal, and incised at the apex; the hind coxæ bear teeth and the second and third abdominal segments are not longitudinally striated.

*Charitojoppa cærulea*, sp. n.

Nigra, abdomine cæruleo, facie, orbitis oculorum, linea pronoti, scutello tegulisque albis; pedibus rufis, basi tibiæ posticarum late, coxis trochanteribusque anterioribus albis; alis hyalinis, stigmate nigro. ♀.

Long. 16 mm.

Head bluish black; the face, clypeus, the upper orbits on the inner side narrowly, and the outer on the lower broadly, yellow; between the antennæ and the base of the clypeus is a broad bluish mark, which becomes slightly and gradually dilated towards the apex; mandibles yellow, the teeth black. The face somewhat strongly, the clypeus more slightly, punctured. Antennæ black, the middle with a broad white band; beyond the white band they are dilated and compressed; the apex distinctly attenuated. The sides of the pronotum broadly, its base, the base of the tegulæ, tubercles, the sides of the scutellum, the lower part of the pro- and mesopleuræ (the latter broadly), and the metapleuræ in front of the coxæ, yellow. Mesonotum dark green, coppery in the middle, strongly irregularly reticulated, the sides with a clearly defined hollow, distinctly bordered, and having inside of it a few sharp transverse keels. The centre of the scutellum

distinctly pyramidal, the sides flat, yellow. Median segment coarsely irregularly reticulated, the reticulations wider in the centre of the segment; the posterior and suprmedian areas united. Propleuræ strongly obliquely striolated; the base of the mesopleuræ coarsely punctured, running into stout longitudinal striolations, except in the middle, where it is smooth on the lower side. Metapleuræ coarsely reticulated all over, its extreme base yellow, the yellow line broader above, narrower below. Areolet much narrowed at the top, being there not much more than half the length of the space bounded by the first transverse cubital and recurrent nervures. Four anterior legs fulvous, the coxæ and trochanters yellow, the front tarsi fuscous towards the apex; the hinder coxæ, basal joint of trochanters, the apex of the femora broadly, and the apical third of the tibiæ black. The basal half and underside of the petiole and the sides of the apex of the petiole yellow; its apex broadly raised in the middle, the sides of the raised part and the centre keeled, the sides with transverse keels; the extreme apex of it smooth, the depressed sides irregularly transversely striolated; the second segment irregularly reticulated, more closely and less irregularly towards the apex. Gastrocœli smooth, yellow. The apices of the second and third abdominal segments pale yellow, the third segment closely longitudinally striolated, the other segments impunctate, shining, their apices pallid yellow; the second segment broadly in the middle, and the apices of the others narrowly, pallid yellow.

[To be continued.]

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L.—On the supposed Rediscovery of "Moseleya" in Torres Straits. By S. PACE, F.Z.S. &c.

AMONG the collections obtained by the 'Challenger' Expedition was included a single specimen of a coral for which Quelch\* founded the genus *Moseleya*, with the single species *M. latistellata*, Quelch. This form, which until now has only been known from the unique type specimen in the British Museum, owes its great interest to the deductions which have been drawn as to the supposed relationship of the genus to the so-called *Rugosa* of Palæozoic times, and as to the affinities of the latter group. Thus, Quelch placed *Moseleya* in the *Cyathophyllidæ*; and even in the most recent work on corals †

\* Ann. & Mag. Nat. Hist., ser. 5, vol. xiii. 1884, pp. 292-3. The specimen was subsequently figured, Chall. Rep. vol. xvi. pp. 110-113, pl. xii. figs. 1-7.

† G. C. Bourne, in Lankester's Treat. Zool., Anthozoa, p. 70.

we read:—"The discovery of *Moseleya latistellata*, a reef-coral from Wednesday Island, Torres Straits, leaves no doubt as to the close relationship of the *Astraeidae* to the *Cyathophyllidae*. *Moseleya* is a compound coral with polygonal calicles, a thin epitheca, a rudimentary theca, and the cavity of the calicles is filled up nearly to the margin by tabulae separated by an abundant dissepimental endotheca. The septa in adult calicles are numerous and give no indication of a hexamerous arrangement, but in young calicles a tetramerous symmetry is distinctly visible \*, owing to the cruciate arrangement of four large septa. *Moseleya* shows decided affinities, on the one hand to a typical *Astraeid* such as *Prionastraea*; on the other hand to a *Cyathophyllid*, such as *Cyathophyllum regium*, and it cannot be doubted that the *Cyathophyllidae* and the forms allied to them can no longer be classified apart as *Rugosa*, but must be placed along with or close to the *Astraeidae*."

It has recently been my fortune, while collecting in Torres Straits, to meet with a very considerable number of specimens † of what I take to be a species of *Lithophyllia*. The coral in question is a common one at most stations in this region; it is met with at and below extreme low-water mark on the reefs, while most of my specimens have been obtained from the backs of pearl-shell picked up by divers in depths ranging from 3 or 4 fathoms to upwards of 20. As is the case with corals in general, the shape and general appearance of the corallum is very variable, and it assumes quite a different character in relation to the nature of the environment. Now, the point to which I would call attention is that some examples of this form appear to be quite indistinguishable from Quelch's *Moseleya latistellata*. The question therefore naturally arises whether those who have based such weighty conclusions upon the single 'Challenger' specimen may not have acted somewhat precipitately: whether, after all, *Moseleya* may in reality have no genetic relationship whatever to the *Cyathophyllidae*, and whether its supposed *Rugose* characters are not merely the expression of adaptive modification.

Most of the specimens brought home by me differ at first sight very considerably from the 'Challenger' specimen of *Moseleya* in that the calices are not nearly so flattened or

\* One can find in this specimen symmetry of any order—tetramerous, hexamerous, or pentamerous; all equally subjective.

† Some examples were preserved and will be presented to the British Museum; but unfortunately I did not at the time realize how much interest they possessed, as otherwise I might easily have collected much more material, and should also have made more careful observation of the coral during life.



expanded as they are in that specimen, neither are they quite so large. The degree of "cuppiness" in this coral appears, however, to be directly dependent upon the character of its environment. Where the bottom is hard and free from mud, then will the calyx be deep, but where (as is the case in many parts of the Straits, and notably at the spot where the 'Challenger' specimen was obtained) the bottom consists largely of soft mud the coral will then be more or less flattened out. This modification is, of course, only what we might, *à priori*, expect to occur; for if a coral living on mud had a deep cup, this would very soon become filled with sediment. So far as my experience goes, mud is the greatest enemy a coral has to dread, and one frequently finds special adaptations to enable it to exist on muddy ground. Thus, specimens of *Turbinaria* from muddy bottom often present a convex upper surface instead of possessing the normal cup-shape, or one side of the cup may be notched or hollowed out, or, again, the cup may be perforated at its base in order to enable the mud to escape, and thus to prevent the clogging of the coral.

It is not my intention here to enter further into a consideration of the morphology and relationships of *Moseleya*, as the elucidation of these questions will, I hope, be undertaken at the much more competent hands of Mr. H. M. Bernard.

#### BIBLIOGRAPHICAL NOTICES.

*Die Mimik des Menschen.* By HENRY HUGHES. Frankfurt-a.-M.: Johannes Alt, 1900. Pp. xi, 423.

STUDENTS of psychology should extend this treatise a hearty welcome. It is comprehensive in its scope, and the various sections are skilfully condensed, yet so as to lose nothing for the sake of brevity. The book is divided into five sections or chapters, and these again are subdivided into smaller sections, thus facilitating reference.

What seem to be omissions are probably intentional on the part of the author. Sub-section V. of Section II. is historical in character, and claims to be a phase of the subject hitherto untouched. We quite agree with the author that the attitude of caution should be ours when drawing conclusions from purely lay-sources relative to incidents of animal instinct and expressions of the emotions. We wish that this section—the section, moreover, most likely to interest readers of this journal—had been more fully treated.

The illustrations certainly leave much to be desired: for the most part they have been drawn from other works; some of them are old, and none of them are beautiful. They are unworthy of the rest of the book.

*The Birds of Ireland.* By RICHARD USSHER and ROBERT WARREN.  
Gurney & Jackson, London, 1900.

A NEW history of the birds of Ireland, thoroughly up to date, has long been needed. That want has now been supplied, with a completeness that leaves nothing to be desired, in the volume now before us. It is a model of what such a book should be, for it is something more than a register of names of birds which may be found and looked for within the boundaries of Irish territory. Its pages teem with facts, and so well presented that they form the most delightful reading. Lovers of outdoor life, and of bird-life in particular, will turn to this volume again and again with a sense of delicious enjoyment, even though they be not specially interested in the birds of Ireland. The whole book shows that the authors have an intimate—we may say a peculiarly intimate—knowledge of their subject, for almost every page records some new fact or observation on the habits of birds and their surroundings. It might very well serve as a textbook on the habits and instincts of birds.

The illustrations comprise a coloured plate, maps, numerous full-page plates, and vignettes, all of which are excellent.

W. P. PYCRAFT.

#### MISCELLANEOUS.

*Notes on the Dates of Publication of the Natural History portions of some French Voyages.*—Part I. ‘*Amérique méridionale*’; ‘*Indes orientales*’; ‘*Pôle Sud*’ (‘*Astrolabe*’ and ‘*Zélée*’); ‘*La Bonite*’; ‘*La Coquille*’; and ‘*L’Uranie et Physicienne*.’ By C. DAVIES SHERBORN, F.Z.S. &c., and B. B. WOODWARD, F.L.S. &c.

‘*Voyage dans l’Amérique méridionale,*’ &c. Par A. D’ORBIGNY.

Tom. III., pt. 4. Paléontologie, by Orbigny. 188 pp. Issued in 1842.

A portion of this work, entitled ‘*Coquilles et Echinodermes fossiles de Colombie*’ (4to, Paris, 1842), was issued earlier in the same year by d’Orbigny.

IV., pt. 2. Mammalogie, by Orbigny and Gervais. 32 pp. 1847.  
Wiegmann, Archiv, 1848, p. 143.

IV., pt. 3. Oiseaux, by Orbigny. 395 pp.

pp. 1–48. 1835. Wiegmann, Arch. 1836, p. 162.

49–158. 1837. Id. 1838, pp. 370 & 380; 1839, p. 234.

159–232. 1838. Isis, 1839, p. 406.

233–352. ?

353–395. 1847. Wiegmann, Arch. 1848, ii. p. 10; Isis, 1847, p. 940.

[A detailed description of the bird part already issued appeared in ‘*Isis*,’ 1839, p. 406 &c.; it says that up to p. 232 had appeared by “*Lieferung 35, 1835*”—but the statements of Wiegmann seem more reliable as to the earlier pages, though it establishes the publication of p. 232 by 1839; besides, *Lief. 35* could not have appeared until the end of 1837, as *Lief. 1* was issued only in Jan. 1835; it appeared Oct. 1838, see *Compt. Rendus*, 1838, Oct., p. 726.]

Tom. V., pt. 1. Reptiles, by Orbigny and Bibron. 12 pp.

1847. Wiegmann, Arch. 1848, p. 196.

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II. Plantes vasculaires 1853. Wiegmann, Archiv, 1855, ii. 372.

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' Voyage autour du Monde exécuté pendant . . . 1836 et 1837 sur . . . 'la Bonite,' commandée par M. VAILLANT,' &c.

Zoologie. Par MM. Eydoux et Souleyet.

Vol. I. pp. i-xxxix, 1-106. 1841. Bibl. Franç. 18 Dec. 1841; Wiegmann, Archiv, 1842, pp. 16 & 38.

107-328. 1842. Wiegmann, Arch. 1843, p. 156.

II. pp. 664. 1852. Wiegmann, Arch. 1853, p. 91; 1854, pp. 395 & 421; J. de Conch. iv. 1853, p. 93.

Zoophytology. Par L. Laurent. 276 pp. 1844. Bibl. Franç. 14 Dec. 1844.

Botanique. Par M. Gaudichaud.

Introduction. 8vo. 1851.

Explication et description des planches de l'Atlas par C. d'Alleizette. 186 pp. 1866.

Cryptogames. 355 pp. 1846. Bibl. Franç. 7 Nov. 1846.

Note.—The whole of the Cryptogams appeared in 1846; Montagne, in the preface, says that the complete MS. was sent to the editor in Dec. 1843, that some proofs were sent by him to Berkeley in 1844, who published extracts therefrom; but the work was not issued till 1846.

Atlas. 150 pls. [1846-49 ?]

' Voyage autour du Monde . . . sur . . . la Coquille pendant . . . 1822-25 . . . ' Par L. J. DUPERRY &c.

Zoologie. 28 livr., forming 2 vols.

Livr. 1.	6 sheets.	Vol. I. pp. 1-48.	Bibl. Franç. 1 Nov. 1826.
2.	5	49-88.	17 Jan. 1827.
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11-14.	8½		137-200.		12 July. 1834.

'Voyage autour du Monde . . . exécuté sur l'Uranie et la Physicienne, pendant . . . 1817-20 . . . ' Par M. L. DE FREYGINET.

Zoologie. Par MM. Quoy et Gaimard. iv. 712 pp, 96 pls.					
Livr. 1.	5 sheets,	pp. 1-40.	Bibl. Franç.	26 June, 1824.	Fér. Bull. iii. 1824.
2.	6	41-88.		31 July, "	Ibid. [62.]
3.	5	89-128.		28 Aug. "	Ibid. 220.
4.	7	129-184.		18 Sept. "	Ibid. iv. 1825, 85.
5.	6	185-232.		9 Oct. "	Ibid. 250.
6.	6	233-280.		20 Nov. "	Ibid. 366.
7.	5 (6)	281-328.		18 Dec. "	Ibid. v. 255.
8.	6	329-424.		{ 29 Jan. 1825.	Ibid. vi. 102, 113.
9.	6		{ 26 Mar. "		
10.	6 (?5)	425-496.		{ 7 May, "	Ibid. vii. 1826, 382.
11.	5 (?4)		{ 18 June, "		
12.	5	497-616.		{ 6 Aug. "	Ibid. xii. 1827, 387.
13.	5		{ 1 Oct. "		
14.	5	617-712.		{ 17 Dec. "	Ibid. xiii. 1828, 418.
15.	6		{ 26 Apr. 1826.		
16.	6			{ 14 June, "	

[Descriptions of the anatomy of some of the marine Mollusca were contributed by H. D. de Blainville; the land-shells were named by Férussac; whilst the descriptions of the "Polypiers flexibles" were by Lamouroux.]

Botanique. Par M. C. Gaudichaud. Algæ, by Agardh; Fungi, by Persoon.					
Livr. 1.	6 sheets,	pp. 1-48.	Bibl. Franç.	25 Oct. 1826.	Fér. Bull. xi. 1827.
2.	5	49-88.		27 Dec. "	429.
3.	5	89-128.		24 Feb. 1827.	
4.	5	129-168.		13 June, "	Ibid. xii. 233.
5.	6	169-216.		12 Sept. "	Ibid. xiii. 1828, 75.
6.	6	217-264.		23 Feb. 1828.	Ibid. xiii. 1828, 418.
7.	6	265-312.		16 Aug. "	
8.	6	313-360.		27 Dec. "	
9.	4 (?5)	361-400.		18 July, 1829.	Ibid. xx. 97.
10.	4	401-432.		12 Sept. "	
11.	4	433-464.		28 Sept. "	
12.	7½	465-522.		6 Mar. 1830.	Ibid. xxiii. 73.

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### Extract from Author's Introduction.

FOLLOWING upon the daily exigencies of official work, the preparation of this volume has occupied the leisure hours of many years, and as an attempt to show in one volume the precise status of every so-called British bird, distinguishing the rare and accidental visitants from the residents and annual migrants, it conveys information of a kind which is not to be found in any other work on British birds.

Divided into two parts, the first portion deals with "British Birds properly so called, being residents, periodical migrants, and annual visitants"; the second portion includes the "Rare and accidental visitants," and a special feature of the book is that in the case of every rare bird a list of occurrences is given, from the publication of the earliest records (so far as has been ascertained) down to the end of the year 1900. The reader is thereby enabled to estimate at a glance the precise nature of the claim which any given species has to be considered "British." Some notion of the labour entailed may be formed when it is stated that the number of references in Part I. amounts to 1500. in Part II. to 2325, and in the whole work to 3825 or thereabouts.

The measurements of every species are given in four dimensions, namely, the length from tip of bill to end of tail; length of bill; length of wing from carpal joint to end of longest primary; and length of leg, or rather the exposed portion of it (the tarsus) which is most readily seen.

The Publisher has illustrated the volume by a series of thirty-five plates in colour, reproduced from original drawings by the late Professor Schlegel, representing the heads of two hundred and sixty-two species (in all four hundred and seventy-seven figures), showing the plumage of both sexes, as well as old and young when necessary, with a fidelity which he ventures to think has never been hitherto approached in a work at the price of this volume, and which are so accurate as to enable an observer to immediately identify a bird by their aid. They have been executed in response to a repeated demand for a book on British birds with accurately coloured plates *in one volume*. This the booksellers have been hitherto unable to supply, the expensively coloured works of Gould and the late Lord Lilford, each costing not less than forty guineas, being altogether beyond the reach of those who cannot afford to pay more than forty shillings for their desideratum.

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# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 41. MAY 1901.

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LI.—*Remarks on Secondary Sexual Differences in Rutelid Coleoptera, with Descriptions of some new Forms.* By GILBERT J. ARROW.

THE sexual differences of the *Adoreti* have as yet received no attention, although the neglect of them has added to the difficulty of establishing order in the nomenclature of this much-confused group of Rutelidæ. There are a number of extremely similar African species of *Adoretus*, characterized by a broad clypeus and close grey pubescence, amongst which are a few erect setæ. The separation of these has been found a matter of the greatest difficulty, but there is a structure found in the males attention to which will, at any rate, very considerably obviate this. The male of *Adoretus xanthochrous*, Har. (*testaceus*, Fähr.), found in Natal, has the hind trochanters produced into a long spine, which has been described as a specific character. It seems to have been overlooked that it occurs in only one sex.

The male of the West-African *A. hirtellus*, Lap., has a similar long spine, but consisting in this case of a sharp projection from the femur. It is represented in the female by a slight and not acute prominence.

In *A. vestitus*, Reiche (Abyssinia), this sexual structure is represented by a triangular plate which occupies the

*Ann. & Mag. N. Hist.* Ser. 7. Vol. vii. 28

same position. These two species are otherwise scarcely distinguishable.

The East-African *A. punctipennis*, Fähr., another species of almost identical appearance, may be distinguished from those just referred to by the entire absence in both sexes of any armature of this kind. In a former paper dealing with Rutelid Coleoptera from the Transvaal (Ann. & Mag. Nat. Hist. (7) iv. p. 120), regarding all the unarmed specimens as females, I failed to distinguish these two species, and referred a specimen of *A. punctipennis* to the West-African species. The range of these insects is therefore still less wide than I there stated. *A. punctipennis*, Fähr., though distinct from *A. hirtellus*, Lap. (= *cinerarius*, Burm.), is, I believe, identical with *A. cephalotes*, Gerst.

In all these forms the two sexes are closely similar and the appearance of both that of typical *Adoreti*; but there are members of the group in which the male characters are greatly exaggerated, the hind legs being of enormous size and the characteristic appearance of the true *Adoretus* almost lost. One of these is *A. albosetosus*, Waterh. (which has been twice redescribed by M. Fairmaire under the names of *albohispidus* and *hystrix*). For this a new genus will have ultimately to be formed, but I do not propose to do this at present, as I have not yet been able to see the female, which appears to be much rarer than the male.

An East-African insect not very distantly related to the last has been described by Herr Brenske under the name of *Trigonocheilus coriaceus*. The author was evidently not acquainted with the nearest allies of this remarkable beetle, for he has formed a new subfamily for it. Had the female only been known, however, the species would no doubt have been placed in the genus *Adoretus*, the peculiarities which have induced its separation virtually all resulting from the great developments peculiar to the male. Here again there is a strong spine upon the lower edge of the hind femur, which, with the tibia, is greatly enlarged, as in *A. albosetosus*.

In the British Museum is an undescribed species from Angola, which, although differing considerably in general appearance from *T. coriaceus*, may well be placed in the same genus. The two sexes of this show similar remarkable differences.

*Trigonocheilus politus*, sp. n.

Breviter ovatus, nitidus, rufo-testaceus; capite rugoso-punctato; prothorace parvo, lateribus valde arcuatis, longe flavo-hirtis, marginibus reflexis, angulis posticis rotundatis, disco fere polito;

scutello flavo-setoso, cordiformi; elytris leviter parum dense punctatis; pygidio cum abdominis dorso flavo-pubescentibus; corpore subtus fere nudo, cum pedibus ferrugineis.

Long. 10.5–12.5 mm.

♂, elytris basi vage infuscatis, subtilissime punctatis, pilis brunneis longissimis parce hirtis; pedibus postice valde incrassatis, femoribus dilatatis spina longa recta munitis, tibiis curvatis, apice intus longissime et acute productis, tarsis quam tibiis paulo brevioribus.  
♀, thorace basi fortius contracto, punctis disco nonnullis magnis; elytris magis punctatis, minute et parcissime flavo-setosis, pone medium maculis parvis 4 prope margines formantibus.

*Hab.* Angola.

This species is of a shorter and more oval form than *T. coriaceus* and of a brick-red colour. The upper surface in the female is decorated with minute scaly setæ, collecting on the posterior half of the elytra into rather indefinite yellow spots. In the male these setæ are replaced by very long



Hind legs of males of (a) *Trigonocheilus coriaceus*, Brenske, (b) *T. politus*, Arrow. Twice natural size.

hairs thinly scattered over the prothorax and elytra. In the female the hairs are much shorter and confined to the margins. The prothorax of the male is flatter and less narrowed behind than in the other sex and the elytra are darker at the base. The hind legs show a similar development to those of *A. coriaceus*, but the femoral spine is straight, the tibia is produced at the extremity into a very long spur, and the tarsus is scarcely as long as the tibia.

I have sketched the hind legs of the males of these two species for the sake of comparison. Herr Brenske's figure of the type species gives a scarcely correct impression of its appearance, as was almost inevitable, since the artist did not see the insect.

A little more attention given to the sexual characters of the genus *Anoplognathus* would have rendered the identification and classification of these beetles much simpler. Some of the

species are unrecognizable from description owing to uncertainty as to the sex of the type, a point which can always be ascertained with very little trouble. These characters also form a more natural and useful basis of subdivision than those which have been employed.

The proper allocation of the species between the genera *Calloodes* and *Anoplognathus* has vexed the minds of all who have dealt with these insects, partly owing to the rarity of the type species of the former genus, but also through oversight of the sexual differences, which has led to forms of very varied type being assigned to it by different authors. Examination of both sexes of *Calloodes grayanus*, White, shows it to possess, in common with its immediate allies, peculiarities in the form of clypeus and tibia which quite clearly separate them from all other forms.

To set this matter at rest I shall for the first time formally characterize this genus, drawing up the diagnosis from White's type (which is a female) and a male of the same species.

#### CALLOODES.

Regulariter ovatus, subdepressus. Clypeus utroque sexu brevis recte truncatus, margine reflexa; maris angulis minus rotundatis, margine magis reflexa. Prothoracis margo postica ante scutellum profunde excisa, ad emarginationis latera acute angulata. Tibiæ anticæ edentatæ, latere externo maris recto, feminae leviter bisinuato. Processus mesosternalis longus, validus, fere rectus.

The known species of this genus are *grayanus*, White, *Rayneri*, McLeay, and *Atkinsoni*, Waterhouse, all others assigned to it being entirely different in essential characters. Mr. Blackburn, who last attempted to define the genus, although believing he knew all the species, had evidently seen none of these three, for he finds the principal generic characteristic to be the possession of "genuinely metallic" colours, whereas all are *unmetallic* green.

I may note that *C. grayanus* has a cleft claw to the front tarsus in the female, while in the other species all claws are undivided in both sexes.

The following new species of *Anoplognathus* may be described here:—

#### *Anoplognathus luridus*, sp. n.

Breviter ovatus, brunneus; capite, prothorace, scutello, pygidio, femoribus tibiisque igneo-metallicis, corpore subtus metallico-nigro, tarsis nigro-viridibus; clypeo brevi, cum fronte paulo

punctato, nitido, maris parte media nonnihil producta, reflexa; prothorace nitido, vix punctato, lateribus paulo arcuatis, angulis anticis acutis, posticis fere rectis, marginis anticæ medio sat profunde ante scutellum exciso, angulis rotundatis; elytris subdense non conflenter punctatis, punctis majoribus seriato-ordinatis interpositis, apicibus paulo productis, subtiliter rotundatis; pygidio fere lævi, punctis magnis setisque nonnullis; corpore subtus fere nudo, processu mesosternali longo, acuto, tibiis anticis 3-dentatis.

Long. 22 mm.

*Hab.* New South Wales.

This insect is intermediate between *A. rugosus*, Kirby, and *A. chloropyrus*, Drap., its colouring being almost that of the former and its form and sculpture more those of the latter, but showing an approximation to *A. rugosus*. The clypeus is as in *A. chloropyrus*, but the sternal process is stronger, there is no definite striation upon the elytra, of which the sutural angles are slightly produced and not squarely truncate, and the sculpturing of the pygidium is only incipient.

*Anoplognathus explanatus*, sp. n.

Ovoidalis, depressus, postice latus, brunneo-testaceus, lævissime purpureo-nitens; capite, prothorace scutelloque paulo æneis, pygidio fusco-viridi, corpore subtus nigro, femoribus tibiisque rufis, tarsis nigro-viridibus, capite, prothorace, scutello suturaque anguste nigro-marginatis; capite punctato-rugoso, clypeo maris producto, quadrato, hirtio, margine antica tota reflexa, feminae semicirculari; prothorace transverso, maris paulo angustiore, leviter punctato, angulis anticis crebrius, his flavo-hirtis, acutis, angulis posticis fere rectis, lateribus angulatis vix arcuatis, margine postica ante scutellum leviter excisa; scutello subtiliter punctato; elytris sublineato-punctatis, ad humeros prothoracis latitudine, deinde ad post medium valde dilatantibus (maris paulo minus), costa laterali ad marginem parallela, angulis suturalibus separatim sat minute rotundatis; pygidio rugoso, parce flavo-hirtio; corpore subtus (abdominis medio excepto), femoribus tibiisque intus flavo-hirtis, mesosterno crebre punctato, breviter acuto, tibiis anticis 3-dentatis.

Long. 23 mm.

*Hab.* New South Wales.

This is a member of the section represented by *A. suturalis*, Boisd., and *A. hirsutus*, Burm., as indicated by the hairy squarely-produced clypeus of the male. It is readily distinguished, however, from these, as from all other described species, by its peculiar pear-shaped outline and the prominent costa running near and parallel to the margin of each elytron.

The purplish lustre characterizing all the specimens I have seen may, perhaps, not be absolutely constant, but another feature distinguishing this species from the two just mentioned is presented by the apices of the elytra, which are separately rounded.

Although these three insects are the only described species of this section of the genus, it consists of a number of closely related forms. As I am not able to decide with certainty which of these is Burmeister's species, it would be unwise to attempt at present to name the other nondescripts.

Another beautiful Australian Rutelid, also sexually dimorphic, requires further description. This is the *Popillia flavomaculata* of McLeay, a species probably described from a single specimen and quite erroneously placed. Specimens of this insect have lately been brought from Mount Bellenden Ker, in North Queensland, and it was only by an accident that I was led to consult McLeay's description, for neither in form nor structure has the species any resemblance to *Popillia*, a genus which is not known in Australia. The rather depressed and elliptical form and pubescent surface of *flavomaculata* distinctly suggest *Adoretus*, but its mouth-parts disprove any such affinity. The flat prosternal process upstanding behind the coxæ is known elsewhere among Rutelidæ only in the genus *Mimela*, but the ten-jointed antennæ, as well as its entire aspect, seem to exclude this insect from the Anomalinæ. Although I am unable to pronounce upon the true place of this new genus in the family, its remarkable combination of characters, together with the peculiar beauty of its colour and marking, will make it quite easy of identification when rescued from the obscurity of a great genus to which it does not belong.

#### MIMADORETUS, gen. nov.

Ellipticus, subdepressus. Clypeus subquadratus, transversus. Labrum simplex, late emarginatum. Maxillæ 3-dentatæ, palporum articulo ultimo grandi, fusiformi, longitudine ad reliquos æquali. Labium latum, margine paulo concava. Antennæ 10-articulatæ, clava triphylla, parum elongata. Prosternum post coxas prominens, cuneiforme. Metasternum inter coxas medias acutum, non productum. Pedes omnes robusti. Tibiæ anticæ fortiter bidentatæ. Maris unguis integri, femine pedis antici externus fissus.

The type of *Mimadoretus flavomaculatus* is evidently a female, in which sex the upper surface is of a light mahogany-colour, with a metallic lustre, especially upon the prothorax.

In the male, however, the elytra are almost black, shining but quite unmetallic. In both there is a similar pattern of yellow scaly hairs which cover the pygidium and under surface. It is quite a small beetle, about 8 millimetres long.

The following two new species of *Pseudosinghala* are remarkable for colour-differences between the two sexes. These are of the nature which I have previously described as general in the *Anomalinae*, viz. the males are invested with a hue superimposed upon that of the females.

*Pseudosinghala regalis*, sp. n.

Curta, robusta, testacea; corpore antice et subtus brunneo, tibiis tarsisque fere nigris, maris capite, prothorace, scutello, pygidio, corpore subtus femoribusque igneo-metallicis, feminae corpore subtus femoribusque solum leviter aeneis: capite dense rugoso, clypeo late arcuato; prothorace valde convexo, grosse punctato, postice sat disperse, lateribus margineque postica fortiter ac equaliter arcuatis, hac utrinque impressa, angulis anticis acutis, posticis valde obtusis; scutello late cordiformi, vix punctato; elytris brevibus, testaceis, grosse lineato-punctatis, punctis ocellatis, macula transversa basali, scutellum amplectente, sutura, plagisque humerali et postica obliqua nigris, punctis flavis duobus (nonnunquam bisectis) parvis ad suturam ante medium; pygidio magno, grosse punctato; tibiis anticis fortiter bidentatis, pedum 4 anteriorum unguibus externis fissis; corporis subtus lateribus parce pilosis.

Long. 8.5-10 mm.

*Hab.* Penang.

This is the largest *Pseudosinghala* yet known. It is stout and globular, with the sides of the thorax more strongly curved than in any other species known to me. The elytra in both sexes are of a rich testaceous colour, with a small yellow spot (sometimes divided) on each side of the suture before the middle, and nearly the entire margin black, together with a transverse patch round the scutellum, which may extend right across the elytra. The difference between the sexes is that, while in the female the head, thorax, and scutellum are of a very dark brown colour, in the male they are suffused with a brilliant fiery lustre. The pygidium of the latter also has a similar lustre, whereas in the female it is, with the rest of the abdomen, unmetallic red.

A series of specimens in the British Museum were collected by the late Mr. Lamb, and the species is also in Mons. R. Oberthür's collection.

*Pseudosinghala conjuga*, sp. n.

Breviter cylindrica, pallide testacea, ubique metallico-nitens; prothorace (lateribus exceptis), scutello, elytrorum sutura (antice et postice latius), abdominis medio, tibiis tarsisque maris nigro-æneis, feminae rufo-testaceis; capite rugoso, clypeo late arcuato; prothorace valde convexo, subtiliter punctato, margine postica regulariter arcuata, lateribus fortiter arcuatis, angulis anticis acutis, posticis valde obtusis; scutello fere æqualiter trilaterali, vix punctato; elytris fortiter punctato-striatis, macula lata suturali vix ad margines anticam et posticam attingente medio utrinque abrupte interrupta; pygidio disperse punctato, cum pectoris et abdominis lateribus femoribusque pallidis; corpore toto nudo; tibiis anticis fortiter bidentatis, tarsorum 4 anteriorum unguibus externis fissis.

Long. 6 mm.

*Hab.* S. India, Nilgiri Hills.

In this species there is a slight metallic gloss over the entire surface, but the dark markings are in the male deep blackish bronze and in the female reddish, becoming in the latter regularly paler from the head backwards, until the posterior division of the broad sutural mark becomes indistinguishable from the testaceous ground-colour. The femora in both sexes are pale and the tibiæ and tarsi of the colour of the dorsal markings according to the sex.

As the result of a study of further examples I have to confess to having, in the case of *Hylamorpha rufimana*, Arrow, fallen into the trap against which I have warned others, this being nothing but a sexual form—the female of *H. elegans*, Burm. My error is due to the fact that the two specimens from which my description was drawn up were from a separate collection, and the only two females in the British Museum collection, as compared with a large series of the other sex. This is very strange, especially as in a collection lent to me by Mr. H. S. Gorham, which I have recently examined, the males are less than twice as numerous as the females. Burmeister apparently did not know the latter, for he has described the sexes as “♀ bright green; ♂ with legs and elytra olivaceous,” which is quite wrong, the discoloured forms occurring equally in both sexes. The real distinction consists in the front legs of the female being of a castaneous colour and the middle and hind tibiæ brilliant golden green. The front tibiæ are also shorter and more strongly toothed in this sex, the third tooth being past the middle. In the male



all the legs are unmetallic green and the front tibiæ slightly toothed on the distal half only.

The discoloration regarded by Burmeister as a sexual peculiarity may possibly be due to immaturity or to the action of preservatives. I have seen it in all stages, and it appears to be one of these imperfect specimens which has been honoured with specific rank by Herr Nonfried, under the name of *Sulcipalpus subviolaceus*.

Dr. Ohaus has kindly pointed out to me that a name—*Anomala solida*—used by me in a previous paper (Trans. Ent. Soc. Lond. 1899, p. 257) dealing with sexual dimorphism in the Rutelidæ is occupied by a species of Erichson's placed as synonymous with *A. ænea* by Gemminger and Harold, but regarded as distinct by Dr. Ganglbauer. I therefore rename my species *Anomala mutata*.

LII.—*Descriptions of Genera and Species of Coleoptera from South Africa.* By H. S. GORHAM, F.Z.S. &c.

[Concluded from p. 365.]

Fam. Endomychidæ.

*Ancylopus bisignatus*, Gerst. Mon. Endom. p. 192.

*Hab.* Mashonaland, Salisbury, in marsh-rubbish (*Marshall*). Three males.

These seem to differ a little from Senegal specimens by their darker red colour and by the base of the elytra being narrowly and indeterminately black. The legs are also very dark. Gerstaecker, by an error, says the *middle* tibiæ in the male are toothed; it is, of course, the front tibiæ, and the middle pair only, as he afterwards says, bent near their apices.

*Ancylopus unicolor*, Gerst. Mon. Endom. p. 194.

A single male specimen without the locality, but I believe from Salisbury with the preceding. The front and middle tibiæ are both toothed, as they are in *A. melanocephalus* ♂.

*Ædiarthrus natalensis*, Gerst. Mon. Endom. p. 346, t. iii. fig. 5.

*Hab.* Mashonaland, Salisbury, "in a swamp" (*Marshall*).

Gerstaecker seems to have considered both sexes to have the enlarged ninth joint of the antennæ; in one of the two examples sent by Mr. Marshall it is not so, and I have observed the same in other examples. It appears to be the sexual character of the male, as the legs have the tibiæ more bent in the example with a swollen joint. I have an example of a *Danaë* from Zanzibar with black antennæ, without an enlarged joint, which seems to be very near, if not identical with, *Ædiarthrus senegalensis*. I have seen so very few *Danaë rufula* from Abyssinia, and what I have seen were so ill-preserved, that I think it will be better to adhere to Gerstaecker's genus for the Natal insect. The figure in Gerstaecker does not represent the flattened margin like that of *Stenotarsus*, which, nevertheless, he mentions, and the thorax is shown as much narrower than it is in our insect.

Fam. Coccinellidæ.

*Lioadalia flavomaculata*, De Geer, Crotch, Rev. Coccin. p. 103 (1874).

*Hab.* Natal, Estcourt (*Marshall*).

*Lioadalia intermedia*, Crotch, *tom. cit.* p. 103.

*Hab.* Natal, Frere (*Marshall*).

*Halyzia exiguenotata*, sp. n.

*Hab.* Natal, Umfuli River; Mashonaland, Salisbury, on *Brachystegia* (*Marshall*).

*Thea variegata*, Fabr., Muls., Crotch, *tom. cit.* p. 134.

*Hab.* Natal, Estcourt (*Marshall*).

*Var.* maculis brunneis.

*Hab.* Natal, Malvern (*Marshall*).

*Dysis Marshalli*, sp. n.

*Hab.* Delagoa Bay (*Marshall*).

*Dysis rufocincta*, sp. n.

*Hab.* Mashonaland, Salisbury (*Marshall*).

*Dysis orientalis*, Weise, Deutsche Ent. Zeits. 1900, Heft i. p. 125.

“Rotundata, convexiuscula, dilute testaceo-flava, nitida; prothorace subtiliter alutaceo et punctulato, elytris punctulatis.

“Long. 3·8 millim.”

*Hab.* Mashonaland, Salisbury (*Marshall*).

Of this recently described species three examples have been sent me by Mr. G. Marshall. It was described from N'Guelo, German East Africa.

*Caria Welwitschii*, Crotch, Rev. Coccin. p. 171 (1874).

*Hab.* Mashonaland, Salisbury (*Marshall*).

The black dots on the elytra seem liable to disappear; in our examples (two in number) the humeral one and that near the suture before the middle alone persist. I have two from Zululand (probably) in which the other spots, or at least a small sutural one, are faintly indicated.

*Micraspis bidentata*, Muls. (*Alesia*), Crotch, *tom. cit.* p. 173.

*Hab.* Natal, Frere (*Marshall*).

*Micraspis inclusa*, Muls. (*Alesia*), Crotch, *tom. cit.* p. 174.

*Hab.* Natal, Estcourt.

*Micraspis frerensis*, sp. n.

*Hab.* Natal, Frere (*Marshall*).

*Micraspis striata*, Fabr., Muls. (*Alesia*), Crotch, *tom. cit.* p. 174.

*Hab.* Natal, Malvern (*Marshall*).

*Chilomenes quadrilineata*, Muls. (*Cydonia*), Crotch, *tom. cit.* p. 179.

*Hab.* Natal, Weenen, Estcourt (*Marshall*).

A very common species and widely distributed in South Africa.

*Chilomenes lunata*, Fabr.

*Hab.* Natal, Mashonaland, Salisbury.

*Chilomenes Weisei*, sp. n.

*Hab.* Natal, Umkomaas River (*Marshall*).

*Chilomenes picticollis*, sp. n.

*Hab.* Natal, Estcourt (*Marshall*).

*Chilomenes geisha*, sp. n.

*Hab.* Mashonaland, Salisbury (*Marshall*). Var. Delagoa Bay (*Marshall*).

*Exochomus nigromaculatus*, Goeze (*Coccinella*), Crotch, *tom. cit.* p. 192.

*Exochomus awritus*, Scriba, Muls.

*Hab.* Natal, Frere, Estcourt (*Marshall*).

*Exochomus justitiæ*, sp. n.

*Hab.* Natal, Malvern, on *Justicia* (Marshall).

*Chilocorus distigma*, Klug (*Coccinella*), Crotch, *tom. cit.* p. 184.

*Hab.* Natal, Estcourt; Mashonaland, Salisbury, on *Acacia horrida* and various plants and flowers (Marshall).

*Var.* *elytris impunctatis*.

Crotch mentions the variety without a red spot from Angola. I can only refer a very small example with red spots to this name.

*Chilocorus cruentus*, sp. n.

*Hab.* Mashonaland, Lesapi River (Marshall).

*Chilocorus Marshalli*, sp. n.

*Hab.* Mashonaland, Salisbury (Marshall).

Found feeding on scale-insects on Port Jackson willow.

*Platynaspis cupicola*, Crotch, *tom. cit.* p. 197 (♀ only).

*Mas.* capite prothoracisque angulis anticis læte aurantiacis.

*Femina*, capite nigro.

*Hab.* Mashonaland, Salisbury, on *Lantana* (Marshall).

Three examples (two male, one female) sent.

*Platynaspis obscura*, sp. n.

*Hab.* Natal, Malvern, Isipingo, Umkomaas River (Marshall).

*Lotis bipunctiger*, sp. n.

*Hab.* Mashonaland, Salisbury.

*Hyperaspis hottentotta*, Muls.? Spec. Col. Trim. p. 645.

*Hab.* Natal, Frere (Marshall), on *Acacia*.

I am not able to identify this certainly, and think it best to record the Natal insect under this name with doubt. The three examples have black heads and are probably females.

*Hyperaspis delicatula*, Muls. Spec. Col. Trim. p. 693; Crotch, Rev. Coccin. p. 236.

*Hab.* Natal, Frere, on flowers of *Acacia horrida* (Marshall).

I have received three examples of a *Hyperaspis* narrower than the one recorded above, but more distinctly punctured, and all with red heads. One of these I sent to Herr Weise, who remarks:—"Durch die schlanke Form von *delicatula* Muls. verschieden." Crotch (*loc. cit.*) evidently thought it

the male of *H. hottentotta*, and I should be sorry to describe the insect till the point is cleared up. Certainly I see no reason why they should not be the males of the species I regard as *H. hottentotta*, Muls. There is in these males, however, no humeral spot.

*Epilachna chrysomelina*, Fabr. (*Coccinella*), Muls., Crotch, Rev. Coccin. p. 71.

*Hab.* Natal, Tugela River, Weenen, Estcourt.

The form met with in Natal and in the Cape Colony pertains to the var. *bifasciata*, Fabr. (*Coccinella*), in which the black spots have become very large, so that often the two basal ones, and sometimes the two middle ones, are transversely united; but they vary excessively, and no permanent distinction appears to exist except that the examples are larger than those from the Mediterranean district.

*Epilachna infirma*, Muls., Crotch, *tom. cit.* p. 72.

*Hab.* Natal, Karkloof (*Marshall*).

*Epilachna Paykulli*, Muls., Crotch, *tom. cit.* p. 77.

*Hab.* Natal, Estcourt, on potato &c. (*Marshall*); Tugela River, Weenen; Karkloof.

I have examples from Barberton in the Transvaal.

*Epilachna hirta*, Thunb., Muls., Crotch, *tom. cit.* p. 69.

*Hab.* Natal, Estcourt, on Solanaceæ (*Marshall*).

One of the most widely spread and most variable species.

"It occurs over the whole of Africa" (*Crotch*).

The examples from Estcourt are of the var. *E. insidiosa*, in which there are three black fasciæ, the two posterior being joined in the middle; the thorax is red, and it is longer than the Cape examples in my collection; it is possibly distinct.

*Epilachna canina*, Fabr. (*Coccinella*), Muls., Crotch, *tom. cit.* p. 68.

*Hab.* Natal, Tafel Kop, Ulundi; Malvern; Mashonaland, Salisbury (*Marshall*).

A very widely spread variable species, which has been described under several names when coming from different parts of the African continent. The Natal form with the thorax pale yellow, and to which the Salisbury examples also pertain, is *E. Dregei*, Mulsant.

*Epilachna cupicola*, Muls., Crotch, *tom. cit.* p. 71.

*Hab.* Natal, Estcourt, Isipingo (*Marshall*). Several examples.

*Epilachna punctipennis*, Muls., Crotch, *tom. cit.* p. 76.

*Hab.* Natal, Isipingo.

Occurs also at Zanzibar, Abyssinia, and the West Coast.

*Epilachna Godarti*, Muls., Crotch, *tom. cit.* p. 76.

*Hab.* Natal; Mashonaland, Salisbury (*Marshall*).

*Chnootriba similis*, Thunb. (*Coccinella*), Muls., Crotch, *tom. cit.* p. 77.

*Hab.* Natal, Estcourt; occurs abundantly from Abyssinia to the Cape; on flowers of *Acacia horrida* (*Marshall*).

*Chnootriba assimilis*, Muls. Spec. Trim. p. 699; Crotch, *tom. cit.* p. 77.

*Hab.* Natal, Umkomaas River.

*Scymnus Rosenhaueri*, Muls. Spec. Col. Trim. p. 966; Crotch, *tom. cit.* p. 258.

*Hab.* Natal, 81 (*Marshall*).

*Scymnus Morelleti*, Muls. Spec. Col. Trim. p. 973; Crotch, *tom. cit.* p. 258.

*Hab.* Natal, 72, 73 (*Marshall*).

*Scymnus Castroemi*, Muls. Spec. Col. Trim. p. 978, var.; Crotch, *tom. cit.* p. 258.

*Hab.* Natal, 174, 196 (*Marshall*).

*Scymnus binævatus*, Muls. Spec. Col. Trim. p. 975?; Crotch, *tom. cit.* p. 258.

*Hab.* Natal, 170, 171 (*Marshall*).

*Scymnus (Sidis?)* sp.

*Hab.* Natal, Frere, on flowers of the wattle (*Acacia mollissima*) (*Marshall*).

*Ortalia pallens*, var. *O. Guillebeaui*, Muls.

This differs from typical *O. pallens* only in having the head and limb of the elytra black; but as we have a specimen from Estcourt in which the margin of the elytra is black while the head is orange, I think Crotch is right in referring them to one species. The specimens from Malvern and Umkomaas in Natal belong to *O. Guillebeaui*, while those from Salisbury are entirely yellow.

*Ortalia fluveola*, Klug, Muls. Spec. Coll. Trim. p. 895?

*Hab.* Mashonaland, Lesapi River (*Marshall*).

The determination of this insect is somewhat doubtful. The type is from Madagascar, and Mulsant was inclined to consider it merely a small form of *O. calliops*. The larger of our two examples is only 4 millimetres in length.

*Ortalia variata*, Muls., Crotch, Rev. Coccin. p. 275.

*Hab.* Mashonaland, Salisbury; Marandello, Headlands (Marshall).

*Ortalia pallens*, Muls., Crotch, *tom. cit.* p. 275.

*Hab.* Natal, Estcourt; Umkomaas River, Malvern; on *Acacia giraffe* (Marshall); Mashonaland, Salisbury.

*Ortalia calliops*, Guér., Muls., Crotch, *tom. cit.* p. 275?

*Hab.* Mashonaland, Umfuli River (Marshall).

Three examples, excessively like and hardly to be separated from *O. Mäklini*, Muls., may possibly belong to this Madagascar species.

*Rodolia?* (*Endochilus*, Weise?).

*Hab.* Natal, Isipingo (Marshall); Zanzibar.

*Aulis annexa*, Muls., Crotch, *tom. cit.* p. 294.

*Hab.* Mashonaland, Salisbury, Lesapi River.

Six examples obtained by beating the "mosasa" tree or *Acacia* are probably to be referred to this species; but they differ from a specimen in the Cambridge Museum by the red spots not being so confluent.

*Aulis* sp.?

*Hab.* Natal, Frere?, 166 (Marshall).

A single specimen of the size of *A. annexa*, but with the red spots differently arranged, and densely clothed with grey pubescence.

*Cyrtaulis sellata*, sp. n.

*Hab.* Natal, Malvern (Marshall).

*Cyrtaulis scypustulata*, sp. n.

*Hab.* Natal, Frere, Estcourt (Marshall).

*Cyrtaulis tristis*, sp. n.

*Hab.* Natal, Frere (Marshall).

#### DESCRIPTIONS OF NEW SPECIES.

*Halyzia exiguenotata*, sp. n.

Breviter oblonga, suborbiculata, sordide pallide flava; prothorace

transverso, angulis anticis prominulis vix acutis, margine antico translucido, oculos subtegente; puncto parvo utrinque, et quatuor aliis cum nota fulva **M** ægre signantibus, his sæpe decumbentibus. Elytris punctis nigris, quasi 12-13 in singulis, notatis, quatuor basalibus (humerali per strigam cum basi interdum conjuncto); quatuor in fasciam medianam irregulariter digestis; tribus sub-apicalibus; duobus in lituram apicalem sæpe conjunctis. Punctis pallido cinctis; antennis, palpis pedibusque pallide testaceis. Punctura thoracis distincta, sed creberrima per minuta et sæpe confluentia; elytrorum minus regulariter et inæqualiter crebre sed obsolete impressa.

Long. 6.5 millim.

*Hab.* Natal, Umfuli River; Mashonaland, Salisbury, on *Brachystegia* (Marshall).

*Dysis Marshalli*, sp. n.

Suborbicularis, parum oblonga, testacea, nitida, minute vix visibiliter punctata; prothorace sanguineo, margine antico et laterali tenuiter flavo-limbato, medio late nigro vittato; elytris nigris, late æqualiter sanguineo-marginatis, singulis maculis duabus subquadratis flavis, una basi ligata, suturam nigram fere attingente, altera nec suturam nec marginem rufum attingente; corpore subtus cum pedibus aurantiaco.

Long. vix ultra 4 millim.

*Hab.* Delagoa Bay (*G. A. K. Marshall*).

Slightly oblong-ovate; thorax nearly as wide as the elytra at the base, quite three times as wide as long. Head with the trophi yellow, eyes finely granulate. Thorax more than twice and a half times as wide as long; front angles acute; sides widening to about the middle, much rounded, not expanded, but the extreme limb narrowly reflexed; base not margined; the surface even and not impressed; deep orange-red, with the front and side-margins narrowly yellow; the punctuation is very close and very fine. Scutellum black. Elytra with four large yellow spots, two on each almost in a square, but the anterior pair are scarcely separated by the very narrow black edge of the suture, while the posterior ones are more widely divided; the transverse black fascia widens out on the margin of the disk; the whole lateral margin, including the shoulders and apex, is bordered with a deep orange margin of equal width; the whole underside, legs, and mouth-organs are orange-yellow. The epipleuræ are very concave, but not fossulate nor expanded, and terminate before the apex.

Two examples of this very pretty species were sent. It is very like *D. decora*, Muls., a species from Senegal, of which



I have seen the type in the British Museum, but differs in several points, particularly in having the scutellum black and in the elytral spots not having an irregular outline.

I am obliged to Herr J. Weise for having examined this insect and for pointing out its affinities. It was unknown to him as to me.

*Dysis rufocincta*, sp. n.

*D. Marshalli* affinis, quoad formam et puncturam simillima, paullulum major, supra sanguineo-rufa; capite et subtus cum pedibus flava; elytris nigris, basi et lateribus late æqualiter sanguineo marginatis, elytris crebre ac distincte punctatis.

Long. 4 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*, at light).

Very like *D. Marshalli*, most of the description of which will apply, with the exception of the four yellow spots, of which no trace is here visible. The disk of the elytra being deep black, the base, which in that species is occupied by the basal yellow spot, is here margined with red like the rest of the margin, and this colour even extends down the suture in an indistinct manner. The scutellum is black, but the thorax in both examples wants the black vitta or any basal indication of it. The front angles and sides are narrowly edged with yellow, this colour ceasing before the hind angles are reached. I think with Herr Weise, to whom I sent one of the two examples, that this is a distinct species from *D. Marshalli*, and it was found at a very distant locality.

*Chilomenes Weisei*, sp. n.

Orbicularis, testacea; thorace parvo, brevi, quam elytra multo angustiore, basi punctisque duobus nigris, sutura tenuissime nigra; corpore subtus piceo; pedibus rufo-testaceis.

Long. 5-6 millim.

*Hab.* Natal, Umkomaas River (*Marshall*).

Orbicular, as wide as, or wider than, long, the thorax very small for the insect, the elytra very much inclined, with extremely wide epipleuræ; the pattern of the thorax is very simple, consisting of two dots, somewhat triangular, and a plain unindented black basal margin terminating before the hind angles. Owing to the inclination of the elytra, the base of the thorax is widely V-shaped. Elytra nearly hemispherical, their margins a little expanded, punctuation scarcely visible, testaceous, their suture narrowly and the scutellum black; at their base they are very much wider than the small thorax, so that the humeral angles are quite outside the sides of the thorax. Four examples are before me.

*Chilomenes picticollis*, sp. n.

Orbicularis, fere hemisphærica, nigra, fere lævis; capite prothoraceque albidis, hoc maculis duabus triquetris discoidalibus, basi tenuiter (utrinque angulariter) dilatato, punctisque duobus oblongis sublateralibus, interdum cum basi ligatis nigris; elytris testaceis, sutura, margineque tenui, et scutello nigris; pedibus nigris; tibiis, tarsis, femorumque apicibus testaceis.  
Long. 4·5–5 millim.

*Hab.* Natal, Estcourt (*Marshall*).

Orbicular, the width equal to the length; thorax twice and a half or three times as wide as long, front angles acute and depressed, their margins with those of the sides very narrowly reflexed and black. The markings are:—two triangular spots on each side of the middle; their longest axis is transverse and their bases are opposed; two oblong spots near each side, in one of two examples sent united to the narrow black base; the basal black line widens into an angular denticulation on each side. The elytra are very obsoletely punctured; their black margin commences a little before the shoulders, and occupies the slightly expanded margin, becoming very narrow at the apex, the suture very finely margined with black. The scutellum is black and impunctate. The body beneath is black, but each abdominal segment has a small yellow spot on each side; the legs are black, with yellow tibiæ and tarsi; the tips of the femora and the trochanters are also yellowish.

This insect has the appearance at first sight of many South-African Coccinellidæ; in particular it resembles *Enopia cinctella*, Muls., though the orbicular shape and the smaller size are different, the latter being an oblong insect of 6 millim. which occurs at the Cape (Stellenbosch). It is also, as Herr Weise, to whom I sent one, remarks, distinct by the remarkable pattern of the thorax.

*Chilomenes geisha*, sp. n.

Oblongo-orbicularis, testacea; capite albo, prothorace nigro, angulis anticis macula subquadrata, ad angulos posticos protracta, margineque antica albis; elytris rufo-testaceis, sutura margine tenui et scutello nigris; corpore subtus nigro-piceo; abdominis lateribus flavis.  
Long. 4·5 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*).

*Var.*? minor, prothoracis basi latius nigra, elytris testaccis.

*Hab.* Delagoa Bay (*Marshall*).

In the typical example of this species the head and thorax are white, the latter having a broad central vitta and a line along the base black, leaving the front margin and a squarish spot occupying the whole side and front angle white. The elytra are of a fine orange-yellow, slightly clouded on their disk, with the suture and the margins (except at the base) narrowly black. The punctuation is fine and close. The thorax is transverse, not so wide as the elytra, but still almost forming a continuous outline with them, its base much rounded and continuous with the rounded sides, so that there is no hind angle.

Herr Weise, to whom I sent the typical example, remarks that it must stand near *Cydonia circumclusa*, Muls. That insect was described from a single female example from Benin, West Africa, and Crotch, who had seen it, considered it a small example of *C. dorsalis*, Oliv. The Delagoa Bay insect has much the appearance of a *Verania*, e. g. it is almost marked exactly as the var. of *V. discolor* recorded by me as *bifurcata* from Birma.

The specimens from Delagoa Bay are rather smaller than the single type, and have the black vitta confused in the more extended black of the base. At the same time their colour is not so rosy.

*Exochomus? justitia*, sp. n.

Orbicularis, nigro-piceus; elytris sanguineis, macula magna transversa postmediana communi, postice indentata nigra, margine subexplanata nigrescente; pube pruinosa grisea vestitus. Long. 3·5 millim.

*Hab.* Natal, Malvern (*Marshall*).

Thorax transverse, with the front angles very much deflexed (as in *Chilocorus*), the sides straight, the angles themselves acute; the excavation for the head has the angles nearly square, being straight at the base. The punctuation of the thorax is only just visible on the disk, but is stronger at the sides. The head is much deflexed (as in *Cryptognatha*) in the single example before me; both it and the thorax are pitchy black, with the sides of the thorax becoming reddish. The elytra are of a rich blood-red, with a black mark very similar to that of *Cyrtaulis sellata*. This mark is produced backwards on the suture and somewhat obliquely at its sides without reaching either the apex or the margins. The punctuation is distinct and thick at the humeral angles and along the blackish sides, but is very minute on the disk, although very close and obsolete. The scutellum, legs, and body are black. The whole insect above is pubescent.

This insect is almost a mimic of *Cyrtaulis sellata*, described in the present paper, and is, it will be observed, from the same locality (Malvern). Although I am not sure that it is correctly referred by me to *Exochomus*, and Crotch has referred another species (*E. uropygialis*, Muls.) to *Brumus* expressly on the ground of its pubescence, I do not think that character alone sufficient to cause their exclusion.

The single example sent was found on *Justicia origanoides*, a plant of the natural order Acanthaceæ; and it would be interesting to know whether it feeds on scale or aphid and whether in company with the *Cyrtaulis*.

*Lotis bipunctiger*, sp. n.

Orbicularis, niger fere glaber; elytrorum margine modice expanso, disco puncto flavo mediano, ad marginem duplo magis quam ad suturam approximato.

Long. 2 millim.

*Hab.* Mashonaland, Salisbury (*Marshall*).

The colour of this little insect is jetty black, excepting the red spot on each elytron, which is placed at one third of the width of the disk from the margin. The thorax is transverse, its base inclined on each side as in *Chilocorus*; a very fine marginal line in its middle; a depression runs across from the corner of the frontal excavation, and is represented on the elytra by a small and vague fossa. The angles and sides of the thorax appear to be finely coriaceous and subpubescent.

*Platynaspis obscura*, sp. n.

Fere hemisphærica, nigra, breviter densius cinereo-pubescentis; elytris rufo-brunneis, apicem versus nigricantibus, nitidis.

Long. 3·5 millim.

*Mas*, capite angulisque anticis prothoracis aurantiacis.

*Femina*, capite prothoraceque nigris.

*Hab.* Natal, Malvern, Isipingo, Umkomaas River (*Marshall*).

The punctuation of this species is very fine, close, and obsolete; that on the head and thorax is just visible under a Coddington lens. It is black, with red legs and red elytra, which become suffused with black towards the apex; in some specimens this is only visible as a small cloud towards and before the apex, while in others the whole apex is blackish. The pubescence is short and pruinose. The thorax is of nearly continuous outline with the elytra, transverse, its front angles much depressed and its base with an exceedingly

fine marginal line. The scutellum obscurely red. The legs are blackish, with red tibiæ and tarsi. The abdomen is red, excepting in the middle and at the base. Herr Weise, to whom I sent this with an example of *P. rufipennis*, Gerst., from Zanzibar, has had the kindness to examine it, and considers it distinct from the latter, which it very closely resembles, but which does not show the black cloud at the apex.

Four specimens are before me—two males (with red heads and red angles to the thorax), one of these is from Isipingo and one from Malvern; and two females?, one from Isipingo and the other from the Umkomaas River.

*Chilocorus cruentus*, sp. n.

Orbicularis, saturate sanguineo-rufus; elytris nigris, singulis plagia magna, e maculis duabus (antere multo majore) formata, sanguinea.

Long. 5.5 millim.

*Hab.* Mashonaland, Salisbury, Lesapi River (*Marshall*).

This *Chilocorus* comes in the same section as *C. Marshalli*; the head, thorax, underside, and legs are of a fine blood-red; punctuation hardly exists except on the sides of the elytra; the latter are deep shining black, with a large blood-red mark on each, evidently formed from two united spots, of which the anterior is much the larger; these spots may be possibly quite disunited in some varieties, as in the only two examples before me they are nearly so. Both examples were found in November, one in 1897, the other in 1899.

I do not know any *Chilocorus* which approaches very near to this.

The form of this species is oblong-ovate and rather convex, the colour pale straw-yellow, clouded with brown in places. The numerous black markings are very small and usually surrounded on the elytra with pale rings; they are very frequently absent more or less. The thorax has an indistinct **M**, the upper and lower extremities of which are sometimes black-dotted, but the greater part is simply brown; there is in addition a black dot on each side, all of which may be absent. It is twice as wide as long, the sides much rounded, their margin reflexed. The front margin half covers the edges, but they are quite visible through it.

The elytra are wider at the base than the thorax, the humerus raised as a small tubercle, the black linear dot on which is on the inner side, and, except when it forms a line to the base, is little visible. There is a linear dot on each

elytron just below the scutellum, and one outside this with two near the suture on each form a curved longitudinal row, and seem more persistent than the rest. The apex itself is surrounded by a thin angular C-like mark, but this is usually reduced to two points at its extremities.

The antennæ in this species are short for an *Halysia*, not being so long as would reach to the base of the thorax.

Five specimens.

*Chilocorus Marshalli*, sp. n.

Orbicularis, convexus, fere impunctatus, sanguineo-rufus; elytrorum sutura ad basin late ad apicem tenuiter nigra, margine ab angulo basali pone medium cum plagia submarginali, ante apicem desinente, in medio plerumque conjuncto nigro.

Long. 6 millim.

*Hab.* Mashonaland, Salisbury.

*Var.* Niger, capite prothoraceque rufis, hoc late nigro-vittato, punctoque subapicali rufo.

*Hab.* Mashonaland, Salisbury (*Marshall*).

This beautiful *Chilocorus* comes into Crotch's Section B, with the "thorax reddish orange," but there is nothing like it known to me. Both the type form and the variety were found by Mr. Marshall feeding on scale-insects on the "Port Jackson willow" in October 1899.

*Cyrtaulis sellata*, sp. n.

Orbicularis, fere hemisphærica, nigra, parum nitida, densius griseo-pubesceus; capite prothoraceque subtilissime, elytris distincte crebre punctatis, his sanguineis, fascia transversa cum sutura in tertia parte subapicali maculam nigram cruciformem præbente. Thorax transversus, angulis anticis haud prominulis, obscure rufescentibus, lateribus subrectis.

Long. 4 millim.

*Hab.* Natal, Malvern (*Marshall*).

Almost hemispherical, slightly gibbous, the apex a little retuse; the general colour is pitchy black, the elytra being of a fine blood-red with a cruciform marking, and the fascia forming the arms is a rather broad common band, of which the front angles on each side are cut off a little, so as to make them appear to bend backwards; this fascia is nearer the apex than the base; the sutural part of the cross does not commence for one third from the base and the posterior

part is longer and more distinct than the anterior and does not reach the apex. The legs and underside are black, in parts pitchy; the scutellum is black. While the head and thorax scarcely exhibit punctuation, what there is being hidden by pubescence, the elytra are deeply, thickly, and evenly punctate, the punctures often confluent in short transverse rows; their margins are not expanded nor reflexed, but extremely finely margined.

This insect rather remarkably resembles the species described here as *Exochomus justitiae*, taken at the same time and place, viz. Malvern, in June 1897.

One specimen is all I have seen.

*Cyrtaulis seypustulata*, sp. n.

Statura et forma *C. sellate* similis at paullo longior, nigra, brunneo-pubescentis; ore, pedibus, thoracis linea utrinque, et elytrorum punctis tribus in singulo, duobus ante medium transversim, uno ante apicem sitis, sanguineis.

Long. 4.5 millim.

*Hab.* Natal, Frere, Estcourt (*Marshall*).

Two specimens of this pretty species, one from each of the localities, were sent; they were found on the *Acacia horrida* in November 1892.

*Cyrtaulis tristis*, sp. n.

*C. seypustulata* similis et affinis, et exemplo majori statura æqualis, sordide nigra, breviter pubescens; subtus cum pedibus, capite prothoracisque margine antico obscure rufis.

Long. 4.75 millim.

*Hab.* Natal, Frere (*Marshall*).

The form, size, pubescence, and sculpture of this insect are so similar to that of *C. seypustulata*, that it is sufficient to note the absence of the red spots on the elytra and of the red line on the thorax; the entire side, front angles, and margin of the thorax are pitchy red, to which colour the general dark colour shades in a quite indefinite manner. The underside and legs are of the same obscure dark red colour.

There being but one example, it is only possible to say that this insect appears to represent a different species from the preceding.

LIII.—*Rhynchotal Notes*.—IX. Heteroptera: *Fam. Coreidæ*.  
By W. L. DISTANT.

THIS instalment, with the preceding Parts VII. and VIII., completes the examination of the Coreidæ in Walker's Catalogues of Heteroptera, vols. iv. and v. (part.). It also contains the descriptions of some new species added to the National Collection since those catalogues were written.

*MICTINÆ*.

Genus MOLCHINA.

*Molchina*, Amyot et Serv. Hém. p. 188 (1843).

*Euplatycoris*, Walk. Cat. Het. iv. p. 103 (1871).

*Molchina granulata*.

*Molchina granulata*, Stål, En. Hem. i. p. 131 (1870).

*Euplatycoris bellicornis*, Walk. Cat. Het. iv. p. 104. n. 1 (1871).

Walker's description is painfully short, incomplete, and incorrect. The second and third joints of the antennæ are not "white for more than half the length from the base," but yellow for this distance. The wings are dark violaceous, not "blackish."

Genus ARCHIMERUS.

*Archimerus pallens*.

*Physomerus pallens*, Dall. List Hem. ii. p. 412. n. 3 (1852).

*Piezogaster pallens*, Walk. Cat. Het. iv. p. 58. n. 4 (1871).

*Archimerus calcarator*, Fabr., var. ?

Genus SAGUNTUS.

*Saguntus lobulatus*.

*Saguntus lobulatus*, Stål, Ann. Soc. Ent. Fr. 1865, p. 176.

*Hypselonotus crassifemur*, Walk. Cat. Het. iv. p. 143. n. 22 (1871).

Walker probably missed, as he did not describe, the posterior lobately produced angles of the pronotum.

Genus QUINTIUS.

*Quintius pallens*.

*Hirileus pallens*, Walk. Cat. Het. iv. p. 73. n. 7 (1871).

*Hirileus pallidus*, Walk. *loc. cit.* p. 74. n. 8.

Genus NEMATOPUS.

*Nematopus fasciatus*.

*Nematopus fasciatus*, Westw. in Hope Cat. ii. p. 14 (1842).

*Hypselonotus fascicollis*, Walk. Cat. Het. iv. p. 143. n. 21 (1871).



*Nematopus ruficrus.*

*Anisoscelis ruficrus*, Perty, Del. An. p. 171, pl. xxxiv. fig. 4 (1830)  
*Hypselonotus ventralis*, Walk. Cat. Het. iv. p. 140. n. 15 (1871).

*Nematopus indus.*

*Cimex indus*, Linn. Syst. Nat. ed. 10, i. p. 447 (1758).  
*Hypselonotus pectoralis*, Walk. Cat. Het. iv. p. 141. n. 16 (1871).

*Nematopus lepidus.*

*Nematopus lepidus*, Stål, Stett. ent. Zeit. xxiii. p. 293 (1862).  
*Hypselonotus armatus*, Walk. Cat. Het. iv. p. 144. n. 23 (1871).

Walker founded his description on a single specimen without the abdomen. It is undoubtedly the *N. lepidus*, Stål, but a pale example.

## Genus ZOREVA.

*Zoreva marginalis.*

*Hypselonotus marginalis*, Walk. Cat. Het. iv. p. 140. n. 13 (1871).

Agreeing generally with the description of *Z. spinifera*, Stål, save in the colour of the legs.

## ANISOCELINÆ.

## Genus LEPTOGLOSSUS.

*Leptoglossus balteatus.*

*Cimex balteatus*, Linn. Mant. Plant. ed. alt. p. 534 (1771).  
*Leptoglossus balteatus*, Uhler, Proc. Zool. Soc. Lond. 1893, p. 705.  
*Leptoglossus zonatus*, Uhler, loc. cit. 1894, p. 178.

Mr. Uhler recorded *L. zonatus* as collected by Mr. Herbert Smith on the island of Grenada, and *L. balteatus* as received through the same collector from the island of St. Vincent. The specimens under the two names, now in the possession of the British Museum, however, both pertain to the species of Linnaeus, and *L. zonatus* still requires to be authenticated as belonging to the Antillean fauna.

*Leptoglossus gonagra.*

*Cimex gonagra*, Fabr. Syst. Ent. p. 708. 57 (1775).  
*Anisoscelis præcipua*, Walk. Cat. Het. iv. p. 128. n. 25 (1871).

? *Leptoglossus rubrescens.*

*Malvana rubrescens*, Walk. Cat. Het. iv. p. 134. n. 2 (1871).

Walker's type is a unique specimen wanting the posterior

legs. It certainly does not belong to the genus *Malvana*, and has all the characters of *Leptoglossus*, though the posterior tibiæ are not in evidence.

*LEPTOSCELINÆ.*

Genus LEPTOSCELIS.

*Leptoscelis fasciifera.*

*Leptoscelis fasciifera*, Stål, Ann. Soc. Ent. Fr. 1865, p. 182.

*Leptoscelis hypselonotoides*, Walk. Cat. Het. iv. p. 134. n. 10 (1871).

*Leptoscelis centralis.*

*Malvana centralis*, Walk. Cat. Het. iv. p. 135. n. 3 (1871).

*Leptoscelis militaris*, sp. n.

Pronotum, scutellum, and sternum pale castaneous; head, antennæ, corium, membrane, abdomen, legs, rostrum, and central area to sternum black; apical joint of antennæ (excluding base) and apical margins to corium and clavus luteous; the margin to corium is broad and inwardly angulated, that to clavus is narrow and almost straight.

Antennæ with the first and second joints about subequal in length, third joint shorter than second, a little longer than fourth; pronotum rugulose, very coarsely punctate, the lateral angles subacutely produced, with their apices slightly directed backward; a distinct transverse ridge in front of base; corium coarsely punctate except on the luteous apical margin; posterior femora in male spined beneath, spines increasing in length towards apex; rostrum passing the posterior coxæ.

Long. 21–22 millim.; exp. pronot. angl. 8–9 millim.

*Hab.* Ecuador, Cachabé, Paramba (*Rosenberg*, Brit. Mus.); Colombia, Cali (*Rosenberg*, Brit. Mus.).

Allied to *L. tricolor*, Westw.

*Leptoscelis obscura.*

*Leptoscelis obscura*, Dall. List Hem. i. p. 458. n. 9 (1852).

Stål (En. Hem. i. p. 171, 1870), by an unaccountable slip on his part, placed this species as a synonym of *Phthia picta*, Dru., with which it has nothing in common. This has been accepted and followed by other writers—Distant (Biol. Centr.-Am.) and Lethierry & Severin (Cat. Gén. Hém. t. ii. p. 52).

*Leptoscelis obscura*, Dall., is allied to *L. elongator*, Fabr., and *L. guttula*, H.-S.

*Leptoscelis egregia*.*Leptoscelis egregia*, Stål, Ann. Soc. Ent. Fr. 1865, p. 182.*Hypselonotus luteiceps*, Walk. Cat. Het. iv. p. 139. n. 12 (1871).

## Genus MALVANA.

*Malvana minax*.*Hypselonotus minax*, Walk. Cat. Het. iv. p. 139. n. 11 (1871).

## Genus PHTHIA.

*Phthia smaragdina*.*Sphictyrtus smaragdinus*, Walk. Cat. Het. iv. p. 137. n. 7 (1871).

The unique type of Walker is a specimen without legs and with a much damaged abdomen. Nevertheless it is doubtless a species of *Phthia* and allied to *P. cantharidina*, Bergr., with which it agrees in its unicolorous hue above, but differs in its unicolorous sternum.

*Phthia affinis*, sp. n.

Above olivaceous green; head, anterior area of pronotum, and body beneath bright metallic green; a transverse arcuated fascia to pronotum, a broad transverse fascia to corium (narrowing inwardly), a large subtriangular spot on each lateral area of the prosternum, central area of sternum from anterior coxæ, and first, second, and third abdominal segments, posterior margins of fourth and fifth segments, coxæ, trochanters, femora, and extreme bases of tibiæ, ochraceous; rostrum ochraceous, the basal joint green, the fourth joint fuscous beneath.

Pronotum with the lateral angles acutely produced, the lateral margins moderately convex and distinctly pilose; pronotum, scutellum, and corium somewhat coarsely punctate; abdomen globular and somewhat inflated beneath.

Long. 20 millim.; exp. pronot. angl.  $6\frac{1}{2}$  millim.

*Hab.* Ecuador, Cachabé (*Rosenberg*, Brit. Mus.).

Allied to *P. ventralis*, Guér., and *P. decorata*, Stål.

## SPARTOCERINÆ.

## Genus SPARTOCERA.

*Spartocera pantomima*.*Sephina pantomima*, Dist. Trans. Ent. Soc. Lond. 1881, p. 293.*Spartocera ortonedai*, Montand. Bull. Soc. Bucarest, 1897, n. 3, p. 6.

*Spartocera fusca*.

*Cimex fuscus*, Thunb. Nov. Ins. Sp. ii. p. 44 (1783).

*Spartocerus diffusus*, Uhler (Say ?), Proc. Zool. Soc. Lond. 1893, p. 705.

Is the *S. diffusa*, Say, a synonym of this species? I have certainly seen three specimens of *S. fusca* from Florida transmitted as Say's species. The West-Indian specimens returned to the British Museum by Mr. Uhler are certainly *S. fusca*, Thunb.

*Spartocera batatas*.

*Lygaeus batatas*, Fabr. Ent. Syst., Suppl. p. 540 (1798).

*Spartocera fusca*, Uhler (nec Thunb.), Proc. Zool. Soc. Lond. 1893, p. 705; *ibid.* 1894, p. 178.

*S. batatas*, Fabr., has been previously recorded from Cuba.

*Spartocera rubicunda*.

*Spartocera rubicunda*, Spin. in Gay, Hist. de Chile, Zool. vii. p. 177 (1852).

*Spartocera chilensis*, Walk. Cat. Het. iv. p. 6. n. 11 (1871).

*Spartocera grandis*, sp. n.

Reddish ochraceous; scutellum, corium, and membrane pale ochraceous; antennæ, apices of lateral lobes to head, anterior area and anterior lateral margins to pronotum, basal margin and a broad central fascia to scutellum, base of lateral margins to corium, extreme lateral margin to connexivum, head beneath (excluding margins of eyes), rostrum, sternum (excluding costal spots and area of prosternal angles), legs, and stigmatal spots black.

Antennæ pilose, with the first, second, and third joints subequal in length, fourth shortest; pronotum rugose and coarsely punctate, its black anterior area levigate, the lateral angles well developed, convex anteriorly, oblique posteriorly, apices subacute; scutellum transversely striate; corium thickly and finely punctate; connexivum longitudinally striate; prosternum and coxal areas very coarsely punctate.

Long. 29 millim.; exp. pronot. angl. 10 millim.

*Hab.* Colombia, Cali (*Rosenberg*, Brit. Mus.).

Allied to *S. gigantea*, Dist.

## Genus SEPHINA.

*Sephina humeralis*, sp. n.

Ochraceous; antennæ, apex of head, basal, apical, and lateral margins, a central fascia (not reaching base), and a

wedge-shaped spot on anterior area and connected with each lateral margin of pronotum, basal angles and apex of scutellum, a rounded discal spot to corium, rostrum, legs, margins of pro-, meso-, and metasternum (broadly), margins of abdominal segments, a central and four lateral macular fasciæ (two on each side) to abdomen, and subquadrate spots to connexivum (above and beneath) black; membrane pale stramineous.

First and second joints of antennæ longest and subequal in length, third and fourth shortest, third slightly longer than fourth. Pronotum rugulose and coarsely punctate, the lateral angles produced into broad flat processes with convex apices, lateral margins rounded, two levigate spots on anterior area; scutellum and corium very finely punctate; rostrum passing the anterior coxæ; lateral margins of the metasternum obliquely straight.

Long. 22 millim.; exp. pronot. angl. 9 millim.

*Hab.* Ecuador, Porvenir (*P. O. Simons*, Brit. Mus.).

A species rendered very distinct by the much produced pronotal angles.

#### PHYSOMERINÆ.

#### Genus RHYTCORIS.

##### *Rhyticoris spinipes*.

*Lygæus spinipes*, Pal. Beauv. Ins. p. 203; Hém. pl. xii. fig. 5 (1805).

*Piezogaster patulus*, Walk. Cat. Hem. Het. iv. p. 57. n. 3 (1871).

#### Genus PHYSOMERUS.

##### *Physomerus grossipes*.

*Lygæus grossipes*, Fabr. Ent. Syst. iv. p. 135 (1794).

*Physomerus delineatus*, Walk. Cat. Het. iv. p. 59. n. 5 (1871).

#### Genus ACANTHOCORIS.

##### *Acanthocoris obscuricornis*.

*Acanthocoris obscuricornis*, Dall. List Hem. ii. p. 516. n. 4 (1852).

*Acanthocoris tarsalis*, Walk. Cat. Het. iv. p. 117. n. 8 (1871).

##### *Acanthocoris esau*, sp. n.

Body above and beneath, anterior femora, and posterior femora and tibiæ dull brownish ochraceous, thickly and longly pilose; anterior and intermediate tibiæ brownish, anterior tibiæ with a broad ochraceous annulation near base; connexivum with obscure ochraceous spots; membrane piceous, black at basal angle.

Antennæ with the first, second, and third joints piceous and longly pilose, fourth joint and extreme base of third joint dull ochraceous; first, second, and third joints almost subequal in length, fourth joint short, cylindrical, and only moderately pilose; pronotal lateral angles produced in long acute spines, their apices slightly or scarcely recurved; corium with the basal area of lateral margins distinctly spinous; rostrum just passing the intermediate coxæ, its apex black.

Long. 15 millim.; exp. pronot. angl. 6 millim.

*Hab.* S.E. Borneo (*Doherty*, Coll. Dist.); Mount Ophir (Brit. Mus.).

This species is to be recognized by the acutely produced lateral angles of the pronotum. A damaged specimen from Mount Ophir in the British Museum was labelled by Stål "*A. acutus?*," and was incorporated under that name by Walker.

#### GONOCERINÆ.

#### Genus PLINACTHUS.

##### *Plinacthus dubius.*

*Gonocerus dubius*, Herr.-Schäff. Wanz. Ins. vi. p. 9, fig. 565 (1842).

*Cletus clarus*, Walk. Cat. Het. iv. p. 190. n. 15 (1871).

##### *Plinacthus pungens.*

*Cimex pungens*, Thunb. Nov. Ins. Spec. ii. p. 36 (1783).

*Gonocerus luridus*, Dall. List Hem. Ins. ii. p. 493. n. 1 (1852).

##### *Plinacthus spinosus.*

*Plinacthus spinosus*, Stål, Öfv. Vet.-Ak. Förh. 1859, p. 470. n. 3.

*Cletus mundus*, Walk. Cat. Het. iv. p. 191. n. 17 (1871).

##### *Plinacthus acicularis.*

*Alydus acicularis*, Fabr. Syst. Rhyng. p. 251 (1803).

*Cletus conspiciuus*, Walk. Cat. Het. iv. p. 198. n. 47 (1871).

#### Genus CLETUS.

##### *Cletus punctulatus.*

*Coreus punctulatus*, Westw. in Hope Cat. ii. p. 23 (1842).

*Cletus femoralis*, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 94 (1891).

There seems considerable doubt whether Mr. Kirby's type is a Ceylon specimen. The locality "Mungphe" should be probably "Mungphu," a locality in Northern India.

*Cletus bipunctatus.**Coreus bipunctatus*, Westw. in Hope Cat. ii. p. 23 (1842).*Cletus signatus*, Walk. (part.), Cat. Het. iv. p. 194. n. 39 (1871).*Cletus rubidiventris.**Coreus rubidiventris*, Westw. in Hope Cat. ii. p. 23 (1842).*Cletus signatus*, Walk. (part.), Cat. Het. iv. p. 194. n. 39 (1871).*Cletus pallescens*, Walk. *loc. cit.* p. 195. n. 40.*Cletus inconspicuus.**Cletus inconspicuus*, Walk. Cat. Het. iv. p. 195. n. 42 (1871).

The unique type is in poor condition. Abdomen black, apex and connexivum luteous; lateral angles of pronotum with their posterior margins very coarsely dentate.

Exp. pronot. angl. 4 millim.

*Cletus punctiger.**Gonocerus punctiger*, Dall. List Hem. ii. p. 494. n. 3 (1852).*Homocercus minax*, Walk. Cat. Het. iv. p. 99. n. 26 (1871).

*Species erroneously included in the Genus Cletus.*

*Colpura inermis.**Cletus?* *inermis*, Walk. Cat. Het. iv. p. 198. n. 48 (1871).*Hab.* Singapore (nec Santarem).

Walker erroneously copied the locality of this species.

## Genus CLETOMORPHA.

*Cletomorpha Walkeri.**Cletomorpha Walkeri*, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 96 (1891).*Cletomorpha benita*, Kirby, *loc. cit.* p. 97.*Cletomorpha Kirbyi.**Cletomorpha denticulata*, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 95 (1891), nom. præocc.*Cletomorpha raja*, sp. n.

Ochraceous; posterior area of pronotum from between the lateral angles, scutellum, and corium thickly fusco-punctate; corium with the lateral margins (obsolete towards apex) and a transverse, sometimes maculate, fascia about one third from apex luteous; membrane pale fuscous, with the margins paler; sternum and abdomen beneath with a number of small discal black spots; antennæ fuscous, with the apical joint ochraceous.

Antennæ with the first and second joints almost subequal in length, third shorter, but longer than fourth; pronotal angles acutely produced, with their apices distinctly recurved; sternum somewhat coarsely punctate. Abdomen above pale reddish ochraceous; connexivum spotted with black, the largest spot a short distance from base, followed by a smaller spot, and a still smaller spot at apex.

Long. 9 millim.; exp. pronot. angl. 4 millim.

*Hab.* Brit. India; Sikkim, Assam, Mungphu (*Atkinson*, Brit. Mus.).

#### CENTROSCELINÆ.

##### Genus ACIDOMERIA.

###### *Acidomeria strigata*.

*Gonocerus strigatus*, Walk. Cat. Het. iv. p. 187. n. 18 (1871).

##### Genus MARGUS.

###### *Margus obscurator*.

*Coreus obscurator*, Fabr. Syst. Rhyng. p. 200 (1803).

*Margus inornatus*, Uhler (nec Dist.), Proc. Zool. Soc. 1894, p. 179.

Although Prof. Uhler refers to my figure of *M. inornatus* (Biol. Centr.-Am., Hem.-Heter. i. pp. 137, 365, t. xiii. fig. 18), the two specimens he has thus identified are typical *M. obscurator*, Fabr. Uhler has also given my name as the describer of *M. inornatus*, which is one of Stål's species, and must for the present be eliminated from the Rhynchotal fauna of the Antilles. *M. obscurator*, Fabr., which stands in its stead, is a very widely distributed Neotropical species.

##### Genus NAMACUS.

###### *Namacus annulicornis*.

*Namacus annulicornis*, Stål, En. Hem. i. p. 186 (1870).

*Namacus rufescens*, Walk. Cat. Het. v. p. 1. n. 2 (1872).

##### Genus CATORHINTHA.

###### *Catorhintha guttula*.

*Lygæus guttula*, Fabr. Ent. Syst. iv. p. 162 (1794).

*Catorhintha selector*, Uhler (nec Stål), Proc. Zool. Soc. 1894, p. 179.

*C. guttula*, Fabr., has been previously recorded from the Antilles, and Prof. Uhler's report on *C. selector*, Stål, being found there must be disregarded, as the British Museum now contains the specimens he thus identified.

###### *Catorhintha semialba*.

*Namacus semialbus*, Walk. Cat. Het. v. p. 2. n. 3 (1872).



## Genus HYPSELONOTUS.

*Hypselonotus interruptus.*

*Hypselonotus interruptus*, Hahn, Wanz. Ins. i. p. 187, fig. 96 (1831).  
*Jadera subvittata*, Walk. Cat. Het. iv. p. 145, n. 5 (1871).

## Genus PARYPHES.

*Paryphes festivus.*

*Paryphes festivus*, Costa, Rendic. Accad. Napol. ii. p. 259 (1863).  
*Paryphes gloriosus*, Walk. Cat. Het. iv. p. 88, n. 12 (1871).

Costa gives the dimensions of his species as "Long. mill. 10; lat. mill.  $6\frac{1}{2}$ ." The length given is evidently an error; the British Museum possesses five specimens from the Amazons, and they average from 20-23 millim. The "lat." as given by Costa applies to these specimens.

## DISCOGASTRINÆ.

## Genus CNEMOMIS.

*Cnemomis dubia.*

*Paryphes? dubius*, Dall. List Hem. ii. p. 440, n. 6 (1852).  
*Hypselonotus mundus*, Walk. Cat. Het. iv. p. 142, n. 19 (1871).

*Cnemomis cognata.*

*Cnemomis cognata*, Stål, Ann. Soc. Ent. Fr. 1865, p. 186.  
*Hypselonotus signatus*, Walk. Cat. Het. iv. p. 141, n. 17 (1871).

## Genus SCAMURIUS.

*Scamurius amabilis.*

*Paryphes amabilis*, Stål, Öfv. Vet.-Ak. Förh. 1855, p. 184.  
*Scamurius amabilis*, Stål, loc. cit. 1859, p. 471.  
*Homæoceroides incongruus*, Walk. Cat. Het. iv. p. 103, n. 2 (1871).

*Scamurius scutellaris.*

*Hypselonotus scutellaris*, Walk. Cat. Het. iv. p. 142, n. 20 (1871).

## Genus SAVIUS.

*Savius*, Stål, Rio Jan. Hem. ii. p. 58 (1862).  
*Homæoceroides*, Walk. Cat. Het. iv. p. 103 (1871).—Type *Homæocerus diversicornis*, Westw.

## Genus DISCOGASTER.

*Discogaster*, Burmeister, Handb. ii. 1, p. 315 (1835).  
*Leptornytus*, Walk. Cat. Het. iv. p. 102 (1871).

*Discogaster ruficornis*.

*Leptomytus ruficornis*, Walk. Cat. Het. iv. p. 102. n. 1 (1871).

A species apparently closely allied to *D. Drewseni*, Stål.

## PSEUDOPHLÆINÆ.

## Genus CLAVIGRALLA.

*Clavigralla acantharis*.

*Lygæus acantharis*, Fabr. Syst. Rhyng. p. 206. 16 (1803).

*Clavigralla acantharis*, Stål, Hem. Fabr. i. p. 67 (1868).

*Clavigralla tuberculata*, Dall. List Hem. ii. p. 513. n. 5 (1852).

*Clavigralla aliena*.

*Cletus alienus*, Walk. Cat. Het. iv. p. 199. n. 49 (1871).

Walker describes the lateral angles of the pronotum as "rounded, not prominent." This is incorrect, as they possess a distinct short recurved spine. Again, there is no indication of a broad black stripe to the head, which, however, possesses a very distinct longitudinal ochraceous stripe. Posterior femora with the apical halves castaneous; tibiæ biannulated with ochraceous; connexivum ochraceous, with large brown spots; apical joint of the antennæ fuscous.

*Clavigralla indecora*.

*Cletus? indecorus*, Walk. Cat. Het. iv. p. 197. n. 45 (1871).

The unique type is in a very bad condition and without the posterior legs. It is most probably a synonym of *C. horrens*, Dohrn.

## LEPTOCORISINÆ.

## Genus CURUPIRA.

*Curupira bicolor*, sp. n.

Ochraceous; anterior third of pronotum, base of scutellum, sternum, and sometimes inner margins of lateral lobes of head, plumbageous; posterior angles of prosternum broadly ochraceous; abdomen beneath reddish ochraceous, with its lateral margins luteous; eyes castaneous. Pronotum, scutellum, and sternum thickly and coarsely punctate; second and third joints of antennæ subequal in length, fourth longest; spine to scutellum long and obliquely ascendant.

Long. 7-9 millim.

*Hab.* Malay Peninsula; Singapore (*Ridley*, Brit. Mus.); Malay Archipelago; New Guinea, Dory (*Wallace*, Brit. Mus.).

This genus, which I originally proposed for the reception of a Neotropical species, is now found, like *Leptocoris*a and other allied genera, to be very widely distributed.

Mr. Ridley has appended a note to his specimens—"Excessively common in sugar-field."

*Curupira distincta*, sp. n.

Ochraceous; anterior third of pronotum and the sternum plumbageous; basal two thirds of pronotum, posterior angles of prosternum, base of scutellum, and inner margins of lateral lobes to head purplish black; abdomen beneath reddish ochraceous, its base plumbageous and its lateral margins luteous.

Pronotum, sternum, and scutellum thickly and coarsely punctate; second joint of the antennæ distinctly shorter than the third; spine to scutellum long and obliquely ascendant.

Long.  $8\frac{1}{2}$  millim.

*Hab.* Malay Archipelago, Ceram (Brit. Mus.).

Genus LEPTOCORISA.

*Leptocoris*a *costalis*.

*Myodochus costalis*, Herr.-Schäff. Wanz. Ins. viii. p. 96, fig. 864 (1848).

*Leptocoris*a *biguttata*, Walk. Cat. Het. iv. p. 174. n. 11 (1871).

ALYDINÆ.

Genus MEGALOTOMUS.

*Megalotomus rufipes*.

*Alydus rufipes*, Westw. in Hope Cat. ii. p. 19 (1842).

*Alydus debilis*, Walk. Cat. Het. iv. p. 160. n. 12 (1871).

*Megalotomus jamaicensis*, sp. n.

Head, pronotum, scutellum, and body beneath piceous; pronotum with a broad, transverse, ochraceous fascia; eyes, ocelli, and apex of central lobe to head castaneous; antennæ with the first and fourth joints castaneous, the second and third joints ochraceous, apex of second joint castaneous; corium castaneous, very finely speckled with ochraceous; femora piceous, the intermediate and posterior femora with their bases paler; tarsi ochraceous, finely speckled with brownish.

Head with an obscure central carination; pronotum coarsely punctate, with a central sulcation and with the lateral angles acutely produced and directed backwards.

Long. 11 millim.

*Hab.* Jamaica (*Mrs. Swainson*, Brit. Mus.).

## Genus TUPALUS.

*Tupalus maculatus*, sp. n.

Head, pronotum, scutellum, body beneath, rostrum, and posterior legs dark castaneous; apex of central lobe to head, a discal arcuated series of four spots to pronotum, central disk of fourth abdominal segment, and a rounded spot on each lateral area of fourth, fifth, and sixth segments, a lateral abdominal marginal series of small elongate spots, anterior and intermediate legs, and about basal third of posterior femora, ochraceous; antennæ black, apical joint and base of third joint castaneous; corium brownish ochraceous.

Posterior femora incrassated, with about six robust spines on apical half of interior margin; rostrum passing the intermediate coxæ.

Long. 15 millim.

Hab. Sierra Leone (*W. G. Clements*, Brit. Mus.).

## Genus RIPTORTUS.

*Riptortus decisus*.

*Camptopus decisus*, Walk. Cat. Het. iv. p. 165. n. 30 (1871).

*Riptortus longipes*.

*Alydus longipes*, Dall. List Hem. ii. p. 473 (1852).

*Alydus flavo-vittatus*, Stål, Cefv. Vet.-Ak. Förh. 1855, p. 30. 2.

Dallas gave Brazil as the habitat of his species, and this locality was clearly erroneous, as pointed out by Stål (En. Hem. iii. p. 95, 1873); I possess specimens from East Africa which agree with both the type of Dallas and the description of Stål.

*Riptortus serripes*.

*Cimex serripes*, Fabr. Syst. Ent. p. 709 (1775).

*Alydus robustus*, Dall. List Hem. ii. p. 473. n. 13 (1852).

*Camptotus sordidus*, Walk. Cat. Het. iv. p. 167. n. 40 (1871).

The type of Fabricius is in the Banksian Collection contained in the British Museum. The species identified by Dallas as *Alydus serripes* (List Hem. ii. p. 474. n. 15, 1852) is not conspecific.

## CORIZINÆ.

## Genus SERINETHA.

*Serinetha abdominalis*.

*Lygaeus abdominalis*, Fabr. Syst. Rhyng. p. 226 (1803).

Var. *Serinetha taprobanensis*, Dall. List Hem. ii. p. 461. n. 6 (1852).

The variety described by Dallas is the yellow form of the species, a form which seems to be constant in Ceylon, but which is also found in Southern India.

*Serinetha vicina.*

*Serinetha vicina*, Dall. List Hem. ii. p. 460. n. 5 (1852).

*Astacops nigricornis*, Walk. Cat. Het. v. p. 36. n. 12 (1872).

*Serinetha coxalis*, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 93 (1891).

*Serinetha lurida.*

*Serinetha lurida*, Dall. List Hem. ii. p. 461. n. 8 (1852).

The type of Dallas is without locality. I possess a series of specimens collected by J. C. van Hasselt at Bankala, Celebes.

*Serinetha aethiops*, sp. n.

*Serinetha fraterna*, Dall. (nec Westw.), var., List Hem. ii. p. 462. n. 9 (1852); Stål, Hem. Afr. ii. p. 112. n. 1 (1865).

Differs from *S. fraterna*, Westw., by the black corium and the ochraceous pronotum. The pronotum is also finely wrinkled and much more coarsely punctate.

*Hab.* West Africa, Sierra Leone (Brit. Mus.), Calabar (*Rutherford*, Coll. Dist.).

Genus JADERA.

*Jadera sanguinolenta.*

*Cimex sanguinolentus*, Fabr. Syst. Ent. p. 721 (1775).

*Lygæus anticus*, Walk. (part.) Cat. Het. v. p. 46. n. 51 (1872), part.

"c-n. St. Thomas."

*Lygæus rufoculis*, Kirby, Journ. Linn. Soc., Zool. vol. xx. p. 546. n. 51 (1890).

*Jadera antica.*

*Lygæus anticus*, Walk. (part.) Cat. Het. v. p. 46. n. 51 (1872), part.

"a-b. St. Domingo."

*Jadera sanguinolenta*, var. ?

*Jadera æola.*

*Serinetha æola*, Dall. List Hem. ii. p. 463 (1852).

*Lygæus conspersus*, Walk. Cat. Het. v. p. 47. n. 57 (1872).

BERYTINÆ.

Genus METACANTHUS.

*Metacanthus*, Costa, Atti Ac. Nap. 1848, p. 258.

*Protacanthus*, Uhler, Proc. Zool. Soc. 1893, p. 707.

*Metacanthus decorus.*

*Protacanthus decorus*, Uhler, Proc. Zool. Soc. 1893, p. 708.

*Metacanthus capitatus*, Uhler, loc. cit. 1894, p. 181.

The British Museum possesses the type of both these species as forwarded by Prof. Uhler. They are absolutely identical, and as Uhler described his second proposed species under the genus *Metacanthus*, he will probably agree with the present synonymical disposition of *Protacanthus*.

*Summarized Disposition of Walker's Genera and Species  
(concluding the Fam. Coreidæ).*

*Genera treated as synonymic.*

*Leptornytus*, Walk. Cat. Het. iv. p. 102 (1871), = Gen. *Discogaster*, Burm.

*Homæoceroides*, Walk. loc. cit. p. 103 (type), = Gen. *Savius*, Stål.

*Euplatycoris*, Walk. loc. cit., = Gen. *Molchina*, A. & S.

*Genus treated as valid.*

*Uranocoris*, Walk. Cat. Het. iv. p. 152 (1871).

*Species considered valid and described under correct Genera.*

*Menenotus diminutus*, Walk. Cat. Het. iv. p. 7. n. 3 (1871).

*Derepteryx truncata*, Walk. loc. cit. p. 11. n. 4.

*Physomerus subargenteus*, Walk. loc. cit. p. 60. n. 6.

*Acanthocoris anticus*, Walk. loc. cit. p. 118. n. 15.

*Leptoscelis varipes*, Walk. loc. cit. p. 133. n. 8.

— *venosa*, Walk. loc. cit. n. 9.

*Hypselonotus lanceolatus*, Walk. loc. cit. p. 140. n. 14.

*Uranocoris suavis*, Walk. loc. cit. p. 153. n. 1.

*Leptocoris discoidalis*, Walk. loc. cit. p. 173. n. 10.

*Noliphus unmulipes*, Walk. loc. cit. p. 176. n. 4.

*Cletus fuscescens*, Walk. loc. cit. p. 190. n. 16.

— *subnotatus*, Walk. loc. cit. p. 191. n. 21.

— *inconspicuus*, Walk. loc. cit. p. 195. n. 42.

*Species considered valid, but requiring generic revision.*

*Hirilcus pallens*, Walk. Cat. Het. iv. p. 73. n. 7 (1871), belongs to gen. *Quintus*.

*Leptornytus rufocornis*, Walk. loc. cit. p. 102. n. 1, belongs to gen. *Discogaster*.

*Anisoscelis santarema*, Walk. loc. cit. p. 127. n. 23, belongs to gen. *Leptoglossus*.

— *selecta*, Walk. loc. cit. n. 24, belongs to gen. *Leptoglossus*.

— *concolor*, Walk. loc. cit. p. 128. n. 26, belongs to gen. *Leptoglossus*.

— *alata*, Walk. loc. cit. p. 129. n. 27, belongs to gen. *Leptoglossus*.

*Malvana rubescens*, Walk. loc. cit. p. 134. n. 2, belongs to gen. *Leptoglossus*?

— *centralis*, Walk. loc. cit. p. 135. n. 3, belongs to gen. *Leptoscelis*.

*Sphictyrtus smaragdinus*, Walk. *loc. cit.* p. 137. n. 7, belongs to gen. *Phthia*.

*Hypselonotus minax*, Walk. *loc. cit.* p. 139. n. 11, belongs to gen. *Malvana*.

— *marginalis*, Walk. *loc. cit.* p. 140. n. 13, belongs to gen. *Zoreva*.

— *scutellaris*, Walk. *loc. cit.* p. 142. n. 20, belongs to gen. *Scamurius*.

*Camptopus decisus*, Walk. *loc. cit.* p. 165. n. 30, belongs to gen. *Riptortus*.

*Gonocorus strigatus*, Walk. *loc. cit.* p. 187. n. 18, belongs to gen. *Acidomeria*.

*Cletus inermis*, Walk. *loc. cit.* p. 198. n. 48, belongs to gen. *Colpura*.

— *alienus*, Walk. *loc. cit.* p. 199. n. 49, belongs to gen. *Clavigralla*.

*Namacus semialbus*, Walk. *loc. cit.* v. p. 2. n. 3 (1872), belongs to gen. *Catorhintha*.

*Species treated as synonymic.*

*Sephina atra*, Walk. *Cat. Het.* iv. p. 4. n. 7 (1871), = *Sephina limbata*, Stål.

*Spartocera chilensis*, Walk. *loc. cit.* p. 6. n. 11, = *Spartocera rubicunda*, Spin.

— *lumpyroides*, Walk. *loc. cit.* n. 12, = *Sephina vinula*, Stål.

*Piezogaster patulus*, Walk. *loc. cit.* p. 57. n. 3, = *Rhyticoris spinipes*, Pal. Beauv.

*Physomerus delineatus*, Walk. *loc. cit.* p. 59. n. 5, = *Physomerus grossipes*, Fabr.

*Hirileus pallidus*, Walk. *loc. cit.* p. 74. n. 8, = *Quintius pallens*, Walk.

*Paryphes gloriosus*, Walk. *loc. cit.* p. 88. n. 11, = *Paryphes festivus*, Costa.

*Homæoceroides incongruus*, Walk. *loc. cit.* p. 103. n. 2, = *Scamurius amabilis*, Stål.

*Euplatycoris bellicornis*, Walk. *loc. cit.* p. 104. n. 1, = *Molchina granulata*, Stål.

*Acanthocoris tarsalis*, Walk. *loc. cit.* p. 117. n. 8, = *Acanthocoris obscuricornis*, Dall.

*Anisoscelis præcipua*, Walk. *loc. cit.* p. 128. n. 25, = *Leptoglossus gonagra*, Fabr.

*Phthia concinna*, Walk. *loc. cit.* p. 132. n. 10, = *Phthia lunata*, Fabr.

*Leptoscelis hypselonotoides*, Walk. *loc. cit.* p. 134. n. 10, = *Leptoscelis fasciifera*, Stål.

*Hypselonotus luteiceps*, Walk. *loc. cit.* p. 139. n. 12, = *Leptoscelis egregia*, Stål.

— *ventralis*, Walk. *loc. cit.* p. 140. n. 15, = *Nematopus ruficrus*, Perty.

— *pectoralis*, Walk. *loc. cit.* p. 141. n. 16, = *Nematopus indus*, Linn.

— *signatus*, Walk. *loc. cit.* n. 17, = *Cnemomis cognata*, Stål.

— *propinquus*, Walk. *loc. cit.* p. 142. n. 18, = *Hypselonotus concinnus*, Dall.

— *mundus*, Walk. *loc. cit.* n. 19, = *Cnemomis dubia*, Dall.

— *fasciollis*, Walk. *loc. cit.* p. 143. n. 21, = *Nematopus fasciatus*, Westw.

— *crassifemur*, Walk. *loc. cit.* n. 22, = *Saguntus lobulatus*, Stål.

— *armatus*, Walk. *loc. cit.* p. 144. n. 23, = *Nematopus lepidus*, Stål.

*Jadera subvittata*, Walk. *loc. cit.* p. 145. n. 5, = *Hypselonotus interruptus*, Hahn.

*Hyalymenus ichneumoniformis*, Walk. *loc. cit.* p. 156. n. 4 (nom. præocc.), = *Hyalymenus Walkeri*, L. & S.

*Alydus debilis*, Walk. *loc. cit.* p. 160. n. 12, = *Megalotomus rufipes*, Westw.

*Camptopus sordidus*, Walk. *loc. cit.* p. 167. n. 40, = *Riptortus serripes*, Fabr.

*Leptocorisa biguttata*, Walk. *loc. cit.* p. 174. n. 11, = *Leptocorisa costalis*, H.-S.

- Cletus clarus*, Walk. *loc. cit.* p. 190. n. 15, = *Plinacthus dubius*, H.-S.  
 — *mundus*, Walk. *loc. cit.* p. 191. n. 17, = *Plinacthus spinosus*, Stål.  
 — *signatus*, Walk. *loc. cit.* p. 194. n. 39, = *Cletus bipunctatus*, Westw.  
 — *pallescens*, Walk. *loc. cit.* p. 195. n. 40, = *Cletus rubidiventris*, Westw.  
 — ? *indecorus*, Walk. *loc. cit.* p. 197. n. 45, = *Clavigralla horrens*,  
 Dohrn?  
 — *conspicuus*, Walk. *loc. cit.* p. 198. n. 47, = *Plinacthus acicularis*, Fabr.  
*Namacus rufescens*, Walk. *loc. cit.* v. p. 1. n. 2 (1872), = *Namacus annulicornis*, Stål.

*To be treated as non-existent.*

*Species the types of which are not now to be found in the British Museum.*

- Paryphes viridipes*, Walk. Cat. Het. iv. p. 88. n. 13 (1871).  
*Jadera abdominalis*, Walk. *loc. cit.* p. 145. n. 6.  
*Cletus apicifer*, Walk. *loc. cit.* p. 195. n. 41.  
*Clavigralla spinigera*, Walk. *loc. cit.* v. p. 6. n. 22 (1872).  
 — *dispar*, Walk. *loc. cit.* n. 23.

*Wrongly included in the Coreidæ.*

- Serinettha antica*, Walk. Cat. Het. iv. p. 147 (1871), belongs to gen. *Astacops* (*Lygæidæ*).  
 — *spurecata*, Walk. *loc. cit.*, belongs to gen. *Astacops* (*Lygæidæ*).  
 — *fascicollis*, Walk. *loc. cit.*, " " "  
 — *turbata*, Walk. *loc. cit.* p. 148, " " "  
 — *immunis*, Walk. *loc. cit.*, " " "  
*Dulichius*? *clavifer*, Walk. *loc. cit.* p. 170. n. 2, belongs to gen. *Helopeltis* (*Capsidæ*).  
*Noliphus*? *ruficollis*, Walk. *loc. cit.* iv. p. 176. n. 5 (1871), belongs to fam. *Capsidæ*.  
 — ? *distinctus*, Walk. *loc. cit.* n. 6, belongs to fam. *Lygæidæ*.  
 — ? *biplagiatus*, Walk. *loc. cit.* p. 177. n. 7, " "

*Verlusia rhombea*, Kirby (nec Linn.), Journ. Linn. Soc., Zool. xxiv. p. 92 (1894).

Mr. Kirby included a "single immature specimen" from Ceylon as "apparently belonging to this common European species." It must, however, be placed in the family Phymatidæ.

LIV.—*Descriptions of some new Species of Lepidoptera from East Africa and Tropical America.* By HERBERT DRUCE, F.L.S. &c.

Fam. *Hesperiidæ*.

*Parosmodes numa*, sp. n.

*Male*.—Head, antennæ, thorax, and abdomen on the upper-side black; underside of the thorax, abdomen, and legs



greyish brown. Primaries black; a yellowish-brown spot at the end of the cell, one beyond on the costal margin from which a series of small spots extends across the wing to the inner margin; the fringe yellowish brown: secondaries black; a small yellowish-brown spot at the end of the cell, below which a wide yellowish-brown band crosses the wing from the anal angle almost to the inner margin; the fringe yellow. Underside: primaries very similar to the upperside, but much browner in colour: secondaries reddish brown, crossed from the costal to the inner margin by two very indistinct redder brown bands, the wing slightly irrorated with small reddish spots.—*Female* very similar to the male, but blacker.

Expanse, ♂ ♀,  $1\frac{1}{10}$  inch.

*Hab.* East Africa, Dar-es-Salaam (*Mus. Druce*)

This species is allied to *Parosmodes icteria*, Mab.

### Fam. Agaristidæ.

#### *Xanthospilopteryx melanosoma*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and abdomen black; the collar and thorax spotted with white; a tuft of yellow hair at the base of the abdomen; a row of white spots down the middle and on each side of the abdomen; the legs black, banded with orange and white. Primaries black, with three small bluish-white dots on the costal margin close to the base; two yellow spots nearest the base, one at the end of the cell and one below extending almost to the anal angle, above which a curved yellow band, becoming narrow near the costal margin; the veins crossing the band are black: secondaries orange-red, darkest from the middle to the inner margin; the apex and outer margin bordered with black nearly to the anal angle. Underside: primaries bright yellow, the costal margin, apex, and outer margin black; a large black mark at the end of cell, a round black spot in the cell, and an indistinct black spot below the cell: secondaries very similar to the upperside, but paler in colour.

Expanse  $2\frac{3}{4}$  inches.

*Hab.* East Africa (*Mus. Druce*).

### Fam. Arctiidæ.

#### *Eucyane hermæa*, sp. n.

*Male*.—Head, palpi, antennæ, collar, tegulæ, and thorax black, the collar and tegulæ irrorated with metallic-green scales; abdomen above blue, dark brown on the underside,

banded with red. Primaries very similar to those of *E. excellens*, Walk., but greener, the white band narrower and without any red spot at the anal angle; the fringe not white at the apex: secondaries darker blue than in *E. excellens* and without the red spot on the costal margin.—*Female* very similar to the male, but rather larger.

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

*Hab.* Venezuela, Bolivia (*Mus. Druce*).

*Eucyrta lucens*, sp. n.

Head and collar yellow; tegulæ white, edged with yellow at the base; thorax white, spotted with black; antennæ black; abdomen above bright red; the underside, anus, and legs white; a row of white spots extends from the base of the abdomen to the anus. Primaries and secondaries pure white; a black spot at the end of the cell on the costal margin, two close to the apex, and two at the anal angle.

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

*Hab.* Colombia, Don Amo (*Mus. Druce*).

This species is allied to *E. daga*, Dogn.

*Neritos blanda*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, and thorax pinkish fawn-colour; abdomen above bright red, the underside, legs, and anus white. Primaries pinkish fawn-colour, crossed about the middle from the costal to the inner margin by a curved indistinct brown band; a small pink spot on the brown band close to the inner margin, a small black dot close to the base, the apex, outer and inner margin partly edged with pink: secondaries semihyaline bright pink, the fringe white.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Colombia, Don Amo (*Mus. Druce*).

This species is allied to *N. asana*, Druce.

*Elysus chrysellus*, sp. n.

*Male*.—Head, collar, and thorax chrome-yellow, tegulæ brown, antennæ dark brown, abdomen and legs reddish brown, anus yellow. Primaries chrome-yellow, the veins and a number of small spots at the base and at the end of the cell bright red; a brownish-red band crosses the wing near the base, and a submarginal brown band edged with red extends from close to the apex to the anal angle; the fringe alternately yellow and brown: secondaries pinkish yellow, the fringe yellow.

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

*Hab.* Colombia, Don Amo (*Mus. Druce*).

## Fam. Limacodidæ.

*Dalcera necoda*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs yellowish white. Primaries pale fawn-colour, darkest at the apex and round the outer margin; a reddish fawn-coloured spot at the end of the cell, from which two faint brown lines extend nearly to the anal angle; a minute black dot about the middle of the inner margin: secondaries pale fawn-colour, palest at the base, the fringe whitish.—*Female* very similar to the male, but larger and almost white.

Expanse, ♂  $\frac{3}{4}$ , ♀  $1\frac{3}{10}$  inch.

*Hab.* Colombia, Don Amo (*Mus. Druce*).

This species is allied to *D. ampela*, Druce.

*Euclea* (?) *punctata*, sp. n.

*Male*.—Head, antennæ, and collar pale brown; thorax, abdomen, and legs white. Primaries white, the base, costal margin, and inner half of the wing thickly spotted with pale brown; the fringe alternately brown and white: secondaries pure white, the fringe white.

Expanse 1 inch.

*Hab.* Colombia, Bonda (*Mus. Druce*).

## Fam. Cossidæ.

*Duomitus daphne*, sp. n.

*Male*.—Head and antennæ dark brown; collar, tegulæ, and thorax greyish brown; abdomen and legs dark brown. Primaries pale greyish brown, thickly mottled with dark brown; a dark brown spot in the cell, three below the cell, and two close to the apex; the marginal line dark brown: secondaries dark greyish brown.

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

*Hab.* Colombia, Minca (*Mus. Druce*).

*Duomitus striatus*, sp. n.

*Male*.—Head, collar, tegulæ, and thorax blackish grey; antennæ yellow; abdomen grey-black, paler at the base and anus. Primaries dark grey, darkest at the base and along the costal margin: secondaries dark grey; both wings are thickly striated with very fine dark grey lines.

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

*Hab.* Colombia, Cacagualito (*Mus. Druce*).

*Langsdorfia Buckleyi*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, abdomen, and legs dark brown; antennæ blackish brown. Primaries dark brown; a large reddish-brown broken band crosses the wing near the base; a large metallic gold spot just above the inner margin; a square-shaped reddish-brown spot below the cell; a dark brown spot edged with white close to the apex; some fine white lines along the outer margin; the fringe dark brown: secondaries dark brown, very mottled on the under-side with darker brown.

Expanse 2 inches.

*Hab.* Ecuador, Sarayacu (*Mus. Druce*).

*Langsdorfia rufescens*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs reddish brown. Primaries reddish brown, crossed about the middle from the costal to the inner margin by a narrow white line, the outer edge of the white line bordered with a dark reddish-brown band; the wing above the anal angle greyish: secondaries reddish brown.

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

*Hab.* Colombia, Bonda (*Mus. Druce*).

*Zeuzera æetes*, sp. n.

*Male*.—Antennæ yellow; head, collar, underside of the thorax, legs, and underside of the abdomen dark brown; tegulæ and thorax white; abdomen pale brown. Primaries: the costal half of the wing pale brown, the costal margin dark brown; the inner half of the wing white, striated with fine dark brown lines; a rather wide short brown streak below the cell: secondaries white.

Expanse 2 inches.

*Hab.* Colombia, Bonda (*Mus. Druce*).

Fam. **Hepialidæ**.*Hepialus prosopus*, sp. n.

Head, antennæ, collar, tegulæ, thorax, abdomen, and legs reddish brown, the abdomen paler above. Primaries pale reddish fawn-colour, mottled with darker brown, the inner part of the wing near the base pinkish; three broken greyish bands cross the wing beyond the middle from the costal to

the inner margin; the fringe dark brown: secondaries pale pinkish brown.

Expanse 3 inches.

*Hab.* Colombia, Bonda (*Mus. Druce*).

Allied to *H. momus*, Druce.

*Dolaca thisbe*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and abdomen dark brown; the underside of the abdomen yellowish brown; the legs dark brown. Primaries yellowish brown, darkest along the costal margin; a metallic gold spot on the inner margin near the base; a row of metallic gold spots crosses the wing beyond the middle from near the costa to the inner margin; two gold spots beyond the cell, and a marginal row of gold dots extend from the apex to the anal angle; the fringe brown: secondaries uniformly pale brown.

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

*Hab.* Colombia, Don Amo (*Mus. Druce*).

Fam. Notodontidæ.

*Rifargia nubila*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and abdomen pale greyish brown; the underside of the thorax, abdomen, and legs cream-colour. Primaries very pale brown, crossed near the base from the costal to the inner margin by a rather wide greyish-brown band; a dark brown spot close to the base and a larger round dark brown spot at the end of the cell, above which is a smaller spot of the same colour; a sub-marginal brown line extending from the apex to the anal angle: secondaries brownish white, the outer margin bordered with brown from the apex to the anal angle.—*Female* very similar to the male, but darker in colour; the secondaries dark reddish brown, with the fringe yellowish; the underside is also very much darker than in the male.

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

*Hab.* Colombia, Don Amo (*Mus. Druce*).

*Heterocampa corda*, sp. n.

*Male*.—Head and antennæ pale brown; collar and tegulæ dark brown; thorax silvery grey; abdomen brown, slightly yellowish at the base, the anal segments grey. Primaries silvery grey, thickly irrorated with brown; two black dots at the end of the cell and two below the cell; a wide waved

brown submarginal band edged with white crosses the wing from the costal margin near the apex to the anal angle; fringe grey: secondaries dark brown, the fringe alternately grey and brown.

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

*Hab.* Colombia (*Mus. Druce*).

Subfam. *STICTOPTERINÆ*.

*Stictoptera creta*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and abdomen pale brown; legs brown. Primaries pale brown, crossed from the costal to the inner margin by very fine greyish-white lines; a wide black band edged with white on the inner side crosses the wing about the middle from the costal to the inner margin, where it is slightly wider: secondaries pure white, broadly bordered with pale brown.

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

*Hab.* Colombia, Don Amo (*Mus. Druce*).

Fam. *Deltoidæ*.

*Hypena divergens*, sp. n.

*Male*.—Head, antennæ, palpi, thorax, abdomen, and legs black. Primaries black; a narrow pale yellow band crosses the wing from the middle of the costal margin to the anal angle: secondaries black, the costal margin edged with yellow, the fringe black. Underside similar to the upperside, but much browner, and the yellow band on the primaries three times as wide.

Expanse 1 inch.

*Hab.* Bolivia (*Garlepp, Mus. Druce*).

*Hypena vitula*, sp. n.

*Male*.—Head, antennæ, palpi, thorax, and abdomen brown. Primaries dark brown; a pale brown indistinct waved line crosses the wing at the end of the cell from the costal to the inner margin; two black dots edged with white in the cell; a submarginal row of indistinct greyish dots extends from the apex to the anal angle; a marginal row of pale brown points; the fringe dark brown: secondaries white, clouded with brown from the apex to the anal angle and along the inner margin; the fringe dark brown. Underside: primaries very similar to the upperside, but rather paler in colour;

secondaries dark brown, with a central brown band and a black spot in the cell.

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

*Hab.* Ecuador, Sarayacu (*Buckley, Mus. Druce*).

*Hypena leucoptera*, sp. n.

*Male.*—Head, palpi, and thorax pale brown; antennæ and abdomen dark brown. Primaries dark brown, the base, inner margin, and a rather wide band crossing the wing to the inner margin all pale pinkish brown: secondaries white, broadly bordered with dark brown from the apex to the anal angle. Underside of the primaries pale brown, with a small white spot close to the anal angle.

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

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

*Hypena lyse*, sp. n.

*Male.*—Head, antennæ, palpi, thorax, and abdomen pale brown. Primaries pale brown, with a large central brown mark, edged with a fine yellowish-brown line, much dentated on the outer side; a submarginal row of very indistinct dark brown spots crosses the wing from the apex to the anal angle; the fringe dark brown: secondaries white, the apex, outer and inner margin broadly bordered with dark brown.

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

*Hab.* Ecuador, Chiguenda (*Buckley, Mus. Druce*).

*Hypena melaleuca*, sp. n.

*Male.*—Head, antennæ, palpi, thorax, and abdomen pale brown. Primaries pale brown, crossed from the costal to the inner margin by several very indistinct, narrow, waved, darker brown lines; a very dark brown band extends from the base to the anal angle; two small white dots close to the apex; the fringe dark brown: secondaries white, broadly bordered with black from the apex to the angle, the inner margin slightly black.

Expanse 2 inches.

*Hab.* Bolivia (*Garlepp, Mus. Druce*).

Fam. Tortricidæ.

*Atteria Buckleyi*, sp. n.

*Male.*—Head, antennæ, palpi, collar, thorax, abdomen, and legs black; tegulæ black, edged with yellow. Primaries

dark blue, the costal, outer, and inner margins streaked with orange-yellow; a row of orange-yellow spots down the middle of the wing; the fringe alternately dark blue and orange-yellow: secondaries brownish black, crossed from the costal margin by four rows of orange-yellow spots; the fringe black.

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

*Hab.* Ecuador, Intaj (*Buckley, Mus. Druce*).

*Atteria maon*, sp. n.

*Male.*—Head, antennæ, thorax, and abdomen black; collar and tegulæ yellow; palpi yellow, the third joint black; legs black, banded with yellow. Primaries chrome-yellow, crossed from the costal to the inner margin by bands of dark blue spots, the outer margin streaked with dark blue; the fringe black: secondaries chrome-yellow, thickly spotted with dark blue; the fringe black.

Expanse 1 inch.

*Hab.* Ecuador, Chiguinda (*Buckley, Mus. Druce*).

*Atteria splendens*, sp. n.

*Male.*—Head orange, palpi and antennæ black, collar orange, tegulæ orange spotted with black; thorax, abdomen, and legs orange, the anal segment of the abdomen black. Primaries orange-red; the costal margin and the outer half of the wing creamy white, broadly banded with black; the fringe alternately black and white: secondaries orange-red, the apex broadly black; two black spots on the outer margin.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Ecuador, Sarayacu (*Buckley, Mus. Druce*).

Allied to *A. mimica*, Feld. & Rog., and *A. volcanica*, Butler.

*Atteria lydia*, sp. n.

*Male.*—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black; palpi, the first and third joints black, the second joint orange-yellow. Primaries very dark blue, crossed from the costal to the inner margin before the end of the cell by three waved orange-yellow bands; a round orange-yellow spot at the end of the cell, beyond which is a curved orange submarginal line; the apex and outer margin streaked with orange-yellow; the fringe dark brownish yellow: secondaries brown, the costal margin yellow; a black spot at the end of the cell.

Expanse 1 inch.

*Hab.* Ecuador, Chiguinda (*Buckley, Mus. Druce*).



## Fam. Tineidæ.

## Subfam. ANOPHORINÆ.

*Ankistrophorus giganteus*, sp. n.

*Female*.—Head, antennæ, palpi, and thorax reddish brown; abdomen darker brown; legs brown. Primaries reddish brown, irrorated with darker brown streaks along the costal margin and the outer half of the wing; the fringe reddish brown: secondaries very similar to the primaries in colour but slightly darker, the fringe pale reddish brown.

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

*Hab.* Mexico, Orizaba (*Boucard, Mus. Druce*).

*Thysanosedes Salvini*, sp. n.

*Male*.—Head, palpi, thorax, abdomen, and legs very pale fawn-colour; antennæ yellow. Primaries pale fawn-colour, slightly irrorated along the costal margin and at the apex with a few brown scales: secondaries pale fawn-colour; the fringes of both wings pale fawn-colour.—*Female* darker than the male, but in all other respects very similar.

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

*Hab.* Panama, Obispo (*Salvin, Mus. Druce*).

*Acrolophus linus*, sp. n.

*Male*.—Head, antennæ, thorax, and abdomen dark brown; palpi dark brown, paler on the inner side; legs pale brown. Primaries dark brown, irrorated with greyish scales; a dark brown mark about the middle of the wing; the outer margin pale brown; the fringe dark brown: secondaries pale whitish brown.

Expanse 1 inch.

*Hab.* Mexico, Orizaba (*Boucard, Mus. Druce*).

*Acrolophus Boucardi*, sp. n.

*Male*.—Head, antennæ, thorax, abdomen, and legs pale brown; palpi greyish brown. Primaries dark brown, striated along the costal margin with pinkish brown; the base of the wing and two large spots on the inner margin pinkish brown, the outer margin pale brown; the fringe alternately dark and light brown: secondaries pale brown; the fringe yellowish brown.—*Female* very similar to the male, but altogether much greyer.

Expanse, ♂  $1\frac{1}{4}$ , ♀  $1\frac{6}{10}$  inch.

*Hab.* Mexico, Orizaba (*Boucard, Mus. Druce*).

*Acrolophus* (?) *Underwoodi*, sp. n.

*Male*.—Head, antennæ, palpi, and thorax dark brown; abdomen pale greyish brown. Primaries brown, with a blackish-brown streak from the base of the wing to beyond the middle; the costal margin clouded with blackish brown; a submarginal row of dark brown dots extends from the apex to the inner margin close to the anal angle; the marginal line black; the fringe brown: secondaries pale brownish white, palest at the base and along the costal margin; the fringe greyish brown.

Expanse 1 inch.

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

*Anaphora numidia*, sp. n.

*Male*.—Head, antennæ, palpi, and thorax very dark brown, almost black; abdomen and legs pale brown. Primaries dark brown, lightest near the apex; a triangular-shaped black spot about the middle of the inner margin, above and beyond a square-shaped black spot, the costal margin striated with black lines; the fringe dark brown: secondaries reddish brown.

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

*Hab.* Mexico, Orizaba (*Boucard*); Guatemala (*Boucard, Mus. Druce*).

*Anaphora Arcéi*, sp. n.

*Male*.—Head, antennæ, palpi, and thorax reddish brown; abdomen blackish brown. Primaries dark reddish brown, the inner margin fawn-colour; a fawn-coloured streak extends from the apex to the middle of the wing; the fringe dark brown: secondaries pale reddish brown.—The *female* differs from the male in not having any of the pale markings on the primaries.

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

*Hab.* Panama, Chiriqui (*Arcé, Mus. Druce*).

*Anaphora libitina*, sp. n.

*Male*.—Head, antennæ, palpi, thorax, and abdomen cream-colour. Primaries cream-colour, clouded about the middle with dark brown; a few dark brown scales near the apex: secondaries cream-colour, the fringe brownish.—*Female* very similar to the male, but the secondaries darker brown.

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

*Hab.* Guatemala, 5000 feet (*Salvin, Mus. Druce*).

*Anaphora punctata*, sp. n.

*Male*.—Head, antennæ, palpi, thorax, and abdomen pale brown; legs brownish white. Primaries pale brown, thickly irrorated with dark brown scales; a black dot at the end of the cell and a curved line of black spots from the apex to the base of the wing, the spots near the base are the largest; fringe dark brown: secondaries reddish brown, the fringe rather darker.

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

*Hab.* Costa Rica (*Van Patten*); Candelaria Mts. (*Underwood*, *Mus. Druce*).

*Anaphora Whitelyi*, sp. n.

*Male*.—Head, thorax, and abdomen pale brown; antennæ and palpi yellowish brown. Primaries yellowish brown, with a large, central, V-shaped, reddish-brown mark extending across the middle of the wing from the costal to the inner margin; the costal margin and the outer margin are striated with reddish brown; a reddish-brown dot on the inner margin close to the base: secondaries blackish brown.

Expanse 1 inch.

*Hab.* British Guiana, Essequibo River (*Whitely*, *Mus. Druce*).

*Anaphora Perrensi*, sp. n.

*Male*.—Head, antennæ, palpi, thorax, and abdomen pale brown, the palpi slightly lighter on the inner side. Primaries pale reddish brown, with a central dark brown streak extending from the base to about the middle of the wing; a curved brown line extends from the costal margin to the anal angle, the apical part of the wing being the palest in colour: secondaries pale reddish brown.—The *female* very similar to the male, but darker in colour.

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

*Hab.* Brazil, Goya (*Perrens*, *Mus. Druce*).

*Felderia echinon*, sp. n.

*Male*.—Head, thorax, palpi, and abdomen dark brown, palpi tipped with white; antennæ yellowish brown; the anus pale brown. Primaries pale brown, the veins all dark brown; two greyish-white spots above the inner margin; the fringe pale brown: secondaries very pale brown, the inner margin slightly darker.

Expanse 1 inch.

*Hab.* Mexico, Orizaba (*Boucard*, *Mus. Druce*).

*Felderia Garleppi*, sp. n.

*Male*.—Head, thorax, and abdomen dark brown; antennæ pale yellowish brown; palpi dark brown, pale on the inner side. Primaries pale brown, with an indistinct paler band crossing the wing from the apex to the middle of the inner margin; the costal margin striated with dark brown; a long black streak at the end of the cell and one below nearer the base of the wing; secondaries dark blackish brown.

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

*Hab.* Bolivia (*Garlepp*, *Mus. Druce*).

LV.—*On Sciurus notatus and allied Species.*

By J. L. BONHOTE, B.A.

THIS group of laterally lineated squirrels is one in which considerable confusion exists. The confusion has been augmented by the existence of two forms, the one having red or yellow underparts, and the other grey underparts; they are frequently found in the same localities, and have generally been regarded as dimorphic forms of a single species.

The name *S. notatus*, which was applied by Boddaert in his ‘Elenchus Animalium’ to Pennant’s description of the “Plantane Squirrel,” has to be restricted to a small and light-coloured species inhabiting Java and Sumatra. Raffles’s name *S. vittatus* belongs to a very variable species found in Sumatra, the Malay Peninsula, and Borneo; while to the form with grey underparts, hitherto considered specifically identical with the above, and which is found in Java, Sumatra, the Malay Peninsula, and Borneo, Horsfield’s name of *S. nigro-vittatus* should be applied.

The following is a list of the species and subspecies of this group:—

	<i>Hab.</i>
<i>Sciurus notatus typicus</i> . . .	Java.
— — <i>albescens</i> . . .	Acheen, Sumatra.
— — <i>vittatus typicus</i> . . .	Sumatra and Malay Peninsula.
— — <i>tenuirostris</i> . . .	Tioman Island, off Malay Peninsula.
— — <i>anambensis</i> . . .	Anambas Islands.
— — <i>Abbotti</i> . . .	Big Tambelan Island, South China Sea.
— — <i>dulitensis</i> . . .	Borneo.

- Sciurus nigrovittatus typicus*. Java, Sumatra, and Malay Peninsula.  
 ——— *orestes* . . . . Borneo.  
 ——— *Klossii* . . . . Kaju Ara Island or Saddle Island, Tambelan Group.

Key to the Species.

- A. Underparts not blue or grey.  
 a. Underparts yellow (buff-yellow, Ridg.).  
   a<sup>1</sup>. Dark stripe narrow (about 6 mm.) and grizzled . . . . . *S. notatus typicus*.  
   b<sup>1</sup>. Dark stripe broad (about 13 mm.) and black, but suffused with white hairs . . . . . *S. n. albescens*.  
 b. Underparts red or fulvous (orange-buff, Ridg.).  
   a<sup>1</sup>. Red tip to tail \* . . . . . *S. vittatus typicus*.  
   b<sup>1</sup>. No red tip to tail † . . . . . *S. v. dulitensis*.  
 B. Underparts blue.  
 a. Chin and sides of face ochraceous. . . . . *S. nigrovittatus typicus*.  
   a<sup>1</sup>. Light stripe lighter than cheeks . . . . . *S. n. Klossii*.  
   b<sup>1</sup>. Light stripe of same colour as cheeks . . . . . *S. n. orestes*.  
 b. Chin and sides of face pale fulvous. . . . . *S. n. orestes*.

*Sciurus notatus typicus*, Bodd.

*Plantane Squirrel*, Penn. Hist. Quad. 1st ed. ii. p. 416 (1781), 2nd ed. ii. p. 151 (1792).  
*Sciurus notatus*, Bodd. Elench. Anim. p. 119 (1785).  
*Sciurus badging*, Kerr, An. King. p. 262 (1792).  
*Sciurus plantani*, S. J. Ljung, Kongl. Vetensk.-Akad. Handl. vol. xxii. p. 99, pl. i. (1801); Horsf. Zool. Res. Java (1824).  
*Sciurus gingianus*, Shaw, Gen. Zool. vol. ii. pl. i. p. 147 (1801).  
*Sciurus bilineatus*, Desm. Nouv. Dict. d'Hist. Nat. x. p. 106 (1817).

General colour of the upper parts, including the top of the head and outer sides of the limbs and feet, dark grey, minutely punctuated with pale buff, each hair having two or more pale buff annulations. The cheeks and face are pale yellowish buff (buff-yellow, Ridg.) †; the underparts and inner sides of the limbs being of a precisely similar colour. Along either side of the body, between the fore and hind limbs, runs a narrow line of pale buff, succeeded below by a narrow grizzled stripe similar in colour to the upper parts. The ears are covered with short hair of the same colour as the cheeks, and immediately behind them is a small patch

\* Two other races, described by Mr. G. Miller, Jun., under the names *S. anambensis* and *S. Abbotti*, would come under this heading; but without specimens I am unable to distinguish them further. A description is given in the text.

† Another race, *S. tenuirostris*, also described by Mr. Miller, should be included under this heading.

‡ Ridgway, 'Nomenclature of Colours': Boston, 1886.

of pale buff. The tail on its upperside is of the same colour as the back, while on the underside the buff annulations are larger and more prominent, causing that colour to predominate.

The only skull available is unfortunately not quite adult and in a somewhat fragmentary condition, but is considerably smaller and narrower than in *Sc. vittatus*. The rostrum is very narrow, especially at its base, and in consequence of this the nasals are rather broad anteriorly in proportion to their width behind. The postorbital processes are short and the zygomatic are moderately straight and bulge out but slightly; this latter character is, however, doubtless due to immaturity.

Dimensions (from skin):—Head and body 213 millim. (approx.); tail 175; hind foot 38.

Skull: greatest length 45 (approx.); length of palate 21; zygomatic breadth 24; interorbital breadth 15; length of nasals 13·2; breadth of nasals, ant. 8, post. 3·5.

*Hab.* Java.

In writing the above description I have had before me one of Dr. Horsfield's specimens on which his remarks under *S. plantani* in the Zool. Res. Java were based.

The general light colour of this squirrel and the absence of a *black* lateral stripe enable this species to be easily distinguished.

*Sciurus notatus albescens*, subsp. n.

General colour above similar to *Sc. notatus typicus*, except that the buff annulations are rather more inclined to fulvous, especially on the limbs and feet. There are also many long pure white hairs scattered over the upper parts, but not in sufficient quantity to have any effect on the general colour. The cheeks and sides of the face resemble the foregoing species, except that the colour is not quite so pure, being interspersed with a few greyish hairs. The underparts and inner sides of the limbs are pinkish buff, some of the hairs being pure white and some having a distinctly rufous tinge. The light lateral stripe is pale buff, and it is succeeded below by a broad darkish area whose width varies from 5 millim. at the posterior end to 15 millim. in its anterior portion. This area is composed of hairs of two kinds, viz. pure white and white hairs with black tips so arranged as to appear like a black line washed over with a thin film of white. The ears, the light patch behind these, and the tail resemble those parts in *Sc. notatus*, except that the buff on the tail is rather more rufous.

*Skull.*—Owing to the skull being very fragmentary, I am unable to give a description.

Dimensions (from skin):—Head and body 187 millim.; tail 150; hind foot 37.

*Hab.* Acheen, Sumatra.

*Type* B.M. 85. 8. 1. 235. Collected on 1st February, 1873, by Mr. W. Davison, and presented by Mr. A. O. Hume.

*Sciurus vittatus typicus*, Raffles.

*Sciurus vittatus*, Raffles, Trans. Linn. Soc. xiii. p. 259 (1822); Cantor, J. A. S. B. xv. p. 250 (1846); Blyth, *op. cit.* xvi. p. 872 (1847); Horsf. Cat. Ind. Mus. p. 152 (1851); Blyth, J. A. S. B. xxiv. p. 476 (1856).

*Sciurus badging*, Kerr, Thomas, P. Z. S. 1886, p. 76; W. Sclater, Cat. Mamm. Calc. Mus. ii. p. 23 (1891).

*Sciurus notatus*, Bodd., Thos. P. Z. S. 1886, p. 77 (partim).

*Sciurus bivittatus*, Desm. Mamm., Suppl. p. 543 (1822).

*Macroxus vittatus*, F. Cuv. Hist. Nat. Mamm. pl. cexxxiv. (Oct. 1824).

*Macroxus toupai*, Lesson, Man. de Zool. p. 238 (1827).

*Sciurus notatus miniatus*, G. Miller, Jr., Proc. Wash. Acad. Sci. ii. p. 79 (1900).

General colour above, including the crown of the head, the outer sides of the limbs, and feet, black, minutely and profusely speckled with fulvous (wood-brown, Ridg.). The fulvous is everywhere in excess of the darker colour, but more especially so on the head and feet. Each hair is greyish at its base, shading into black at its tip, and carries two or three fulvous annulations, which are about equal in breadth to the intervening portions. The cheeks, face, and chin are of a grizzled rufous (ochraceous buff, Ridg.); on the muzzle and a ring round the eye the colour is pure. The underparts and the inner sides of the limbs vary from a deep chestnut to a very pale orange (ochraceous rufous to orange-buff, Ridg.), individuals being found of all shades within these limits. The light lateral stripe which borders the grizzled colour of the back is pale buff (buff, Ridg.), and is succeeded below by a deep black stripe, which is usually rather broader. The breadth varies from 5 millim. to 10 millim., but this variation is probably partly due to the different ways in which the skins are made up. The ears are covered with short rufous hairs, similar in colour to those on the muzzle; there is no conspicuous light patch behind the ear, although in a few cases a slightly lighter tinge may be observed by pulling the ear forward, but in most cases it is entirely absent. The tail on its upper part is similar in colour to the back, but the annulations are rather broader; below the fulvous so greatly predominates as to almost entirely obscure the darker colour;

towards the tip, and in some cases throughout nearly its entire length, it becomes of the same rufous colour as the underparts.

The *skulls* of this species at my disposal are, I regret to say, so imperfect that it is impossible to give a very accurate description. It is a typical *Sciurus* skull of moderate dimensions and presenting no especially salient features. The nasals are of moderate length and taper considerably towards their posterior margin, which is in most cases considerably anterior to the posterior margin of the premaxillæ. The interorbital region is broad and the postorbital processes well developed and turning considerably downwards. The braincase is rather narrow and short.

Dimensions (from skin):—Head and body 237 millim.; tail 190; hind foot 45.

Skull: greatest length 52; length of palate from henselion 23; zygomatic breadth 32; interorbital breadth 19.5; length of nasals 15; breadth of nasals, ant. 8, post. 5.

*Hab.* Sumatra and Malay Peninsula.

*Co-types* B.M. 79. 11. 21. 580-1. Bencoolen, Sumatra. Received from the Indian Museum, ex coll. Sir S. Raffles (69 a, b. Bencoolen, Sumatra. Presented by Lady Raffles).

In making out the characters of this species I have examined the above-mentioned types as well as a large series from the Malay Peninsula. Within certain limits it is very variable, most especially in the colour of its underparts; but nevertheless, when once allowance has been made for these variations, it forms an easily recognizable and distinct form, the red tip to the tail being a conspicuous and constant mark. I am unable to agree with Mr. G. Miller, Jr., who, in a recent paper, has separated the Northern Malay form from those found in the south of the peninsula. The point of difference seems to be, according to Mr. Miller, in the colour of the underparts, which he states to be much deeper and darker in the northern form. From the series of specimens I have examined, those with the lightest underparts are certainly from the south; but I am able to match very deep-coloured specimens from Perak with individuals from both Johore and Singapore.

*Sciurus vittatus tenuirostris*, Miller.

*Sciurus tenuirostris*, Miller, Proc. Wash. Acad. Sci. p. 221 (1900).

This form, which has recently been described by Mr. Miller, may be distinguished from the Sumatran form by the absence of the red tip to the tail and the skull having the "rostral



portion more slender and lightly built." In other respects it resembles *S. vittatus* from Singapore. The colour of the underparts is orange-rufous.

Dimensions (flesh):—Head and body 191 millim.; tail-vertebræ 165; pencil 50; hind foot 42.

Skull: greatest length 50; palatal length 21.6; zygomatic breadth 28; interorbital breadth 17.4; length of nasals 15.6; breadth of nasals, ant. 6, post. 3.

*Hab.* Tioman Island, off the east coast of the Malay Peninsula.

*Type* no. 101753 United States National Museum. Collected by Dr. W. L. Abbott.

Not having had an opportunity of examining examples of this and the two following races, the particulars have been taken from Mr. Miller's paper.

*Sciurus vittatus anambensis*, Miller.

*Sciurus anambensis*, Miller, Proc. Wash. Acad. Sci. p. 223 (1900).

Resembles *S. vittatus typicus*, but is slightly smaller, of a paler colour, and has no red tip to the tail.

*Skull* as in the typical race, except that the palate is narrower and the audital bullæ slightly larger.

Dimensions (in flesh):—Head and body 191 millim.; tail-vertebræ 178; pencil 70; hind foot 44.

Skull: greatest length 49.6; palatal length 21.4; zygomatic breadth 29; interorbital breadth 17.4; length of nasals 14.4; breadth of nasals, ant. 7, post. 4.2.

*Hab.* Islands of the Anambas group.

*Type* no. 101686 United States National Museum.

*Sciurus vittatus Abbotti*, Miller.

*Sciurus Abbotti*, Miller, Proc. Wash. Acad. Sci. p. 224 (1900).

Similar to *S. v. anambensis* in colour, "but the skull with more slender rostrum and smaller, less inflated audital bullæ."

Dimensions (in flesh):—Head and body 197 millim.; tail-vertebræ 178; pencil 60; hind foot 46.

Skull: greatest length 49; length of nasals 16; greatest breadth of nasals 6.6.

*Hab.* Big Tambelan Island and Pulo Bunoa, South China Sea.

*Type* no. 101662 United States National Museum.

The inclusion of this and the two preceding races in this paper does not imply that I am convinced of their validity. I have not seen any specimens, and with regard to the first

two am in no position to give a definite opinion; they are merely included to show in what relationship they stand to the group as a whole, and in order that any future worker may bear them in mind when studying this group. On this last race, however, I feel compelled to make a few remarks. Mr. Miller starts his description by giving as its *distinctive* characters, "Skull with more slender rostrum and smaller, less inflated audital bullæ," both characters being comparative. In the study of comparative characters one naturally looks at the dimensions, in order to get some idea of the amount of the difference between the two forms; and in this case we are met with the announcement that "The skull is so nearly alike that of *S. anambensis* in size, that it is unnecessary to give detailed cranial measurements." In other words, were it not for a description of the audital bullæ we should have a *species* characterized by comparative features of size alone, which are incapable of being demonstrated on paper by measurements. It will, perhaps, make my meaning clearer if I quote Mr. Miller's description in full:—"Skull much like that of *S. anambensis* in size and general form. The rostrum is more slender, particularly when viewed from below, and the audital bullæ are noticeably different in form. The bullæ are so flattened that when viewed from behind (the skull held upside down) they appear to rise scarcely above the level of tips of hamulars. Each is constricted near the middle by a groove extending from just behind the lateral process of basioccipital over the ventral ridge of the bulla and disappearing on the outer side. This groove, faintly indicated in the related species, is here so greatly developed as strongly to affect the shape of the bullæ, particularly when viewed from the side."

The distinction of the groove on the bulla, although more pronounced in Mr. Miller's specimens, is, judging from the analogy of the skulls of other races of *S. vittatus*, a very variable feature, two skulls from the same locality in Borneo showing varying degrees of constriction. The only characteristic of this species left, therefore, is that the bullæ are so flattened that "when viewed from behind (the skull held upside down) they appear to rise scarcely above the level of tips of hamulars."

I should be the last to maintain that such small differences where they exist should be disregarded, and, in fact, the less obvious they are the more interesting are they likely to prove in future ages, as showing what may be the first incipient beginnings of a definite species; but when these differences are so minute as to be incapable of being definitely expressed,

the race should not be given a separate name, but noted under the name of the species from which they are as yet but imperfectly defined.

Mr. Miller took this view with regard to a specimen from Pulo Riabu when dealing with *S. anambensis*, and, as far as I am able to judge without seeing the actual specimens, it seems a pity that he did not act likewise with regard to *S. Abbotti*.

*Sciurus vittatus dulitensis*, subsp. n.

*Sciurus notatus*, Bodd., Hose, Mamm. Borneo, p. 46 (1893).

General colour throughout as in *Sciurus vittatus typicus*, with the following exceptions:—The tail is *always* annulated right to the end and has no red pencil, though in some cases it has a slight tinge of rufous near the tip, but the annulations are always visible. The lateral light stripe is duller and less buffy in tint, being cream-buff\*, as compared with buff\* in the typical form. The colour of the underparts is pale orange (orange-buff\*).

The skull shows hardly any difference except in being slightly narrower.

Dimensions (from skin):—Head and body 213 millim.; tail 200; hind foot 44.

Skull (another specimen): greatest length 51 millim.; length of palate from hensenion 21; zygomatic breadth 30; interorbital breadth 17; length of nasals 14; breadth of nasals, ant. 7, post. 4.

*Hab.* Borneo.

*Type* B.M. 94. 6. 2. 21, ♂ ad. Mount Dulit, 1000 feet. Collected and presented by Messrs. Charles and Ernest Hose.

The colour of the underparts of this form appears to vary between the same limits as in the typical race, but whereas in Sumatra and the Malay Peninsula the dark form seems to predominate, in Borneo the converse is the case. The absence of the bright red pencil to the tail forms the best-marked character by which this species may be distinguished.

When the underparts of this species are deep chestnut it somewhat resembles *S. baluensis*, which I described in a recent paper, when dealing with the various forms of *S. Prevostii*. *S. baluensis* is easily recognizable by its much larger size and darker colour of the upper parts.

\* Ridgway, 'Nomenclature of Colours.'

*Sciurus nigrovittatus*, Horsf.

*Sciurus nigrovittatus*, Horsfield, Zool. Res. Java (1824); Cantor, J. A. S. B. xv. p. 250; Blyth, *op. cit.* xvi. p. 872; id. *op. cit.* xxiv. p. 476.

General colour of the upper parts, including the top of the head and outer sides of the limbs and feet, black, profusely speckled with fulvous, which is everywhere in excess of the darker colour, each hair being grey at its base, shading to black at the tip, and having two or three buff annulations. The cheeks, face, and chin, including a ring round the eye, are of a light rufous brown (tawny ochraceous, Ridg.). The extent of this colour on the chin is very variable; in some cases it covers the whole of the underpart of the neck, but in the majority of cases it is confined to the tip of the chin, and may be traced back along the sides of the neck nearly as far as the shoulder, becoming gradually more and more grizzled, till it loses itself in the colour of the upper parts.

The whole of the underparts and inner sides of the limbs are of a pale bluish grey (smoke-grey, Ridg.), each hair being dark at its base, with a hoary tip; the colour is rather lighter on the fore-chest, and in some specimens there is a tendency to a darker stripe along the middle line. The light lateral line has a tendency to be short and narrow and is very yellowish in tint (buff-yellow, Ridg.). The dark stripe is of similar dimensions and pure black. The ears do not differ from the colour of the back, and there is a distinct patch of lighter colour behind them. The tail is of the same colour as the back, but the annulations being considerably broader, it has sometimes the appearance of being ringed; on the underside it has a rather more fulvous tint, but the tip does not differ from the rest.

*Skull*.—From the somewhat imperfect series of skulls at my disposal I am unable to notice any characters by which the skull of this species may be distinguished. It is generally a trifle smaller and is somewhat narrower.

Dimensions (from skin):—Head and body 203 millim. (approx.); tail 193 (approx.); hind foot 40.

Skull: greatest length 48; zygomatic breadth 31; inter-orbital breadth 18·6; length of nasals 14; width of nasals, ant. 7, post. 5.

*Hab.* Java, Sumatra, and Malay Peninsula.

*Co-type* B.M. 73 a, ♂. Java (*Horsfield*), from the East India Company's Museum.

I have examined specimens from Java, Sumatra, and the

Malay Peninsula, and can find no characters which would justify their division into geographical races.

With regard to considering this form as a distinct species, a few words may not be out of place. As it occurs in so many places in company with *S. vittatus*, it must clearly be considered either a dimorphic form or a separate species. Although in *S. vittatus* all shades of rufous colour may be found, in *S. nigrovittatus* the colour is always constant, and there are no intermediate forms between the two species as one would expect were it a dimorphic form or geographic race. The next point to be noticed is that its distribution is not the same; it occurs in Java, where the red-bellied form is unknown, and this is also the case, as Mr. Miller has shown, on an island in the South China Sea. This last instance also tends to disprove the supposition that *S. nigrovittatus* is a mountain form, as none of the China Sea islands rise to any great height; and in furtherance of this statement it may be noticed that the red-bellied species occurs at a considerable height on the mountains of Perak.

*Sciurus nigrovittatus orestes*, Thos.

*Sciurus notatus orestes*, Thos. Ann. & Mag. Nat. Hist. ser. 6, vol. xv. p. 529 (1895).

Differs from *S. nigrovittatus typicus* in its smaller size, more rufous coloration on the back, absence of the brown colour on the cheeks and chin, and in the tail being thinner and more sparsely clad and ending in a black pencil. The general colour of the back and upper parts is as in *S. nigrovittatus*, but the annulations are much broader and more rufous (ochraceous rufous, Ridg.). The cheeks and sides of the face are very pale fulvous tinged with grey; the chin is bluish grey like the underparts, but with slight traces of fulvous. There is a tendency to a fulvous ring round the eye, and the light patch behind the ears is conspicuous. The tail resembles the back, but the annulations are light and conspicuous; the tip is black.

*Skull*.—Except in size the skull presents no marked features by which it might be distinguished from the typical race. The rostrum is slightly broader in proportion and the nasals do not taper quite so much posteriorly.

Dimensions (type, after Thomas):—Head and body 196 millim.; tail 144; hind foot 33·3.

Skull: greatest length 39·7; zygomatic breadth 25; inter-orbital breadth 14·7; length of nasals 11; greatest breadth of nasals 5·9, post. 4·2.

*Hab.* Mountains of Borneo.

*Type* B.M. 94. 6. 2. 24, ♀. Mount Dulit, 4000 feet. Collected January 1892, and presented to the Museum by Messrs. Charles and Ernest Hose.

*Sciurus nigrovittatus Klossii*, Miller.

*Sciurus Klossii*, Miller, Proc. Wash. Acad. Sci. p. 225 (1900).

This is apparently an easily recognizable local race rather intermediate between the two preceding. In size it is practically the same as *S. n. orestes*, while it differs from it in the absence of the light patch behind the ear and in the dull ochraceous of the cheeks, chin, muzzle, and sides of the neck, approaching very closely in these last two characters the typical race.

The *skull* apparently differs in no way from that of *S. n. orestes*.

Dimensions:—Head and body 171 millim.; tail-vertebræ 152; hind foot 41.

Skull: greatest length 42; palatal length 17.4; zygomatic breadth 26.6; interorbital breadth 16; length of nasals 12; breadth of nasals, ant. 6, post. 3.

*Hab.* Saddle Island, Tambelan Group.

*Type* ♂, no. 101678 United States National Museum. Collected August 15th, 1899.

NOTE.

Since the above paper has been in the press Mr. Miller\* has published a list of the "Mammals of the Natuna Islands," in which he describes five new forms of this group. They are as follows:—

- (1) *Sciurus lutescens*.—Sirhassen Island. "Allied to the *S. notatus* from Borneo (*S. vitt. dulitensis*, J. L. B.), but considerably smaller. Colours very pale, underparts buff or cream-buff."
- (2) *Sciurus seraie*.—Pulo Serai, S. Natunas. "Most nearly allied to *S. lutescens*, but the upper parts slightly less pale and the underparts and pale side-stripe buff-yellow, the former without admixture of grey."
- (3) *Sciurus rutiliventris*.—Pulo Midei, S. Natunas. "Size slightly greater than *S. lutescens* and *S. seraie*, but not equal to that of the Bornean or Bunguran representatives of *S. notatus* [*S. vittatus*, J. L. B.]."

\* Proc. Wash. Acad. Sci. vol. iii. pp. 124-129, March 1901.

Colour above as in *S. seraïæ*. Underparts bright clear orange-rufous."

- (4) *Sciurus rubidiventris*.—Size and general appearance above and below as in *S. notatus* from Borneo, but red of underparts brighter and cheeks and chin distinctly less fulvous than surrounding parts. Skull with broader, deeper brain-case than in Bornean animal.
- (5) *Sciurus lautensis*.—Pulo Laut, North Natunas. "Size slightly less than that of *S. rubidiventris* and colour conspicuously pallid. Upper parts as in *S. lutescens*; lower parts nearly as in *S. seraïæ*, but rather less dull; pale side-stripe much less yellow than belly. Skull as in *S. rubidiventris*."

LVI.—On Two new Species of Squirrels from the East Indies. By J. L. BONHOTE, B.A.

WHILE working at the squirrels in the National Collection I have come across two specimens each of which seems to belong to a hitherto undescribed species. The first was collected at Klong Morn, Siam, by Mr. S. S. Flower, and I propose for it the name

*Sciurus Floweri*, sp. n.

General colour above greyish brown, rather more rufous along the middle of the back, the colour being most intense on the head and snout. Each hair is dark grey at its base, having a tip of rufous or pale ashy according to its position on the body, and also one or two annulations of a similar colour. These annulations are darkest along the middle line, lighter at the sides, and on the feet and limbs the colour is very pale. The ears and the parts immediately surrounding the mouth are deep rufous. The underparts and inner sides of the limbs are pure white, interspersed here and there with a few black and chestnut hairs, but not in sufficient numbers to in any way influence the general appearance, which is pure white. The white extends slightly on the cheeks and there is a tendency to a white ring round the eye. The tail is about equal in length to the body and moderately bushy; the hairs are jet-black, annulated with fulvous, and ending in a fulvous tip.

The skull in its general shape is rather short and stout; the rostrum tapering and short. The auditory bullæ are moderately long and laterally flattened. It most nearly

resembles the skull of *Sc. Finlaysoni*, but is much smaller; the rostrum is narrower and the brain-case rather rounder and broader.

Dimensions (in flesh):—Head and body 190 millim.; tail 170; hind foot 42; ear 18.

Skull: tip of nasals to occipital ridge 44; hensenion to hinder margin of palate 19; zygomatic breadth 28; breadth of skull immediately behind roots of zygoma 23; breadth at postorbital constriction 17; length of nasals 13; greatest breadth of nasals, ant. 7, post. 4; length of tooth-series 10.

*Hab.* Klong Morn, near Bangkok, Siam.

*Type* B.M. 99. 2. 7. 1, ♀ ad. 13th August, 1898. Collected by Mr. S. S. Flower.

The affinities of this species are not very clear. It does not resemble any of the hitherto described forms. The skull seems to approach that of *S. Finlaysoni* more closely perhaps than that of other species, while from the general external appearance it appears to be more closely related to *S. erythreus*. Further material is, however, necessary before pronouncing a definite opinion.

The other species comes from Java, and for it I propose the name

*Sciurus Andrewsii*, sp. n.

General colour of the upper parts, including the top of the head and outer sides of the limbs, black, profusely grizzled with fulvous (buff-yellow, Ridg.\*). Each hair is very dark grey at the base, shading to black at the tip, having several fulvous annulations, which greatly predominate over the darker colour. The cheeks and face are of a very pale grizzled fulvous, each hair having a dark base and a fulvous tip; on the chin and underside of the neck the fulvous tip becomes gradually lighter, until its colour is pale greyish white. This colour extends over the underparts, inner sides of the limbs, and surface of the feet. There is a fair-sized patch of pale orange (orange-buff, Ridg.) at the base of each limb. At the base of the hind limbs these patches join in the middle line and spread backwards to the root of the tail. There is a very short but distinct stripe of pale buff (buff-yellow, Ridg.) running along either side between the limbs, and this is succeeded below by a still shorter stripe the colour of the back. The ears are precisely similar in colour to the back. The tail is short, bushy, and distichous; in colour it resembles

\* Ridgway, 'Nomenclature of Colours.'



the back, except that the annulations are broader; the under-side is suffused with yellowish, the tip is black.

The skull is very long and narrow, and although undoubtedly that of a true *Sciurus*, in its restricted sense\*, it shows considerable resemblance to the skull of a *Funambulus*.

In size it is nearly equal to that of *Funambulus Berdmorei*. The nasals are intermediate, and while being flattened as in *Sciurus*, in length and proportions they resemble those of a *Funambulus*. The interorbital region and anterior end of the brain-case is bold, swollen, and rather broad in proportion to the general build of the skull. The postorbital processes are of moderate length and jut outwards more than in *F. Berdmorei*. The zygomata are moderately straight and do not jut out, especially anteriorly, so much as is usually the case in *Sciurus*. The brain-case, which reaches its maximum height at the level of the postorbital processes, falls away rapidly behind. The teeth are of the ordinary Sciurine form and the auditory bullæ rather small.

Dimensions (from flesh):—Head and body 178 millim.; tail 172; hind foot 40.

Skull: greatest length 50; basal length 38; palatal length 20·5; zygomatic breadth 27; interorbital breadth 15·5; length of nasals 15; breadth of nasals, ant. 6·7, post. 4.

*Hab.* Tjigombong, Java.

*Type* B.M. 99. 8. 6. 49. Tjigombong, Java, 28th June, 1897. Collected by Mr. C. W. Andrews.

The skull of this species is so distinct as to prevent any confusion with the existing species. Its nearest ally is most probably *S. notatus*, but its grey feet, the colour of the underparts, and the patches of colour at the base of the limbs render its identification a matter of no difficulty.

LVII.—*Description of a new Hexactinellid Sponge from South Africa.* By R. KIRKPATRICK, Assistant in the British Museum (Natural History).

[Plate VIII.]

THE two specimens described below, which represent a new species of the Rossellid genus *Rhabdocalyptus*, were sent to the Museum by Dr. J. D. F. Gilchrist, of the Department of Agriculture, Cape Town, who obtained them by dredging

\* Thos. P. Z. S. 1897, p. 933.

from depths of 140 and 154 fathoms, about 70 miles north of Lion's Head, South Africa.

Family **Rossellidæ**.

Subfamily *ACANTHASCINÆ*, F. E. Schulze, [1] p. 348.

Genus *RHABDOCALYPTUS*, F. E. Schulze, [2] p. 155.

*Rhabdocalyptus lophodigitatus*, sp. n. (Pl. VIII.)

Sponge in form of a thick-walled subglobular cup, from the base of which proceed solid digitate processes provided with tufts of basalia, forming in the fully grown condition a dense root-tuft; tufts of basalia also originating from the general basal surface of the sponge. Outer surface provided with small conical papillæ, from which bundles of pentact pleuralia project radially, the paratangential rays of the spicules forming a veil about 1.5 centim. from the surface. Orifice subcircular, with thin naked edge. Cavity of cup shallow, with smooth walls, and with very large openings at the lower part leading into wide cavernous efferent canals.

*Skeleton*.—*Parenchymalia* long diacts, wholly smooth or roughened towards the ends, the more slender in bundles and the thicker isolated, those in the digitate basal processes being stouter and more spinous than those in the body-wall.

*Autodermalia* finely spined diacts, 600–1000  $\mu \times 10$ –15  $\mu$ , often with two or four central knobs.

*Hypodermalia* oxypentacts with the paratangential rays paratropal, the two external often forming an angle of 180°, more or less curved, smooth, or finely shagreened, or shagreened and provided with irregularly distributed thorns, sharp in young, but blunt and occasionally branched in older spicules.

*Basalia* long oxypentacts with short orthotropal or paratropal paratangentials, slightly curved, shagreened, and occasionally with small spines; the outer end of the proximal ray often shagreened. Diact basalia apparently absent.

*Autogastralia* spinous diacts similar to the autodermalia.

*Microscleres*.—1. Discocasters: *a*, large kind, 130–160  $\mu$  in diameter, knobbed centrum 12–14  $\mu$ , principal rays 18  $\mu$ , terminal rays 48–60  $\mu$ .

Principal rays appearing to split up by fission at different levels into 6–8 terminal rays, the latter being slightly curved and divergent, and provided with fine spines pointing backwards and a 4- to 8-toothed disk.

*b*, small kind, 60  $\mu$  in diameter, with secondary rays more divergent than in the large discocasters.

2. Oxyhexasters, 90–100  $\mu$  in diameter, with usually bifurcate, but occasionally single, roughened rays.

Of the two specimens, the smaller, which is almost globular, has only a slightly developed root-tuft; the larger has several long digitate processes about 9 centim. long by 1 centim. thick, provided with tufts of long pentact basalia, forming a dense root-tuft. The total length of the large specimen is 23 centim., the breadth at the base 18 centim., length of body 13 centim., of root-tuft 10 centim.; diameter of orifice 7  $\times$  6 centim.; depth of gastral cavity about 6 centim. It should be remarked that the specimens have probably been considerably distorted by compression, as the outer veil is only intact over a small area of the smaller specimen.

The dimensions of the smaller specimen are:—Length 13 centim., with three digitate processes 2.5 centim. in length; breadth 13 centim.; orifice 4 centim.; depth of gastral cavity about 4 centim.

Diact basalia are apparently absent, though very numerous long spicules occur which are broken at the end. All the young complete spicules are pentactine, and I have been unable to find among them any diacts. In addition to the shape of the sponge and the fissile character of the principal rays of the discocasters, the occurrence of spined diacts in the gastral membrane characterizes the new species; in all of the eight previously described species, [3] p. 105, of this genus the autogastralia are hexactine or hexactine and pentactine. In a species of a closely allied genus, *Staurocalyptus pleorhophides*, Ijima, [4] p. 58, both the dermal and gastral membranes are supported by spinous diactines.

*Locality.* Large specimen, 73 miles north and 28 miles east of Lion's Head, 140 fath., Cape Colony: small specimen, 63 miles north and 34 miles east of Lion's Head, 154 fath. Both specimens obtained by shrimp-trawl.

[1] SCHULZE, F. E. "Revision des Systems der Asconematiden und Rosselliden," Sitzungsab. Akad. Wiss. Berlin, 1897.

[2] ——. 'Challenger' Hexactinellida, 1887, p. 155.

[3] ——. 'Amerikanische Hexactinelliden nach dem Materiale der Albatross-Expedition,' 1899.

[4] IJIMA, I. "Revision of Hexactinellids with Discocasters, with Descriptions of Five new Species," Annotationes zoologicae Japonenses, 1897, vol. i.

#### EXPLANATION OF PLATE VIII.

Fig. 1. *Rhabdocalyptus lophodigitatus*, sp. n., large specimen, reduced to one third natural size. The figure has been slightly idealized, in order to show the gastral orifice, the basal digitate processes,

and veil of pentacts, the two former features not being so plainly visible from one and the same aspect.

*Fig. 2.* Pentactine spicule (pleural prostalia),  $\times 68$ .

*Fig. 3.* Autogastral diaect,  $\times 225$ .

*Fig. 4.* Large discocaster,  $\times 300$ .

*Fig. 5.* Small discocaster,  $\times 300$ .

*Fig. 6.* Oxyhexaster,  $\times 300$ .

LVIII.—*On a new Genus and Species of Vespertilionine Bat from East Africa.* By OLDFIELD THOMAS.

HARDLY had my description of *Scotæcus Hindei*\* been published than the Museum received from Dr. Hinde a second new bat, so distinct from all previously known as to require the formation of a new genus for its reception.

It is the analogue of the South-American *Histiotus* in Africa, and may be called by a name having a similar meaning to that word—

LÆPHOTIS †, gen. nov.

Most nearly allied to *Vespertilio*, but the ear and tragus enlarged as in *Histiotus*.

Skull, as compared with that of the allied form, long and narrow, flattened above, very smooth and little ridged, the crests scarcely perceptible. Palate narrow, its posterior part unusually produced backward. Bullæ rather large.

Dental formula as in *Vespertilio*.

Upper incisors close to canines, instead of being well separated from them, the tip of the lower canine biting on to the top of, or outside, the outer incisor, instead of between it and the upper canine. In correlation with this the lower canine is unusually short and feeble, its length from cingulum to tip not exceeding the outer horizontal length of *m*.<sup>1</sup>. Detailed proportions of teeth as described below.

*Type* and only species

*Læphotis Wintoni*, sp. n.

Size rather less than in *Histiotus velatus*; general appearance very much as in that species, although the ears are not so large. Fur close and fine, the hairs of the back about 6–7 millim. in length. General colour above coppery brown, the basal halves of the hairs sooty, the terminal halves clear

\* Ann. & Mag. Nat. Hist. (7) vii. p. 263 (1901).

† λαιφος, a sail.

coppery or cinnamon (Dr. Hinde speaks of the colour as "bronze"). Under surface paler brown, the tips of the hairs becoming almost white in the pubic region.

Fur above not extending on to arms or wing-membranes, though there are a few fine hairs on the thumbs; but the legs are clothed as far as the knee, the backs of the feet are finely hairy, and the basal half of the interfemoral is thinly covered with fine and inconspicuous hairs. Below the wing-membranes are finely clothed nearly as far outwards as a line from the elbow to the knee, but the interfemoral membrane is more nearly naked than above. No trace of an interfemoral fringe.

Ears large, much larger than in *Vespertilio*, but not so large as in *Plecotus*, *Otonycteris*, or *Histiotus*; not connected across the forehead with each other. Inner margin with a distinct basal fold, ending below in a narrow lobe; its basal third is strongly convex forward, so that the basal line is at right angles to the upper two thirds, which are very slightly convex and pass gradually into the rounded tip; outer margin nearly straight above, slightly convex below; antitragus low, half-oval, marked by a distinct notch behind. Tragus unfortunately damaged in the type on both sides, but enough is left to show that it is long, broad at base, with a slightly concave inner margin and a broadly rounded tip.

Wings of normal Vespertilionine proportions, the metacarpals of the third, fourth, and fifth digits approximately equal in length. Insertion of wing-membrane at base of the digits, so far as can be made out in the dry skin. Calcars reaching about halfway towards the tip of the tail; post-calcaneal lobule present, but very narrow. Tip of fourth finger T-shaped, or even slightly spatulate. Membranes and ears uniformly brownish grey, except that the wing-membrane from the tip of the fifth finger to the ankle is edged with whitish.

Skull very thin and papery, long and narrow, low, smooth, and scarcely ridged at all. Nasal notch comparatively shallow. Intertemporal region not strongly constricted, the intertemporal but little less than the interorbital breadth. Palatal notch penetrating to the level of the middle of the canines. Palate narrow, the greatest breadth across the outer corners of  $m.^2$  going nearly three times in the total length of the skull; its posterior part produced behind the molars a distance equal to the combined lengths of  $p.^4$  and  $m.^1$ .

Upper incisors slightly convergent, of about the same relative proportions as in the Serotine, the inner one long, with a secondary postero-external cusp near its tip and a small

postero-internal cingular cusp at its base; outer incisor quite small, its main cusp about half the height of the inner incisor, also with a small internal basal cusp. Large premolar pressed close up against the back of the canine; last upper molar triangular, with a well-developed posterior lobe, in correspondence with which the talon of the last lower molar is large and tricuspid. Lower incisors trifid, overlapping; anterior lower premolar about one half the height and one fourth the area in cross-section of the posterior one.

Dimensions of the type (measured in skin):—

Forearm 37 millim.

Head and body (approximate) 50; ear (dry and no doubt contracted) 21; tragus, length on inner edge 6·3, breadth basally 3·5; metacarpus of third finger 35; first phalanx 13; tibia 13·5; hind foot, s. u. 7, c. u. 7·7; calcar (c.) 15.

Skull: greatest length 15·7; basipalatal length in middle line 12·8; interorbital breadth 5; intertemporal breadth 3·6; breadth of brain-case 7·8; palate length 6·6. Front of lower canine to back of  $m_3$  5·6.

*Hab.* Kitui, British East Africa. Altitude about 3500 feet.

*Type.* Male. Original number 64. Collected 7th January, 1901, by Dr. S. L. Hinde.

I have ventured to name this interesting bat in honour of my friend Mr. W. E. de Winton, to whose labours on the small mammals of Africa all naturalists, and I especially, have been so constantly indebted for assistance.

In working out *Læphotis* I have had occasion to investigate the question as to the generic separation of the Serotine group from the other species of *Vespertilio*, as advocated in Prof. Méhely's admirable work on the bats of Hungary. No doubt the species examined by him, *V. murinus* and *Nilssoni* on the one hand and *V. serotinus* on the other, are fairly far apart; but in my opinion the exotic species seem to render the separation of "*Eptesicus*" from the rest quite impossible, such species as *V. megalurus*, *Innesi*, *capensis*, and *minutus* by no means falling naturally into one or other of the two groups. The characters drawn by Prof. Méhely from the cranial crests, the shape of the tragus, and the insertion of the wing-membranes do not by any means run parallel throughout the series, and I am convinced that it is better for the present not to recognize *Eptesicus* as distinct from *Vespertilio*.

LIX.—*New Genera and Species of Eastern and Australian Moths.* By Colonel C. SWINHOE, M.A., F.L.S., &c.Family **Boarmiidae**.Subfam. *ABRAXINÆ*.*Abraxas latifasciata*, nov.

♀. Wings above and below black, with a very broad white medial band, not quite touching the costa on either wing, constricted in the middle in the fore wings, broader and nearly of even breadth throughout in the hind wings; head and body black, with yellow markings, as in the allied forms of *A. munda*, Walker.

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

Fergusson Island.

Nearest to *A. (Craspedosis) sibilla*, Warren, Nov. Zool. vi. p. 345, from Halmahera, and to some of the forms of *munda*, Walker; these do not belong to the genus *Craspedosis*, but come into the *Potera* group of the genus *Abraxas*; there is no fovea in the male, as in *Craspedosis* proper.

Family **Limacodidae**.*Susica sinensis*.

*Tadema sinensis*, Walker, vii. p. 1759 (1856).

The type came from Shanghai and is a male. I have both sexes from Sarawak, and as the female has been hitherto unknown, I describe it.

♀. Of a uniform glossy ochreous fawn-colour: fore wings sparsely irrorated with black atoms; a brown spot at the end of cell; indications of interior and exterior bands, the latter containing a brown faint patch in the middle of the disc: hind wings slightly paler and without markings; cilia of both wings dark brown, with pale basal line: underside coloured like the upperside; wings without gloss; both wings covered with black irrorations; cilia concolorous with the wings.

Expanse of wings  $1\frac{8}{10}$  inch.

*Thosea bhaga*, nov.

♂. Top of head and band behind collar yellow, as is also the abdominal tuft, the rest of the body dark red-brown: fore wings pale red-brown, the basal third dark brown like

the body, the outer edge nearly straight and pale; a small patch of dark brown on outer margin below apex: hind wings paler than the fore wings and without markings; cilia of both wings concolorous with the wings, with a whitish basal line: underside pale uniform reddish grey, without markings.

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

Sarawak, Borneo.

*Contheyla chara*, nov.

♂. Antennæ, palpi, head, and abdomen ochreous red; thorax and fore wings dull dark red; a large yellowish-white apical space with a rounded inner margin, with some slight reddish suffusion inside it in some examples, in others it is quite clear; in some examples the dull red surface of the fore wings is without any markings, but generally there is a brown discal spot and some brown blotches and indications of a brown, outwardly curved, discal fascia: the hind wings vary from ochreous grey to pale brown, without markings; cilia of both wings ochreous white: underside, body and legs ochreous red; wings nearly white, unmarked.

Expanse of wings  $\frac{8}{10}$  inch.

Sarawak, Borneo.

In the B. M. there are several examples of this species unnamed—two from Singapore, one from Kuching, one from S.E. Borneo, and two from Sandakan; one of these examples has a blackish-brown patch on costa of fore wings on the inner side of the whitish apical spot, this patch occupying the upper half of the wing, and from it two brown lines run down to the hinder margin of the wing, one before the middle and the other at the angle.

*Miresa sola*, nov.

♂. Chocolate-brown: fore wing with a space at the base of a golden tinge, limited by a dull pale line from the middle of the costa to the hinder angle, where it joins a brown sub-marginal band which throws shoots out to the margin, the band and shoots also being tinged with golden; cell-spot brown: hind wings dark brown; frons and head orange: underside of a uniform dark chocolate-brown, without markings.

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

Sarawak, Borneo.

There are two examples from Borneo in the B. M. mixed up with *M. scotopipla*, Hmps., from Sikkim (Limacodidæ, drawer no. 6), and another under the genus *Belippa* in



drawer no. 18; it is, however, differently shaped, and has an orange instead of brown head, and the markings are of an entirely different character.

*Narosa concinna*, nov.

♂. Greyish orange; palpi black at the sides; frons and a stripe behind the collar white; thorax red, with white stripes: fore wing with the costal and cell portions mostly yellowish white, the lower portion of the wing with many sinuous and outwardly curved short red bands, with yellowish-white bands between them; outer third of the wing with the veins red and prominent, intersected by a pale band which curves inwards and makes two red bands on the upper disc: hind wings yellowish white without markings: underside ochreous grey, with the veins pale and distinct, the hind wings slightly the paler.

Expanse of wings 1 inch.

Sarawak, Borneo.

Allied to *N. conspersa*, Walker.

Family Lymantriidæ.

*Euproctis flavociliata*, nov.

♀. Head and collar dull ochreous; thorax brown, with some ochreous hairs in front and at the sides: fore wings purplish brown, with an ochreous tinge, the ground-colour being ochreous, thickly irrorated with minute purple-brown atoms: hind wings purplish brown without the ochreous tinge, consequently rather darker and duller in colour; both wings without any markings; cilia long and bright ochreous; abdomen brown, abdominal tuft ochreous white, silky: underside with the pectus and legs ochreous; body and wings of a uniform purple-brown, except for some ochreous hairs at the base; costal line of fore wings and cilia of both wings ochreous.

Expanse of wings 2 inches.

Perak.

Allied to *E. conspersa*, Felder, but browner and with the irrorations very minute, and not coarse and black as in that species, the fringes distinctly yellow, which is not the case in *E. conspersa*.

Family Arctiidæ.

Subfamily ARCTIINÆ.

*Rhodogastria fumida*, nov.

♂. Palpi crimson; antennæ brown, crimson at the base;

frons, head, and thorax white, tinged with crimson; abdomen crimson, without markings; a black spot on the head and one on each tegula: wings pale smoky brown; fore wings with a white hyaline streak nearly filling outer upper half of cell, a white hyaline band beyond, divided into three by the veins, the lowest spot the largest: hind wings with some whitish scales on basal half of costa, and also some in the cell: underside with the colour of the wings paler; fore wings with markings as above; hind wings with the entire cell whitish; body and legs crimson; abdomen with some black spots on the sides.

Expanse of wings 2 inches.

Gilolo (*Doherty*).

#### Subfamily NYCTEMERINÆ.

##### *Nyctemera onetha*, nov.

♂ ♀. Frons ochreous; thorax black, with white stripes; abdomen black, with white segmental bands and ochreous tuft; head black: fore wings black, a white club-shaped stripe from the base, commencing very narrowly, then broadening out and extending to the middle of the wing, with a dent in its otherwise rounded end, its upperside running along the costal vein, its lower a little above the hinder margin of the wing, a small white spot just above the end of the stripe; a broad distorted white discal band, not touching either costa or hinder angle, slightly irregularly sinuous on its outer side, indented in three places on the inner side, deeply so in the middle; a short white line on the hinder margin at the base: hind wings white, with the usual broad black marginal border, its inner margin somewhat sinuous and excavated in the middle: underside, legs black above, ochreous beneath; thorax black, with ochreous bands; abdomen black beneath, with ochreous bands, bright ochreous at the sides, with black spots.

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

New Britain.

Differs from *N. crescens*, Walk. = *N. luctuosum*, Voll., in the basal stripe not having irregular margins and in the absence of the basal white streak on the basal half of the hinder margin.

#### Subfamily LITHOSIINÆ.

##### Genus MONOSYNTAXIS, nom. nov.

*Monotaxis*, Hmps. Cat. Lep. Phal. B. M. ii. p. 181 (1900) (præocc.).

*Monosyntaxis trimaculata.**Monotaxis trimaculata*, Hmps. l. c. p. 182.

Perak.

Hampson's type came from Borneo; his generic name must go, because it has been used by Hulst for a North-American Geometer in the 'Canadian Entomologist,' vol. xxx. p. 120 (1898).

*Pseudoblabe ? dona*, nov.

♂. Head and thorax ochreous; abdomen ochreous grey; fore wing purplish brown, a yellow space at the base, a yellow angular space at middle of costa, and apical margin yellow; hind wings with the basal half whitish, the outer half purplish brown: underside as above, but paler; body and legs yellow.

Expanse of wings  $\frac{7}{16}$  inch.

Coomoo, Queensland.

Somewhat resembling *P. oophora*, Zeller.*Pseudoblabe ? nigrisquamata*, nov.

♂. Head and thorax ochreous: wings above ochreous grey, uniform in colour and without markings, the outer ends of the veins prominent through want of scaling: underside paler, a black smear beneath the basal half of costa of fore wings; a very broad grey marginal band on both wings, with well-defined and even inner edge occupying nearly half the wings; legs and body dull yellow.

Expanse of wings  $\frac{7}{10}$  inch.

Coomoo, Queensland.

*Lyclene obliquilinea*, nov.

♂ ♀. Head, body, and fore wings rather bright yellow; palpi outwardly edged with black; fore legs with black bands: fore wings with blackish-brown bands, two irregular outwardly curved interior lines and a basal spot, middle line outwardly oblique, nearly straight from costa to near hinder margin, where it curves inwards, then outwards on to the margin, discal line also outwardly oblique, corresponding to the very oblique outer margin, and entirely composed of very acute angles, with the spear-points outwards, the centre one longer than the rest and coming close to the submarginal row of spots, which seem to be broken continuations of the points: hind wings nearly white, without markings.

Expanse of wings 1 inch.

Jaintia Hills, Assam.

Intermediate between *L. undulosa*, Walker, from India, and *L. cuneigera*, Walker, from Borneo; the outwardly oblique median line is characteristic and as oblique as in *L. inconspicua*, Moore; but the other markings of that species are quite different.

*Lyclene eldola*, nov.

♂. Pale yellow, with a slight ochreous tinge; palpi black; head and thorax more ochreous than the wings: fore wings with five transverse brown bands, all more or less sinuous, first basal, second and third bent toward each other in the centre and almost connected, their ends curved inwards on the hinder margin, fourth recurved outwards above the middle; a prominent brown spot in the upper disc between the third and fourth bands; fifth band submarginal, acutely angled twice into spear-shaped marks with their points close to the outer margin; in one example there is some brown suffusion between the third and fourth bands: hind wings nearly white, without markings.

Expanse of wings  $\frac{8}{10}$  inch.

Coomoo, Queensland.

Allied to *L. senara*, Moore, from Java, also to *L. flavida*, Butler, from the Solomons.

*Mittochrista sullia*, nov.

♂. Head, thorax, and fore wings bright ochreous yellow, thorax with crimson markings: fore wings with crimson on base of costa and double crimson cross-lines disposed so as to border and enclose two pale purple transverse bands, the first from hinder margin one third from base straight to middle of costa, the other from hinder margin one third from the angle to near costa before apex, where it is broken, and the division also banded with crimson, as is also the outer half of costa and the outer margin; between the latter and the outer purple band are some crimson streaks, and there is a crimson angle on middle of hinder margin; these markings are so disposed as to leave a clear diamond-shaped space a little beyond the middle of the wing, in the centre of which is a crimson spot; abdomen and hind wings pale yellow: underside, fore wings uniform pale crimson, with a dark cell-spot; hind wings and legs yellow, fore and mid legs with crimson bands.

Expanse of wings  $\frac{7}{10}$  inch.

Sarawak, Borneo.

Somewhat resembling *M. chypsilon*, Semper, from the Philippines, but quite distinct.

## Family Cossidæ.

*Arbela disciplaga*, nov.

♂ ♀. Antennæ yellowish; head, thorax, and fore wings greyish white; thorax with some dark red spots: fore wings irrorated with red and reddish-grey atoms, forming many indistinct transverse bands, an elongated dark red spot at the base, and another in the upper disc, its inner edge lobed: hind wings and abdomen pure white. The female only differs from the male in its larger size and in the absence of the basal spot.

Expanse of wings, ♂  $\frac{8}{10}$ , ♀  $1\frac{2}{10}$  inch.

Sarawak, Borneo. ♂ type in B.M.

Singapore. ♀ type in B.M.

I have a male in poor condition from Singapore identical with the male from Sarawak.

## Family Hepialidæ.

*Phassus sericeus*, nov.

♂. Head and body brown: fore wings pale chocolate-grey, costa marked throughout with chocolate-brown spots in pairs; a white dot at the end of the cell; a broad brown patch which fills the cell is excavated above, leaving a pale space below the costa, and is diffusely extended hindwards below vein 2; two brown macular bands before the outer margin, meeting together on the hinder margin before the angle: hind wings grey, without markings: underside grey, without markings, except for a few brown spots in the middle of the costa of the fore wings.

Expanse of wings  $2\frac{5}{10}$  inches.

Malang, Java.

Closely allied to *P. sinensis*, Moore, from China, but can be distinguished by the absence of the short white streak on the inner side of the white cell-spot and by the absence of the white spot near base of cell.

## Family Acontiidæ.

## Genus COPHANTA, Walker.

*Cophanta*, Walker, xxx. 964 (1864).

*Toxophleps*, Hmps. Ill. Het. B. M. ix. p. 124 (1893).

*Cophanta funestalis*.

*Cophanta funestalis*, Walker, l. c.

Sarawak.

*Cophanta optiva.*

*Tarache optiva*, Swinh. Trans. Ent. Soc. 1890, p. 224.

*Toxophleps optiva*, Hmps. l. c. pl. clxvii. fig. 26; Moths Ind. ii. p. 307.

Rangoon, Ceylon, Calcutta, Deesa.

The two species are similarly coloured, but there are no markings apparent in the freshest of specimens of *funestalis*, but they are undoubtedly congeneric. *Toxophleps* might stand as a subgeneric name for *trilutalis*, Walker, which Sir George Hampson has put into his second section—vein 10 of fore wings present, and 7, 8, and 9 not distorted.

*Xanthoptera nicea*, nov.

♂ ♀. Pinkish grey, irrorated in parts with brown atoms; palpi dark brown at the sides: fore wings with the orbicular small, reniform very large and ear-shaped, both ringed with brown; costa with many brown patches, like the commencement of bands, which in some specimens are more or less indicated across the wings; a discal duplex pale sinuous line, rather close to the margin, the apical space pale, and a pale band running down the outer side of the duplex line; in some examples this band is dark, in one example the lower outer space and the whole lower area of the wing is dark pink-brown: hind wings pink-brown, without markings; cilia of both wings ochreous, on the fore wings with brown patches: underside ochreous grey, shining; hind wings with a brown cell-spot and thin brown discal band. The female differs from the male in the only two specimens I possess in being darker and in having a large blackish-brown patch which occupies two thirds of the costal portion and is limited outwardly by the duplex discal line.

Expanse of wings  $1\frac{3}{10}$  inch.

Port Blair, Andaman Islands, and one example from the Great Nikobars.

Very variable in shades of colour, hardly two specimens being alike.

*Xanthoptera rectivitta.*

*Orthosia rectivitta*, Moore, P. Z. S. 1881, p. 353.

*Polydesma rectivitta*, Hmps. Moths Ind. ii. p. 469 (1894).

The type came from Darjiling and is a female. I have now both sexes; the male proves it to be an Acontid of the genus *Xanthoptera*; it does not differ from the female in colour or markings, but the outer margin of the fore wings is prominently crenulate.

Expanse of wings  $1\frac{8}{10}$  inch.

Jaintia Hills.

*Metachrostis cœnia*, nov.

♀. Palpi ochreous, brown above; head, body, and wings greyish white, irrorated with grey; a broad antemedial transverse band, elbowed outwardly in the middle, the inner part of the wing suffused in parts with grey, as is also the lower part of the band; a thin white discal band, sinuous and outwardly curved, a white submarginal band even with the margin; a large blackish patch, which on the costa extends from the inner band to the apex, is angled downwards to the elbow of the inner band, and is continued as a narrow and paler-coloured band to the hinder margin running alongside the white band; two spear-shaped black submarginal streaks below the middle: hind wings greyish white, with some grey irrorations on the outer and abdominal margins, a brown spot at end of cell: underside greyish white; fore wings with the inner and outer areas grey; hind wings with a brown cell-spot, a grey sinuous discal line, and marginal grey irrorations.

Expanse of wings 1 inch.

Jaintia Hills.

There is a female of this species from the Khasia Hills and another from Sikkim unnamed in the B. M. (Trifidæ, drawer no. 206).

*Rivula everta*, nov.

♂. Head, body, and fore wings dark ochreous; two white spots, each with a black dot in it, at end of cell; antemedial and discal rows of small white spots, the last curving outwards towards apex; several white spots on costal margin and a row of them on the outer margin: hind wings paler, whitish towards base: underside, body, and legs uniform ochreous, without markings.

Expanse of wings  $\frac{7}{10}$  inch.

Coomoo, Queensland.

The body is more robust than is usual in this genus.

*Eublemma nigridiscata*, nov.

♂. Grey, very thinly irrorated with reddish-grey atoms: fore wings with the costa dark grey; a broad brownish-grey middle band, limited on its inner side by a blackish edge or thin band running from hinder margin before the middle to the median vein, and on its outer side by a thin blackish band edged outwardly with white from the hinder margin beyond the middle to the costa one third from apex; orbicular represented by a minute black dot, and the reniform, which is well within the band, by a black cruciform spot: hind wings

without markings, except for a grey lunular mark at the end of cell: underside grey, uniform in colour, with dark grey cell-spots on all the wings.

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

Coomoo, Queensland.

*Eublemma demba*, nov.

♂. Palpi, head, thorax, and fore wings white, the latter tinged with grey in parts and with four indistinct ochreous-grey transverse bands, the first basal; all the bands most apparent on the costa, except the discal band, which is complete and is angled outwardly in its centre; a prominent dark blackish-brown patch on the outer margin at the apex: hind wings white, with indications (very faint) of two grey transverse bands; cilia of both wings pure white: underside white; fore wings suffused in parts with grey; hind wings with the grey bands more distinct.

Expanse of wings  $\frac{7}{16}$  inch.

Sarawak, Borneo.

*Eublemma radila*, nov.

♂ ♀. Dull red, with a slight pinkish tinge, very uniform in colour, irrorated with brownish-red atoms: fore wings with a brown spot in the cell, a lunule at the end, bands thin and indistinct, slightly darker than the ground colour, indications of one near the base, another from centre of hinder margin straight to beyond end of cell, then acutely angled inwards to the costa a little beyond the middle; indications of another similar band close to it, but continued further towards apex, and bent round on to the costa about one fourth from apex; indications of a double row of discal points on both wings and of a double band in centre of hind wings: underside paler, more red; black spot in cell on fore wings, another at the end; a cell-lunule on hind wings, medial and discal bands on both wings.

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

Sarawak, Borneo.

*Cerynea morma*, nov.

♂ ♀. Palpi, head, collar, fore part of thorax, and abdomen (except first segment) dark purple-chocolate, remainder of thorax and first segment of abdomen ochreous yellow, corresponding to a broad ochreous-yellow stripe across the fore wings, occupying nearly half the upper portion, gradually widening from the apex, with its inner side quite straight



and even, and extending across the base of the hind wings; the remaining portion of both the wings is dark chocolate, the ochreous band is slightly irrorated in parts with fine chocolate-brown irrorations, more so in some examples than in others; on the fore wings there is an ochreous, slightly sinuous, duplex line or thin band from the hinder margin one third from the hinder angle up to the apex of the wing, an indistinct somewhat similar submarginal band, and some pale markings between the two bands and some pale dots on the costa: hind wing with very indistinct antemedial and submarginal sinuous lines, marked outwardly here and there with ochreous; cilia of both wings ochreous, with brown patches: underside uniform chocolate-brown, with ochreous dots on costa of fore wings.

Expanse of wings  $\frac{7}{10}$  inch.

Sarawak, Borneo.

Very similar in appearance to *Cerynea semilux*, Walker, but is easily distinguishable by the transverse discal duplex ochreous band.

This is the species referred to by Herr Semper in Schmett. Philipp. Het. p. 524 (1900), from Luzon, an example of which he was good enough to send me for examination.

*Oruza astona*, nov.

♂ ♀. Ochreous grey, with very minute ochreous-brown irrorations: fore wings with a longitudinal row of four black spots in the middle, some black dots on costa near apex, submarginal and marginal rows of black lunular spots on a darker ground, and a dark short apical streak: hind wings with a dark cell-spot; a medial transverse, white, narrow, and even band, thickly edged with dark brown on the inner side, the brown edging slight on the outer side; submarginal and marginal black lunules, a largish brown spot in upper portion of the space below the middle band, the remaining portion filled in with indistinct grey markings: on the underside the hind wings are mostly white; two black spots in middle of fore wing; medial and submarginal blackish bands on hind wing, the first being continued a short distance near hinder angle of fore wing; lunule at end of cell and marginal black points.

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

Sarawak, Borneo.

Allied to *O. hydrocampata*, Guen., but is at once distinguishable by the longitudinal row of four black spots on the fore wing.

[To be continued.]

LX.—*A List of Californian Diatoms.*  
By C. MERESCHKOWSKY.

[Continued from p. 300.]

101. *Nitzschia angularis*, W. Sm. Santa Monica, amongst *Macrocystis*, not rare. [M.]  
 105. *Nitzschia bilobata*, W. Sm. Santa Monica, amongst *Macrocystis*, not rare. [M.]  
 106. *Nitzschia circumsuta* (Bail.), Grun. San Pedro, marine, rather rare. [M.]

Length: 0·252 0·311

Breadth: 0·070 0·069

107. *Nitzschia distans*, Greg. San Pedro; Santa Monica, amongst *Macrocystis*, not rare; Northern California, rare. [M.]  
 108. *Nitzschia fraudulenta*, Cl. San Pedro, rare. [M.]  
 I have seen only one short chain composed of four individuals united by their ends. Length 0·035 mm. Endochrome composed of two plates.  
 109. *Nitzschia granulata*, Grun. San Pedro, rather common. [M.]  
 110. *Nitzschia incolor*, Mer. San Pedro, very common. [M.]  
 This species, which I have described in my paper on the Diatoms of the Black Sea, is remarkable for the complete absence of chromatophores, of which there is not the slightest trace, the frustules being absolutely colourless. It is also very common in the Mediterranean Sea (Villefranche).  
 111. *Nitzschia insignis*, var. *Smithii*, Ralfs. Santa Monica, amongst *Macrocystis*; Northern California, not rare. [M.]  
 112. *Nitzschia obtusa*, var. *scalpelliformis*, Grun. San Pedro, not common. [M.]  
 113. *Nitzschia palea*, var. *subtilis*, Grun. San Pedro, rather rare. [M.]  
 114. *Nitzschia paradoxa* (Gmel.), Grun. San Pedro, common. [M.]  
 115. *Nitzschia sigma*, var. *intercedens*, Grun. Santa Monica, marine, not rare. [M.]

Length 0·262 mm. Usually to be found in brackish water.

116. *Nitzschia spathulata*, var. *hyalina*, Greg. San Pedro, not common. [M.]

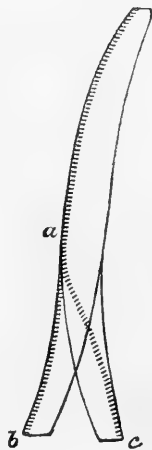
Length 0.043 mm. Endochrome composed of two plates.

117. *Nitzschia spiralis*, sp. n. (Pl. V. figs. 18-20.) San Pedro, rather rare. [M.]

Valve narrow, linear lanceolate, with rounded ends; girdle-face narrow, linear, slightly attenuated towards the ends; carinal dots elongated, not accompanied by lines, 9 in 0.01 mm. Frustule arcuate and twisted near one of the ends, where the keels cross one another, passing from one side of the frustule to the other. Length 0.140-0.175 mm., breadth of the girdle-face 0.007-0.008 mm.

This curious form has a very different appearance according to the position of the frustule, as can be seen from the three figures, 18-20, representing the same individual—fig. 18 showing it in an almost quite horizontal position, fig. 19 when slightly turned around its axis to the left, and fig. 20 when still more turned in the same direction. In fig. 19 the upper end is elevated and the lower turned down; in fig. 20 the lower end is horizontal, while the upper one is turned upwards.

The structure of this diatom can be easily understood if we imagine a frustule having the form of *Nitzschia sigma*, in which one end (the inferior) has been twisted to the right side at an angle of about  $180^{\circ}$ : the accompanying diagram shows how by such a process a frustule of *N. spiralis* would be formed; and as a consequence of this the lower part of the left keel *ab* would change its place from the left to the right side of the frustule (*ac*), while the other keel on the opposite side of the frustule would naturally take the opposite place, thus producing a crossing of both keels. The upper end is also slightly twisted, but in a much less degree than the lower one. The endochrome seems to be composed of six granules; but this requires further examination, as the material was not in a very fresh condition.



118. *Nitzschella Lorenziana* (var. *incurva?*), Grun. San Pedro, rather rare. [M.]

119. *Nitzschiella longissima* (Bréb.), Ralfs. San Pedro, not very common. [M.]

120. *Nitzschiella biplacata*, var. *pacifica*, nov. var. (Pl. IV. figs. 15-17.) San Pedro, very common. [M.]

In the Black Sea I have repeatedly observed a form greatly resembling *N. longissima*, but much smaller and more delicate, varying in length from 0·060 mm. to 0·175 mm., while *N. longissima* varies from 0·162 to 0·483 mm. The main difference between these two forms consists, however, in the endochrome, which in *N. longissima* is composed of numerous elongated bacilliform granules, while in the small form there are two plates, a difference which shows that they are specifically different. This smaller species, which I have named *N. biplacata*\*, is the same which Van Heurck, not knowing of the difference existing in the endochrome, has mentioned in his treatise on the Diatomaceæ (p. 404) simply as a form (*forma parva*) of *N. longissima*.

In the Pacific I have found a variety of *N. biplacata* which is smaller and has a much broader girdle-face (fig. 16); the latter has a very different appearance from the valve-face (figs. 15, 17). The rostra are usually quite straight, their apices sometimes inflated, sometimes not. Endochrome composed of two plates. While moving the frustule does not turn around its longitudinal axis. Length 0·056-0·098 mm., breadth of the valve 0·006-0·0065 mm., of the girdle-face in the middle 0·0058-0·01 mm. (usually 0·01), at the apices 0·003-0·0055 mm.

121. *Nitzschiella tenuirostris*, Mer. (Pl. IV. figs. 1-3.) San Pedro, common. [M.]

Under the name of *N. closterium* there have been founded a number of forms belonging partly to *N. tenuirostris*, partly to another species (*N. gracilis*, Mer.); and as it is impossible to know what the different authors meant by this name, I proposed in my paper on the Diatoms of the Black Sea a new arrangement of the various forms belonging to this group, in which, in order to avoid confusion, I abandoned the old name *closterium*. Under the name *N. tenuirostris* I understand the following form:—

Valve fusiform, abruptly terminating in long very fine rostra, slightly curved on the same side, the whole frustule being arcuate. Striæ and carinal dots invisible. Girdle-face not differing from the valve-face. Endochrome composed of two plates. General length 0·082-0·180 mm. (usually

\* See my paper on the Diatoms of the Black Sea.

0·120–0·150 mm.), length of the body 0·028–0·042 mm., breadth of the valve 0·003–0·008 mm.

This I consider now as the type species, the var. *genuina*, which I formerly thought to represent the type, having proved to be much rarer.

It is a very delicate, almost membranaceous diatom; the rostra are very fine, flexible, usually slightly inflated at the apices; while moving, the frustule is constantly turning around its longitudinal axis in the same way as in *Cylindrotheca*. The girdle-face does not differ from the valve aspect as it does in *N. gracilis*, *N. biplacata*, *N. acicularis*, *N. longissima*, &c., the rostra being cylindrical, not flattened as in the above-mentioned species, and the inflated lanceolate part of the frustule or "body" being as distinctly separated from the rostra in the valve- as in the girdle-face (compare *a* and *b* in fig. 2). A form with straight rostra can be distinguished from the type species as

**Forma directa.** (Pl. IV. figs. 4, 5.) San Pedro, very common. [M.]

General length 0·098–0·166 mm., length of the body 0·020–0·038 mm., breadth of the valve 0·003–0·0075 mm.

Although I have occasionally seen such forms in other localities (Black Sea, Villefranche), it is only in California (San Pedro) that I have met with it in great abundance, always, however, in company with the type. I do not think it advisable to consider such forms as a variety unless they are found in unmixed assemblages.

122. **Nitzschiella tenuirostris**, var. *parva*, Mer. (Pl. IV. figs. 8–10.) San Pedro, not rare. [M.]

Differs from the type only by its smaller size, being about 0·055 mm. in length.

In my paper on the Diatoms of the Black Sea I did not separate this smaller form from the larger ones which I now consider as the type species, and I would not do it even now, preferring to consider the small forms merely as reduced individuals of the type; but since then I have examined a gathering from Theodosia (Crimea) in which this small form is extremely abundant and in a perfectly pure condition, all the individuals having the same aspect and *never* attaining the size of the type species. This fact compels me (I must confess against my will) to regard it as a distinct variety.

The same form is not rare in San Pedro, although mixed with the larger type species.

A still smaller form, 0·035–0·040 mm. in length, with very short rostra, can be distinguished as

*Forma minutissima.* (Pl. IV. fig. 11.) San Pedro, rather rare. [M.]

The forma *semicircularis* and varietas *arcus*, Mer. (the latter attaining 0·364 mm. in length), belonging to the same group, are mentioned in my paper on the Diatoms of the Black Sea. I have not seen them in the Pacific.

123. *Nitzschiella tenuirostris*, var. *hamulifera*, Mer. (*N. tenuirostris*, var. *genuina*, Mer. Diat. Black Sea). (Pl. IV. figs. 6, 7.) San Pedro, rare. [M.]

Differs by the very thin elongated rostra, which are straight, becoming curved and spirally twisted at the apices only, where they form a hook. General length 0·140–0·194 mm., length of the body 0·045 mm., breadth of the valve 0·006 mm.

This variety is very frequent in some localities of the Black Sea. I have found it also in the Mediterranean (Villefranche). The hooks are not always so distinct as represented in fig. 6.

124. *Nitzschiella gracilis*, Mer. (Pl. IV. figs. 12, 13.) San Pedro, rare. [M.]

This is quite a distinct species, differing from *N. tenuirostris* by the more robust frustule, the rostra being broader, straight, curved in the same direction at the ends only; they are flattened, especially at the apices, which makes them appear broader and more hyaline at the girdle-face. Endochrome composed of two plates. While moving, the frustule does not turn around its longitudinal axis. Length 0·126–0·165 mm., attaining 0·245 mm., breadth of the valve 0·0052–0·008 mm.

125. *Nitzschiella gracilis*, var. *reversa*, Mer. (Pl. IV. fig. 14.) San Pedro, very common. [M.]

Rostra curved in opposite directions. General length 0·1–0·175 mm., length of the body about 0·05 mm., breadth of the valve 0·008–0·009 mm. Very common in San Pedro, where the type species is very rare; the opposite is the case in Villefranche (Mediterranean) and the Black Sea. Var. *reversa* is also frequent in fresh water, California (Los Angeles).

The following table will facilitate the distinction between

all these forms which have been confounded under the name of *N. closterium*\* :—

- I. Girdle-face not differing from the valve-face.
- A. Length over 0.06 mm.
- a. Frustule arcuate.
- aa. Both or one end curved backwards; very large forms, attaining 0.364 mm. . . . . *N. tenuirostris*, var. *arcus*.
- bb. Ends not curved backwards.
- Frustule gently arcuate . . . . . *N. tenuirostris* (typica).
- Frustule strongly arcuate, semi-circular . . . . . *N. tenuirostris*, forma
- b. Frustule straight. [semicircularis.
- Ends forming a hook . . . . . *N. tenuirostris*, var. [hanulifera.
- Not forming a hook . . . . . *N. tenuirostris*, forma [directa.
- B. Length 0.06 mm. or less. [parva.
- Length about 0.05 mm. . . . . *N. tenuirostris*, var. *parva*.
- Length about 0.035 mm. . . . . *N. t.* var. *parva*, forma [minutissima.
- II. Girdle-face differing from the valve-face.
- Rostra curved on the same side . . . . . *N. gracilis*.
- Rostra curved in contrary directions . . . . . *N. gracilis*, var. *reversa*.

126. *Nitzschiella californica*, sp. n. (Pl. IV. figs. 18–20.)  
Redondo Beach, common. [M.]

Valve fusiform, abruptly terminating in straight rostra (fig. 18). Girdle-face (figs. 19, 20) asymmetrical, with one side straight and the other convex; rostra forming a knee-like curve at their junction with the body, thus being carried to one side. Endochrome composed of two plates. General length 0.056–0.063 mm., length of the body 0.023–0.029 mm., breadth 0.0035–0.0055 mm.

127. *Cylindrotheca gracilis* (Bréb.), Grun. (Pl. IV. fig. 21.)  
San Pedro, rather common. [M.]

I first observed this freshwater diatom in the Mediterranean (Villefranche) in purely marine water, and now I have met with it again in San Pedro, in marine water too and in great abundance. The size is extremely variable, from 0.035–0.224 mm., breadth from 0.015–0.008 mm. The frustule is sometimes arcuate, especially in small individuals. The endochrome is composed of 2 to 36 rounded or elliptic granules arranged in a spiral along the inner walls of the frustule.

128. *Cymatopleura angulata*, Grev. Calif. guano. [Gv.]

\* Small individuals of *N. biplicata* have been probably also confounded under this name.

129. *Surirella fastuosa*, var. *lata*, W. Sm. Monterey, rare. [M.]  
 130. *Campylodiscus echeneis*, Ehr. San Pedro, rare. [M.]  
 131. *Campylodiscus marginatus*, C. Johnston \*. Calif. guano. [Gv.]  
 132. *Campylodiscus stellatus*, Grev.† Calif. guano. [Gv.]

[To be continued.] *man p. 505*

LXI.—*Descriptions of Seventeen new Genera of Ichneumonidæ from India and One from Australia.* By P. CAMERON.

[Continued from p. 385.]

MAGRETTIA, gen. nov.

Head large, cubital, largely developed behind the eyes, which are large, parallel, and distinctly distant from the base of the mandibles. Occiput not margined. Clypeus not distinctly separated, its apex margined, foveate laterally. Mandibles bidentate at the apex. Mesonotum not lobate. Scutellum flat, its sides stoutly carinate to near the apex, which is incised. Median segment with the basal area indicated; its spiracles large, about four times longer than broad, and placed near the base. Legs stout; the hinder coxæ stout, not elongate; their lower inner side armed with a stout tooth; the claws simple. Areolet slightly oblique, triangular, the transverse cubital nervures uniting at the top; the recurrent nervure with a short branch issuing from its middle. Petiole dilated at the apex, its spiracles placed near the apex, oblique, about three times longer than broad. Gastrocœli deep, narrowed.

This genus has the petiole widely dilated at the apex, as it is in the *Platyuri*, the postpetiole being widely separated. Its distinctive features are the large head, well developed behind the eyes, the toothed hinder coxæ, the stoutly keeled scutellum, incised at the apex, and the mandibles with a long sharp apical tooth, and a blunt, short, hardly projecting sub-apical one. Characteristic is the pronotum, which is roundly incised near the apex; the mesonotum is broadly raised in front of the scutellar keels; the supramedian area is distinctly defined, as is also the posterior median, the two lateral and

\* 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. xxvii. fig. 11, pl. xxx. fig. 2.

† *L. c.* pl. xxi. fig. 3.



the spiracular area. The mesopleural tubercles are elongate and project largely. The antennæ are long and dilated beyond the middle in the female, in the male they are longer and serrate. The hinder femora reach to the middle of the third segment. The base of the median segment is not obliquely depressed as in typical *Joppina*; the metathoracic area, too, are more regularly defined than they are in that group.

*Magretta crassispina*, sp. n.

Nigra, thorace albo-maculato; mesonoto reticulato; scutello carinato; basi petioli alba; pedibus rufis; coxis posticis, apice femorum basique tibiæ nigris; tarsis posticis albis. ♀.  
Long. 13-14 mm.

Antennæ stout, longish, dilated (but not conspicuously so) beyond the middle and before the apex, black, the eighth to twentieth joints whitish, the eighth to fourteenth entirely so; the scape on the underside thickly covered with white pubescence. Head large, largely developed behind the eyes, black; the face and clypeus, the inner orbits narrowly, and the outer broadly below, yellowish white, the face black in the middle, the mark rounded at the top and of nearly equal width, punctured, but not strongly, except on the black spot; the labrum black, slightly dilated in the middle at the apex. Mandibles yellow, the teeth black, rufous at the base; the palpi long, yellow. Thorax black, a broad line on the pronotum extending from near the base to the apex, the base of the tegulæ, a mark, longer than broad, on the lateral lobe of the mesonotum, opposite the apex and shortly behind them, the scutellum behind and broadly in the middle at the base, the postscutellum, two large marks on the apex of the median segment, dilated inwardly on the upperside, narrowed towards the apex, the lower two thirds of the propleuræ at the base, the tubercles, the lower side of the mesopleuræ broadly, the edge of the mesopleuræ above (narrowed below), yellow. The mesonotum wants the parapsidal furrows, coarsely longitudinally reticulated, the base and sides almost smooth, the sides on the yellow part near the tegulæ raised. The scutellum is stoutly obliquely keeled to near the apex on the sides; the basal depression is narrow, deep, slightly curved; on the sides near the base are two stout transverse keels; the base depressed; the centre with some large deep punctures; at its apex, between it and the postscutellum, is a stout short projection, roundly narrowed in the middle. Postscutellum large, smooth, foveate in the middle, the sides depressed, the whole base being obliquely depressed. At the base of the median segment, touching the postscutellum, is a large area

wider than long, slightly wider at the apex than at the base, and open at the apex; on either side of this is a slightly smaller area; the central area is coarsely, longitudinally, rugosely reticulated; the lateral more closely and not so strongly rugose; the apex is coarsely, transversely, rugosely striated; there are no teeth and the posterior median area is not clearly separated. The propleuræ at the base smooth, the middle above sparsely covered with large punctures; the apex stoutly striated, the striæ stout, especially the lower; the upper curved. The base of the mesopleuræ punctured and with a few striæ; the middle smooth, striated under the tubercles; the lower (and yellow) part strongly punctured; the metapleuræ coarsely, closely, rugosely punctured; the lower side striated. Mesosternum closely and strongly punctured, the middle deeply furrowed; on the apex are two large yellow marks. The four anterior legs fulvous; the coxæ and trochanters yellow; the hinder coxæ black, the base above and the apex on the lower side, the basal joint of the trochanters, the apex of the femora, the base of the tibiæ more narrowly and its apex more broadly, black; the rest of the femora and the tibiæ rufous; the hinder tarsi yellowish, closely spined beneath. Wings hyaline, the nervures and stigma black. The basal half of the petiole lemon-yellow; the postpetiole broadly dilated, black; the apex yellow, strongly punctured at the apex of the black and the base of the yellow; the second and third segments are closely punctured; the gastrocœli yellow, not very deep, and bearing stout curved keels; the part between them strongly longitudinally striated; the apices of the segments yellow.

#### LAMPROJOPPA, gen. nov.

Antennæ, if anything, longer than the body, flattened and compressed beyond the middle. Areolet 4-angled, or the transverse cubital nervures may be united above; the transverse basal nervure is interstitial. Labrum roundly projecting. Apex of mandibles with one large apical and a small subapical tooth. Scutellum roundly convex, its sides stoutly keeled from the base to the apex; postscutellum large, roundly convex. Median segment with three central and two lateral areæ; the teeth large, stout. Legs stout. Abdomen short, the petiole longish and slender, the segments closely punctured and seven in number; there is a broad ventral fold.

The areolet may be shortly appendiculated; the median segment is reticulated and transversely striated; the head is

obliquely narrowed behind the eyes; the occiput is margined; the gastrocoeli are large and deep; the antennæ are longer than usual; the head is obliquely narrowed behind the eyes; the hind legs are longish; the femora reach beyond the third abdominal segment.

*Lamprojoppa cærulea*, sp. n.

Cærulea, scapo antennarum nigro; alis fere hyalinis, nervis stigmatæque nigris. ♀.

Long. 12 mm.

Antennæ as long as the body, thickened and compressed beyond the middle, the apex attenuated; the scape and the base of the flagellum blue. Head above the antennæ blue, with slight brassy tints; below the antennæ in front black, the inner orbits from shortly above the antennæ yellow. The vertex behind the ocelli transversely punctured, running into striæ in parts; behind the eyes closely and finely obliquely striated; the ocellar region closely and distinctly punctured. The front in the middle is roundly depressed, the depression transversely striated, the sides above punctured, below smooth. The face in the middle is irregularly reticulated, its sides depressed and closely punctured. Clypeus roundly convex, black, closely and distinctly punctured. The white line extends from shortly above the insertion of the antennæ to the base of the mandibles, which are black, as are also the lower outer orbits and the palpi. Mesonotum closely punctured, the middle slightly raised at the base. Scutellum with the lateral keels and its centre almost smooth, the sides with scattered punctures and with some transverse keels on the outer side. Postscutellum finely longitudinally striated. Median segment irregularly transversely striated, most closely at the base; there are three central areæ, the middle one has a stout keel down the middle; the teeth are large. Propleuræ closely and minutely punctured at the base below, the upper part more strongly punctured, below and at the apex striated.

May be known from *L. fuscinerva* by the wings being more iridescent and with the stigma and nervures deep blue-black, by the supramedian area not being reticulated laterally, having only one central keel, by the darker antennæ, which have a distinct bluish tint; the recurrent nervure is received behind the middle of the areolet; the abdomen is not so strongly punctured.

SETANTA, gen. nov.

Mandibles with only a very minute tooth on the upperside.

Clypeus with a deep fovea on either side at the base and not separated from the face, its apex transverse; labrum projecting, its apex rounded. Occiput sharply margined. Scutellum flat, not margined; postscutellum bifoveate at the base. Median segment areolated, its spiracles linear. Areolet narrowed at top, not quite one half the length of the lower side; the recurrent nervure is received in the middle; the transverse median nervure is received in front of the transverse basal. Antennæ thickened beyond the middle, the apex attenuated. Legs stout, the tarsi spinose, the claws simple. The spiracles on the petiole are placed near the base of the postpetiole; the gastrocœli large, deep; there are seven segments, the ventral keel is only on the second and third; the ovipositor is short; the hypopygium is large, broad, rounded at the apex; the apical segment is larger than usual compared to the penultimate.

Belongs by the form of the petiole to the *Platyuri*. It has the bluntly pointed abdomen of *Amblyteles*, with which it also agrees in the apical ventral segments not being retracted. Characteristic is the form of the mandibles, which have only one very small, almost obsolete tooth on the upperside. The three central areæ on the median segment are clearly defined, the others are obsolete, but the keel on either side of the spiracles is distinct; the basal joints of the flagellum are elongated; the apex of the abdomen is broad and bluntly pointed; the face is flat; the occiput roundly concave; the two abscissæ of the basal part of the cubitus are straight and oblique; a short nervule issues from the middle.

*Setanta rufipes*, sp. n.

Nigra, flavo-maculata; pedibus rufis, coxis trochanteribusque anterioribus flavis, coxis posticis nigris; alis hyalinis, stigmatibus fusco. ♀.

Long. 10-12 mm.

Antennæ black, a line in the middle of the scape and the eighth to fourteenth joints (except above) white; they are stout, flattened and dilated beyond the middle, attenuated towards the apex. Head black, the inner orbits, and the outer more broadly on the lower half, yellow; there is a broad mark on the lower side of the face, extending to and enclosing the foveæ; above it is obliquely narrowed from the sides to the centre; on the middle of the clypeus is a large black mark, which is also obliquely narrowed above. Mandibles yellow, their apex narrowly black; palpi yellow. Thorax black; a narrow curved line on the pronotum, reaching from near the base to the apex, two short lines near

the middle of the mesonotum, scutellum, postscutellum, a large mark, rounded on the outer side, straight on the inner side, on the apex of the median segment, a line on the lower edge of the propleuræ, the tubercles, a large elongated mark of almost equal width on the lower side of the mesopleuræ, and a small mark under the hind wings, yellow. Mesonotum shagreened; the scutellum sparsely punctured. The centre of the median segment is smooth at the base; the supra-median area is longer than broad, bulges out below the middle, inside it is finely irregularly striated; the posterior median area is stoutly transversely striated; the others are strongly punctured, except the inner side of the outer lateral, which is transversely finely striated. Propleuræ shining, the lower apical part striated. Mesopleuræ closely but not strongly punctured; the apex on the lower side is depressed, the depression with some stout keels. Metapleuræ more closely and strongly punctured; behind the curved keel striated. Mesosternum closely punctured, the furrow triangularly widened at the apex and crenulated. Legs rufous, the four anterior coxæ and trochanters yellow; the hinder coxæ black, as are also the basal joint of the trochanters, the apices of the tibiæ and femora, and the apex of the second joint and the whole of the apical three joints of the hinder tarsi, this being also the case with the four front tarsi; the claws are rufous. Wings hyaline; the stigma fuscous, the nervures paler; the areolet at the top is hardly one half the length of its lower side; the recurrent nervure is received in the middle. Abdomen black; all the segments marked with pale yellow laterally at the apex; the yellow mark on the petiole is large, dilated at the apex on the outer side, and these marks are united at the apex by a narrow line; the marks on the second segments are large, broad, on the third narrower and longer; on the other segments they are continuous; the ventral fold is yellow.

#### GYRODONTA, gen. nov.

Mandibles short, broad, their apices bluntly rounded, without teeth, the lower side at the base projecting downward and clearly separated. Head large, broad, largely developed behind the eyes, and almost transverse behind. Eyes parallel, widely distant from the base of the mandibles above, if anything reaching above to the level of the vertex; the lower edges are sharply keeled. Clypeus not separated by a distinct suture from the face, its foveæ distinct, its apex bluntly rounded. Labrum projecting, distinct. Antennæ thicker than usual; the apical joints of the flagellum longer

than broad. Areolet 5-angled, narrowed above; the transverse basal nervure is interstitial. Scutellum flat. Median segment not completely areolated; it is longish, its apex has an abrupt oblique slope; spiracles long, curved, rounded at the top and bottom. Legs short, stout; the hinder coxæ large, roundly produced backward; the tarsi spinose; the middle joints on the front pair narrowed at the base; the basal joint incised at the base; the apex of the tibiæ spinose; the claws are large, curved, bare. Abdomen with seven segments, its apex bluntly pointed; the last segment well developed all round; the ventral fold reaches to the base of the ovipositor; the cenchri are stout.

The median segment is less distinctly areolated than in the Ichneumonini; the hinder coxæ project backward more than usual; there is a short nervure on the cubital nervure, as in *Ichneumon*, and another on the outer side of the recurrent nervure, this latter being a somewhat uncommon feature. The median segment is also rather more elongated than usual. The mandibles, when they touch at their apices, leave an open space between them and the labrum, as in the division Cyclostomi of the Braconidæ; the apices of joints 1-4 of the tarsi bear long stout spines. The thorax, compared with the abdomen, is rather longer than usual; the apex of the hinder femora reaches to the end of the fourth abdominal segment. There can hardly be said to be teeth on the median segment, but the lateral keels are dilated on the top of the apical slope. Gastrocoeli indistinct.

This genus does not fit into any of the tribes as defined by Foerster and Ashmead. The edentate mandibles might place it with the Heresiarchini, but in that group they are acute at the apex, not broad and blunt as in this genus. The mandibles are so different from anything hitherto known, and form such a distinctive mark, that the genus might well form the type of a new tribe, which is readily separated from all others by the short, curved, broad, edentate, and (at the apex) broadly rounded mandibles, which are also broadly hollowed at the base on the outer side. The eyes are small and appear more widely separated from the base of the mandibles than usual. The antennæ are thicker than in the Ichneumonini. The bluntly pointed apex of the abdomen, with the well-developed last segment and ventral fold, refer it to the division Amblypygi. The sheaths of the ovipositor project largely.

*Gyrodonta flavomaculata*, sp. n.

Rufa, flavo-maculata, abdominis apice nigro; pedibus rufis, coxis

trochanteribusque anterioribus flavis; alis hyalinis, stigmatè rufo. ♀.

Long. 15 mm.

Antennæ stout, thickly covered with short fulvous hair; in the middle is a broad pale yellow band; the apical portion is darker than the basal, almost black. Head rufous, the inner orbits broadly, the outer more narrowly; the part below the eyes broadly, and below the antennæ, lemon-yellow. The projecting face is thickly covered with white hair and is sparsely punctured; the clypeus smooth and shining, its outer edge yellowish. Mandibles shining, impunctate, rufous, black round the edges; the palpi pale yellow. Thorax rufous, the edge of the pronotum above, the apical two thirds of the scutellum, the postscutellum, the apex of the median segment largely on the sides, the lower part of the propleuræ, the greater part of the lower half of the mesopleuræ, the tubercles, and a spot under the hind wings, lemon-yellow. Mesonotum closely punctured, thickly covered with short white pubescence; the scutellum is more sparsely and strongly punctured. The middle basal area of the median segment is strongly but not very closely punctured, and is not separated from the central, which is irregularly longitudinally striated; the outer basal area are strongly punctured, the middle strongly, irregularly, obliquely striated; the posterior median area is strongly transversely striated, the outer strongly punctured; the tooth is broad; the spiracular area is punctured at the base, obliquely striated beyond the spiracles. The middle of the propleuræ is striated towards the apex; the meso- and metapleuræ are closely punctured and are thickly covered with white hair. Legs stout, rufous, the four front coxæ and trochanters lemon-yellow; there is a lemon-yellow mark on the upperside of the hinder coxæ at the base; the hair on the tibiæ is thick and fulvous; the tarsi are thickly and stoutly spinose. The wings have a slight fulvous tinge; the areolet at the top is about one half the length of the space bounded by the recurrent and the cubital nervures; the recurrent nervure is received in the middle, it is bent outwardly above the middle, and a short nervure issues from the middle of the angle. Abdomen shining; the petiole sparsely punctured; the third and the following segments are black above; the third and fourth are narrowly rufous at the base, the others more narrowly at the apex; the projecting sheath is rufous and is thickly covered with long fulvous hair; the ventral keel is pale testaceous.

[To be continued.]

## MISCELLANEOUS.

*On the Anatomy of certain Agnathous Pulmonate Mollusks.*

*To the Editors of the 'Annals and Magazine of Natural History.'*

GENTLEMEN,—In the 'Annals' for January 1901 is a paper by Mr. W. E. Collinge with the above title. The author says "he is unable to confirm many of my statements" published in the 'Proceedings of the Malacological Society of London,' vol. i. (1893). I think, however, two errors into which I was led can be explained. The drawings on pl. i. figs. 10 & 12 represent parts magnified, and drawn, with the aid of a camera lucida, as presented to me. The vas deferens joined the penis where I have shown it, and is free from that point; so far that drawing is not incorrect, for there was nothing to indicate that it continued, hidden by tissue, to the distal end of the penis\*. The specimen is in the Natural History Museum; with more material and in better condition I might possibly have detected what Mr. Collinge was enabled to do. Next, as to the "knob-like process" and "nipple-like crenulations": here I was certainly deceived by appearances caused by myself during dissection. On slitting up the more open part of the penis-tube as far as it was possible, and turning back the severed sides, a solid end was presented (fig. 12), and the nipple-like crenulations I saw were, no doubt, I think now, nothing more than the broken ends of the rugose lining of the organ meeting together where the tube became closely contracted. This certainly did not strike me at the time, and it is evident they have no structural existence as papillate growths round a central main papilla †. It is satisfactory to find these points of detail more clearly defined by Mr. Collinge: the only way in which science can advance is to frankly compare and criticize one another's results. We are all liable to make mistakes—more liable to make false deductions—and the sooner they are put right the better. I must, however, take exception to the following sentence:—"On the supposition that the vas deferens in this species was very short &c., Godwin-Austen proposed to place the genera *Paryphanta*, *Elea*, and *Schizoglossa* in a new subfamily." This is not exactly what I said. I did not single out any particular organ or specify any minor details of the anatomy. I came to my conclusion on the broad grounds of general structure of an Agnathous group, and more particularly mentioned the more or less perfect shell-bearing and slug-like species occurring in the families and subfamilies referred to.

Yours &c.,

H. H. GODWIN-AUSTEN.

Nore, Godalming,  
15th April, 1901.

\* This is a character in itself.

† Nothing at all like this, in fact, is found which my drawing would indicate.



- The London, Edinburgh, and Dublin Philosophical Magazine. Monthly. 2s. 6d.
- The Annals and Magazine of Natural History. Monthly. 2s. 6d.
- The Observatory, Monthly Review of Astronomy. 1s.
- Aelfric Society's Publications. 15 parts. 37s. 6d.
- Aéronautics, by Brewer and Alexander. 6s.
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ZOOLOGY, BOTANY, AND GEOLOGY.



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## CATALOGUE

OF THE

## PHYSIOLOGICAL SERIES OF COMPARATIVE ANATOMY

IN THE

MUSEUM OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

By PROF. C. STEWART, LL.D., F.R.S., &c.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

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LXII.—*New Genera and Species of Eastern and Australian Moths.* By Colonel C. SWINHOE, M.A., F.L.S., &c.

[Continued from p. 473.]

Family *Sarothripidæ*.

*Gadirtha sara*, nov.

♂. Palpi ochreous white, brown at the sides, terminal joint speckled with brown and with a brown band at the tip; head, body, and fore wings pinkish grey, irrorated with brown atoms, the irrorations on the fore wings very dense in parts, forming brown indistinct patches, making the wing look variegated; a very indistinct interior line, of which only a very acute angle near the hinder margin is distinct, the orbicular represented by a black spot, the reniform a brown ring with a small pale ringed spot in its centre; an outwardly rounded double discal brown line with pale centre, the outer one with three or four teeth; a whitish smear at the apex, bordered by a blackish dentate line; a pale submarginal line, dividing the black veins, a black marginal line, and ochreous cilia, interlined with brown: hind wings with broad brown marginal border and ochreous cilia: underside whitish, fore wings with broad marginal border suffused greyish.

Expanse of wings  $1\frac{4}{5}$  inch.

Talaut (*Doherty*).

*Blenina effusa*, nov.

♀. Body and fore wings pinkish grey, smeared with grey; a brown, highly sinuous, thick line from costa before the middle to hinder margin beyond the middle, a black spot at end of cell, and some blackish markings near its inner side; a similar line from costa beyond the middle to the hinder margin close to the first line, sinuous and well curved outwardly; two indistinct sinuous lines between this and the margin, the outer one with some blackish spear-shaped marks; cilia yellow, with brown patches opposite the veins; hind wings pale pink, cilia yellow: underside, fore wings pale pink, hind wings pale ochreous, nearly white, without markings except for some yellow and brown suffused patches on costa and apical portions of fore wings; cilia as above.

Expanse of wings 1 inch.

Pulo Laut (*Doherty*), Lewas (*Everett*).

*Clettharra iphida*, nov.

♂. Head, thorax, and fore wings dark pink-brown; a broad nearly white band along the costa, containing blackish streaks and marks on the outer half; a whitish band on the hinder margin from base to one third from the angle; cilia white, with brown patches; abdomen and hind wings white: underside white; fore wings suffused with grey; some small blackish-brown marks on costa near apex.

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

Jaintia Hills.

Allied to *C. albonotata*, Hmps., but that species has white spots on the outer margin.

*Clettharra floccifera*.

*Clettharra floccifera*, Hmps. Moths Ind. ii. p. 386, ♂ (1894).

*Clettharra valida*, Hmps. (nec Walker). l. c. iv. p. 528 (1896).

The types of *C. floccifera*, Hmps., from Tenasserim and the Nagas, are males; the type of *C. valida*, Walker, from Sarawak, is a female; and Sir George Hampson very naturally came to the conclusion that they were sexes of the same species; but I have in my collection males of both forms and a female of *C. floccifera*; the sexes are alike; the two forms are undoubtedly quite distinct.

Tenasserim, Nagas, Khasia Hills.

*Sarothripa morena*, nov.

♀. Frons and palpi white, last joint brown; head, body,

and fore wings dark purple-grey; a small pale pinkish space at end of cell; a whitish patch in the middle of hinder margin, somewhat triangular, with the point inwards; the entire wing of different shades of grey; a black dot in the cell, another at the end, two beyond it, included in a circular row of whitish points which extend from the costa, round the cell, nearly to the whitish patch on the hinder margin; some whitish points on costa near apex; a row of submarginal black points and marginal whitish points: hind wings grey; cilia of both wings whitish grey: underside uniform pale grey, without markings.

Expanse of wings 1 inch.

Sarawak, Borneo.

Allied to *S. chlorana*, Hmps., from Sikkim and the Khasia Hills; there is one example from Borneo in the B. M. amongst the *Stictoptera*, in *Quadrifidæ*, drawer no. 206, and another from Perak with *Plotheia metaspillella*.

### Family Stictopteridæ.

#### Genus VIZAGA, nov.

Palpi upturned, smooth, third joint two thirds length of second; abdomen smooth, extending a little beyond the hind wings; antennæ in the male very minutely ciliated, about two thirds the length of the body; mid tibiæ with one long and one short terminal spur, hind tibia with two pairs, the outer ones short: fore wings increasing in width to outer margin, apex blunt, hind margin nearly as long as the costal margin, the wing rather short, no raised tufts, retinaculum bar-shaped; the end of the cell in the male rather distorted, with two patches of rubbed membrane on the underside, indicated above by two short semihyaline streaks, the lower portion of the discoidal vein produced into an acute angle, its middle portion concave, vein 2 from close to lower end, 3 from the end, 4 and 5 commence close together from the produced angle, 6 and 7 from upper end of cell, the latter bent and forming the lower side of a six-sided areole, 8 and 9 on a stalk from the outer angle of the areole, 10 from two thirds, forming the upperside of the areole: hind wings with veins 3 and 4 stalked, 5 from near lower end of cell.

Type *V. (Ophiusa?) cyanea*, Snellen, Tijds. voor Ent. xxiv. p. 129, pl. xiv. fig. 2 (1881). Type ♀, Luzon.

I have the female also from Malang, Java; and the Hon. Walter Rothschild has very kindly lent me a male from Sumba. It has many affinities to the genus *Maceda*, Walker.

*Gyrtona nama*, nov.

♂. Palpi dark brown, with white tips; head, body, and fore wings dark brown, with a greyish tinge; a white streak between the antennæ and along the frontal tuft; some white scales on the thorax: fore wings with indications of many very indistinct and very fine sinuous transverse lines, the veniform dotted with white; a black spot below the middle of cell; a band composed of two lines rather close together from the costa near apex, which bends abruptly opposite end of cell, and then runs nearly straight to hinder margin beyond the middle; the inner side of this band is marked with deep black spots above the bend and on its outer side with two white lunules and a white spot; at the apex of the wing is a white streak edged with deep black, composed of three conjoined elongated spots; a deep black spot on the grey cilia below the apex, three white costal subapical dots and white marginal points: hind wings grey, with broad brown marginal border; cilia of both wings interlined, on the hind wings tipped with white.

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

Jaintia Hills.

There is an example of this species in the B. M. from Bhutan mixed up with *Stictoptera albodentata*, Moore.

Family **Gonopteridæ**.*Capotena elaina*, nov.

♂ ♀. Head, thorax, and fore wings chestnut-red, more or less suffused with brown; two pale transverse lines—first from costa near base, straight to middle of hinder margin, the other from costa one third from apex to the hinder margin, curving slightly outwards; a pale line at base of cilia: hind wings white, sometimes with blackish suffusions, otherwise without markings; abdomen brown, so thickly covered with white pile in the female as to make it look white, with an orange-grey apical tuft in the male: underside, fore wings pale red, white at base of costa and broadly so on hinder margin; pectus, body, and legs white, covered with thick white hairs.

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

Queensland.

*Carea tarika*, nov.

♂. Head, body, and fore wings dark pinkish grey, irradiated with red-brown; some brown dots at base, one in the



cell, and a brown spot at the end; some brown marks at the base, a broad antemedial brown band with irregular edges from costa before the middle to the centre of hinder margin, a marginal pinkish-white band with sinuous inner margin; on the inner side of this band on the costa near the apex is a broad brown patch which diffusedly narrows downwards; cilia dark brown: hind wings orange, whitish on costa, without markings; cilia concolorous: underside, body, legs, and wings uniform dull orange, suffused slightly in parts with grey; a whitish subapical costal patch on fore wings.

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

Gilolo (*Doherty*).

Intermediate between *C. ocyra*, Swinh., from Singapore, and *C. nitida*, Hmps.

### Genus ERIZADA, Walker.

*Erizada*, Walker, xxxii. p. 506 (1865).

*Tinosoma*, Hmps. Moths Ind. ii. p. 426 (1894).

#### *Erizada semifervens*.

*Gadirtha* (?) *semifervens*, Walker, Journ. Linn. Soc. vii. p. 163 (1864).

*Erizada lichenaria*, Walker, xxxii. 506 (1865).

*Tinosoma hyperythrum*, Hmps. l. c.

Andaman Islands.

Also from the Naga Hills and from Sarawak, Borneo.

### Family Trifidæ.

#### *Aucha vesta*, nov.

♂. Antennæ dull red; palpi dark brown; head, thorax, and fore wings olive-grey, tinged with ochreous; orbicular represented by a black spot and the reniform by two black spots, one above the other, both ringed with grey; a submarginal sinuous grey thin band; a similar antemedial band running close on the inner side of the orbicular; the bands are erect and the latter is more than sinuous, almost dentated; then follows a broad dark brown band, its outer edge running through the reniform; the inner portions of the wing are almost as dark as the brown band, the outer portions much lighter, almost grey; with several subdentate pale grey thin bands and a submarginal dark brown band, the inner edge of which is diffuse, the outer edge toothed throughout, the largest teeth being a little below the costa and in the middle: hind wings with two broad orange-ochreous longitudinal interior streaks, the costa and outer margin broadly blackish

brown, the abdominal marginal space ochreous, clouded with brown; a brown spot at the end of cell; cilia bright orange-yellow: underside dull brownish grey; fore wings with the hinder margin ochreous; hind wings with the inner streaks and abdominal space dull ochreous.

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

Coomoo, Queensland.

In one example the broad central brown band on the fore wing stops halfway and leaves an ochreous space on the costa.

*Hadena amanda*, nov.

♂. Head, thorax, and fore wings dark olive-brown; palpi black at the outer sides: fore wings with some pale pinkish dots on the costa towards the apex; three very indistinct sinuous transverse bands, brown, with pale pinkish inner edges; orbicular large, indistinct; reniform large, ear-shaped, and nearly white, with brown interlining, two pale pinkish spots just beyond it: hind wings grey, pale in the interior and whitish towards base; abdomen grey; apical tuft dull red.

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

Perak.

Easily distinguishable by the double pinkish spots beyond the stigma.

*Semiophora eriza*, nov.

♀. Of a uniform ochreous grey, slightly tinged with pink: fore wings with orbicular indicated by a black oblique spot, the reniform by a black V-shaped mark; a discal submarginal pale line, rather far from the margin, slightly sinuous and marked and spotted in places with black; grey marginal dots: hind wings unmarked; cilia of both wings with a pale basal line: underside paler; hind wings whitish; a brown discal dot.

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

Kulu (*Graham Young*).

Allied to *S. carnipennis*, Butler, from Japan.

*Elusa semipecten*, nov.

♂ ♀. Palpi with the second joint brown, the third paler and ochreous red; head, body, and fore wings dark brown, with a bronzy gloss; orbicular represented by a white dot ringed with black, the reniform by two spots, one above the other, also ringed with black; these spots in some specimens are snow-white, in others brown; indications of three trans-

verse, outwardly curved, sinuous brown lines—antemedial, postmedial, and submarginal—the last in some examples with two or three black dots towards costa: hind wings brown, with a whitish cilia: underside pale brown; hind wings with a cell-spot and pale internally; body and legs with a red tinge.

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

Queensland.

Superficially like *Penza puncticeps*, Wlk. The type of the genus *Elusa* is *aneusalis*, Wlk., from Sarawak, which has a large boss of black scales at the bend in the antennæ of the male, beyond which the antennæ are unipectinate; *E. bipars*, Moore, and *E. antennata*, Moore, agree therein; *Penza puncticeps*, Walker, from Borneo, has shortly bipectinate antennæ in the male from base onwards; in the male antennæ *E. semipecten* agrees with typical *Elusa*, except that the boss of scales is wanting, there being merely a thickening at the bend.

*Caradrina hennia*, nov.

♂ ♀. Head, body, and fore wings fawn-colour, some white scales on the head at the base of the antennæ; a white line at the base of the cilia, otherwise absolutely without markings: hind wings white, slightly tinged with reddish grey on costal and outer margins; a white line at base of cilia, as in fore wings: underside paler; hind wings with silvery scales.

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

Sarawak, Borneo.

In the B. M. unnamed. I have it also from Calcutta.

Family **Quadrifidæ**.

Subfamily *POLYDESMINÆ*.

*Pandesma pagana*, nov.

♂. Palpi dark brown; body and wings of a uniform pale purplish brown, with a slight ochreous suffusion: fore wings with a black suffused basal patch, a large blackish, almost square patch on middle of costa, and another with rounded lower edge before the apex; the whole costal margin marked and spotted with black; a very indistinct sinuous, transverse, brown medial line in continuation of the outer edge of the medial patch, and another similar line just beyond it: hind wings pale at the base, with a large blackish patch in the centre before the middle and traces of an indistinct sinuous discal line; marginal festoon of both wings brown, with brown points: underside brownish grey; fore wings with a

brown lunule at end of cell; hind wings with a similar lunular mark and a spot below it.

Expanse of wings  $1\frac{5}{10}$  inch.

Jaintia Hills.

Belongs to Hampson's Section 1 A. *b*<sup>1</sup>, mid legs with a tuft of long hair from the femoro-tibial joint, and is allied to *P. costalis*, Moore.

There is an example from Sikkim in the B. M. without name (Quadrifidæ, drawer no. 226).

#### Subfamily *OPHIUSINÆ*.

##### *Bocula erota*, nov.

♀. Palpi, head, thorax, and fore wings dark yellow, tinged with bronze, and irrorated with very minute grey atoms; a prominent blackish spot at end of cell; a very broad brownish-black marginal band, its inner edge running straight up from the hinder margin near the angle, ending opposite the upper angle of the cell, where it abruptly bends and is irregularly sinuous to the apex of the wing; an indication of a thin grey band in the disc, close to the inner side of the broad marginal band; marginal points black, with yellow dots: hind wings dark ochreous brown, without markings: underside uniform dark grey-brown; hind wings with a cell-spot; both wings with marginal ochreous points.

Expanse of wings  $1\frac{3}{10}$  inch.

Port Blair, Andamans.

Allied to *B. punctilineata*, Hmps. n.; the marginal band is much broader and differently shaped and the discal row of black dots is wanting. I have received several examples, all females.

##### *Motina shumara*, nov.

♂ ♀. Pale ochreous pink; palpi dark red below: fore wings irrorated with red, a brown cell-spot, and crossed by many straight red-grey bands, two antemedial indistinct, two postmedial, both rather close together; several before the margin very close together, broadly shading the marginal space: hind wings paler, with three indistinct discal bands, most apparent towards the abdominal margin; both wings with minute black marginal lunules and pale-tipped reddish cilia: underside pale pinkish, without any markings.

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

Sarawak, Borneo.

Hardly any variation in the long series before me; there are two examples from Borneo in the B. M. unnamed (Quadrifidæ, drawer no. 127).

## Genus TIRUVACA, nov.

♂. Fore wings narrower than hind wings, of uniform width throughout; costa straight, becoming convex shortly before apex, which is slightly subfalcate; outer margin oblique, subsinuous, hinder angle obtuse; hinder margin strongly convex on basal half: hind wings ample, outer margin well rounded; apical and anal angles both well marked; antennæ slender, minutely subserrate and pubescent; palpi with second and third joints erect in front of face, laterally flattened, the second joint with a tuft of hairs at apex on upperside projecting over the third; tongue and frenulum present; femora and tibiæ densely hairy; hind tibiæ with four long sharp spurs.

Fore wing with the cell half as long as the wing; discocellular concave; veins 1 to 5, the median vein itself, and the submedian fold all distorted and sinuous; vein 2 from just beyond middle of cell, bent downwards and closely approximated to submedian fold in its outer half; vein 3 from three fourths of cell, approximated at first to the median, then curved downwards; veins 4 and 5 from lower end of cell, co-sinuous at first, then divergent; the median vein itself thickened and bent downwards before end of cell; 6 from upper angle, 7 and 8 stalked from upper angle, 9 and 10 stalked from three fourths, 9 soon anastomosing with 7 and 8; 11 free, but closely approximated to 10; basal half of cell clothed with downy hairs; wing-membrane between median vein and submedian fold fluted and without scales.

Hind wing with the cell short; costal well separated from subcostal; veins 6 and 7 from upper angle of cell; 3, 4, and 5 close together from lower angle.

♀. With the fore wings triangular and the veins normal. The male is coloured and marked like the female, but the apex of the fore wing is more produced.

Type *Tiruvaca (Thermesia) subcostalis*, Walker, xxxiii. p. 1059.

The type specimen (a female) came from Moulmein. Kiriwini, Trobriand Island.

*Platyja minutipuncta*, nov.

♂ ♀. Dark olive-brown; palpi nearly black, with yellow tips; antennæ yellow at the base; spots and dots on the wings pale grey: fore wings with a subcostal round spot a little beyond the middle, a large spot in the lower disc, several dots in the interior, a discal row of dots across both wings, obsolete towards costa of hind wings, and a marginal row of

grey points; cilia white: the underside is browner and less olive, the wings without markings except for the discal row of dots, obsolete on the fore wings in the male, distinct and complete on both wings in the female.

Expanse of wings  $2\frac{4}{10}$  inches.

♂. Singapore. In B. M.

♀. Jaintia Hills.

### Family Focillidæ.

#### *Zethes multiplaga*, nov.

♀. Of a uniform ochreous grey, with brown irrorations; last joint of palpi with a black band at the tip: fore wing with two large green-black spots—first at costal fifth, with some red-brown scales beneath it, a sinuous pale line on each side, which circles round the spot at the costal edge, forming all together a subbasal band; the second is at the end of cell, a black dot in the middle, a pale medial red-brown band, more or less double, straight across the wing, except where it courses round the large cell-spot; a discal straight band, which is green-black, from below the costa to vein 5, crossed by the whitish veins, and a whitish transverse line down the black centre, some black and white costal marks: hind wing with a large green-black spot at lower end of cell, two near anal angle, and a medial double grey line touching the inner side of the large cell-spot; both wings with a submarginal highly sinuous band, the space from this to the outer margin darker than the rest of the wings; small black lunules close to the margin and grey cilia with pale basal line: underside grey; fore wings tinged with pale red, small cell-spots; a medial sinuous reddish line across both wings; a broad blackish band, smeared with greyish, and black lunules near outer margin as above.

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

Jaintia Hills.

#### *Egnasia costalis*.

*Acharya costalis*, Moore, P. Z. S. 1883, p. 28, pl. vi. fig. 10, ♂.

The type specimen is a male from the Andamans. I have now the other sex; it is in general coloration and in the disposition of the markings similar to the male, but the costal band of fore wings and the discal line of both wings are purplish black, instead of being ochreous white as in the male.

Port Blair, Andaman Island.

*Diomea diffusifascia*, nov.

♂. Palpi dark blackish brown, ochreous on the inner sides and at the tips of terminal joints; head, body, and wings of a uniform dark blackish brown, tinged with pink; some white marks on costa; four white points towards apex; a broad pinkish-grey diffused band, narrow towards costa, broadening downward to the hinder angle, covering nearly its outer half, the band containing a whitish angulated transverse line and many brownish marks and suffusions; some grey marks near apex, indicating a submarginal band, also slightly indicated on the hind wings, which are otherwise without markings; both wings with black marginal spots and black marginal line; cilia of fore wings brown with ochreous spots, of hind wings brown with ochreous tips: underside nearly black; fore wings with the discal band white and pure; apical portion blackish grey.

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

Sarawak, Borneo.

There is an example of this species in the B. M. from Borneo unnamed.

*Diomea almana*, nov.

♀. Palpi ochreous, a black band above at end of second joint, a black stripe above along terminal joint; head, thorax, and abdomen pinkish brown, with grey markings: fore wings with nearly the entire inner space smeared with pinkish grey, due to the thinness of the scaling; thicker scales at the base, along the costal apex and outer marginal portions dark pink-brown, forming the commencement of transverse bands divided by pinkish-grey lines, and the commencement of two white bands indicated on the costal third and two thirds by white marks; marginal line black, slightly running in on the veins: hind wings pink-brown, with several blackish-brown transverse bands; a black central angulated line, broadly suffused with white on the outer side; a blackish marginal band, with a broad white suffusion running through it; a marginal black festoon; cilia of both wings ochreous, with brown patches: underside uniform pale grey, with indications of a central transverse band.

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

Sarawak, Borneo.

*Diomea lichenosa*, Hmps., has a similarly smeared space on fore wings, but the markings are quite different.

## Genus RHESALA, Walker.

*Rhesala*, Walker, xv. p. 1776 (1858).

*Enea*, Walker, Journ. Linn. Soc. vii. p. 65 (1864).

*Daona*, Walker, *ibid.* p. 190.

*Vescisa*, Walker, *ibid.* p. 191.

*Raparna*, Moore, Deser. Ind. Lep. Atk. p. 177 (1882).

*Hingula*, Moore, *ibid.* p. 180.

*Byturna*, Moore, P. Z. S. 1833, p. 28.

*Rhesala mansueta*.

*Daona mansueta*, Walker, Journ. Linn. Soc. vii. p. 190.

*Byturna rufifascia*, Hmps. Ill. Het. B. M. viii. p. 100, pl. cxlviii. fig. 6 (1892).

*Raparna digramma*, Hmps. Moths Ind. iii. p. 24 (1895).

*Xanthoptera mansueta*, Swinh. Cat. Het. Mus. Oxon, ii. p. 57 (1900).

Sarawak, Borneo. Also from the Nilgiri Hills.

Sir George Hampson has put this form as one of the synonyms of the common Indian *Rhesala digramma*, Walker; but it is a good form and very constant. I have some fine specimens now from Sarawak, and am able to properly determine it; the type specimen is old and badly set, and would not bear much handling. I have three examples from the Nilgiri Hills; they are slightly larger, but otherwise identical.

*Rhesala asphalta*, nov.

♂. Ochreous brown, both wings crossed by many very fine brown striations; orbicular round, reniform ear-shaped, both pale-ringed; transverse lines dark brown, indistinct—first antemedial, nearly erect; second postmedial, from centre of hinder margin, outwardly oblique and sinuous, curving round the reniform to the costa; third submarginal and sinuous; costal margin with some pale points towards apex; one example has a deep black band filling up the inner space caused by the curve of the second line: hind wings with two indistinct pale discal lines, marked with brown on their inner sides towards the abdominal margin; both wings with black marginal lunules: underside uniform dark grey, pale points on costa of fore wings; black lunules on outer margins of both wings.

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

Dawson, Queensland.

Allied to *R. imparata*, Walker, but that species has a dark brown band behind the collar.

*Rhesala iada*, nov.

♂ ♀. Head, thorax, and fore wings bright orange-yellow,



irrorated with red, the thickness of the irrorations giving a dark shade to the costa, and broadly so to the outer marginal border; a black dot at the end of cell; antemedial and post-medial transverse brown lines or thin bands, nearly erect but very sinuous, almost zigzag; the disc with three rows of very fine black points, not always visible to the naked eye: hind wings ochreous grey, outer margin broadly smeared with dark red-grey; an indistinct sinuous medial brownish line; cilia of both wings with the inner half orange, the outer half white, divided by a brown line: underside brownish grey, whitish on the hinder border of fore wings; a sinuous, indistinct, brownish discal line across both wings.

Expanse of wings  $\frac{8}{10}$  inch.

Sarawak, Borneo.

Rather variable in shades of colour; some of my very long series are much paler and yellowish, nearly all the females are paler and more yellow than the males.

There is one example in the B. M. from Borneo unnamed.

Allied to *R. ochreipennis*, Moore, and *R. transversa*, Moore.

*Rhesala laevis*, nov.

♂. Pectus white; top of head and fore part of thorax whitish, rest of thorax and fore wings shining pink-grey, with an ochreous tinge, with sparse grey irrorations; a black dot at the end of cell; two indistinct blackish transverse discal lines, with some black dots on them; blackish points also close on the veins to the outer margin; cilia ochreous grey, with pale ends: hind wings pale ochreous grey, darkest on the outer half; cilia pale pink, with white ends: underside of a uniform pale ochreous grey, shining, without any markings.

Expanse of wings 1 inch.

Coomoo, Queensland.

There is an example of this species unnamed in the B. M. from West Australia (Quadrifidæ, drawer 224).

[To be continued.]

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LXIII.—*The Mechanism of the Protrusion of the Tongue of the Anura*.—Preliminary Note. By Prof. MARCUS HARTOG, M.A., D.Sc., F.L.S.\*

FOR an explanation of the mechanism whereby the Anurous Batrachia protrude and reverse their tongue one may seek in

\* Translated by the Author and slightly modified. From the 'Comptes Rendus de l'Académie des Sciences,' March 4, 1901.

vain in general textbooks of zoology and in special monographs. Almost all authors have been content to repeat after Fixsen that the genioglossus muscles are the "protractors" and the hyoglossus muscles the "retractors," though the frog has served as the object for the initiation of the student into the problems of anatomy and physiology for over forty years. As my own annual course begins with the study of the frog, this gap in our knowledge had long preoccupied me. A very simple experiment has sufficed to fill this gap and to demonstrate how the frog throws forth its tongue and turns it through an angle of  $180^{\circ}$ .

If we expose the tongue by removing the upper jaw and front of the skull (cutting straight across behind the eyes with a pair of stout scissors), remove the skin of the lower jaw, and then inject air or liquid through a small hole in the mylohyoid (mandibular) muscle, the tongue rises up and springs forward, especially if, at the same time, we draw forward the hyoid bone. Again, if we inject with melted cocoa-butter coloured with carmine or alkanet, and keep up the pressure till the mass sets, we find that it fills an enormous lymph-sac between the muscle and the body of the hyoid, extending through a median intermuscular fissure into the tongue itself, sending branches between the fan-shaped ramification of the intrinsic muscles at the edges of the tongue and into its terminal dilatations.

The whole mechanism is now obvious. The petrohyoids raise the hyoid bone and commence its protraction, an action continued by the geniohyoids. The genioglossi and hyoglossi may co-operate to some extent at first, shortening the tongue, and so expanding its cavity; but it is the MYLOHYOID which by its contraction expels the lymph of the subhyoid space into the tongue, and is the true "protrusor linguæ" muscle. In retraction the intrinsic muscles pull the tip of the tongue backwards, and the median portion of the genioglossi especially pull its base downwards and inwards. The sternohyoids and omohyoids retract the body of the hyoid bone, with its attachments to the tongue, and the closure of the mouth by the levators of the mandible presses the tongue against the roof of the mouth, and so expels the lymph from its cavity. Clearly this sudden propulsion of the tongue of the Anura is an erection, and is thus comparable with the sluggish protrusion of the foot in Lamellibranchs, also too often miscalled a "protraction."

Silvestro Baglioni, in his recent remarkable solution of the problem of the respiration of the frog\*, hithertomisunderstood,

\* In Arch. f. Anat. u. Physiol., Physiol. Abth. 1900, Suppl. Bd. p. 36.

has noted that during the contraction of the mylohyoid the tongue "wird nach vorn und oben gezogen." For the further development of this movement into the protrusion of the tongue all that is required is the further simultaneous advance of the hyoid bone and a more complete contraction of the mylohyoid muscle.

I propose completing this study with a detailed account of the dissection of the structures involved, for which I am awaiting the supply of larger objects than the common grass-frog, which is alone at my disposal at Cork.

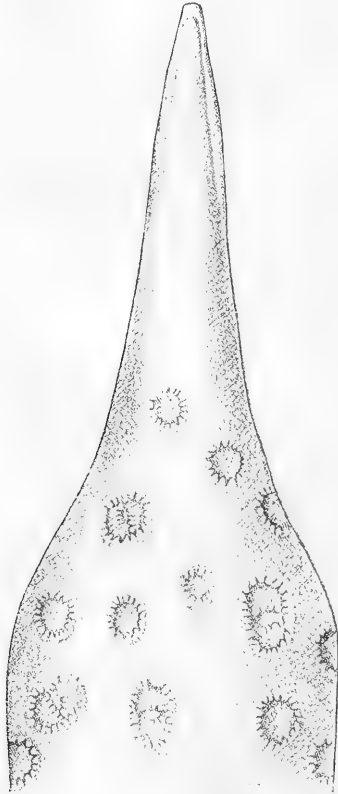
LXIV.—*Note on a Dolphin showing traces of an Encounter with a Cuttlefish.* By Professor D'ARCY W. THOMPSON, C.B.

A SPECIMEN of *Grampus griseus* which I obtained last Christmas at Galway set me thinking of the curious markings which have been often described as present on this species, though I did not find them on this particular specimen. These markings are well figured in Flower's paper in the 'Transactions of the Zoological Society' (vol. viii. pl. i.); and the suggestion first made by Capt. Chaves, of Ponta Delgada\*, that they are the traces of encounters with large cuttlefishes is now well known and generally accepted. The purpose of this note is to call attention to a very much older figure of a dolphin on which a great cuttlefish has left his unmistakable marks.

The annexed figure is a copy of that on pl. xxviii. (Mammifères) fig. 2, of the 'Voyage de l'Astrolabe,' and represents the lower surface of the head of *Delphinus novæ-zelandiæ*, Q. et G., a somewhat doubtful species very closely resembling *D. delphis*. On p. 150 of the text the authors say:—"On remarque sous la mâchoire inférieure des pores formant de petits anneaux; et sur le corps, de petites plaques de stries blanches assez régulièrement contournées." This statement appears again in Gray's 'Catalogue of Seals and Whales,' p. 246. A glance at the figure will show that the so-called pores are the clear impressions of the suckers of a cuttlefish. The dolphin itself was 5 feet 10 inches long, and we may judge from the figures that the sucker-rings were about, or very nearly, an inch in diameter. We may, perhaps, go a

\* In Girard's "Céphalopodes des îles Açores," Journ. Sc. math. phys. e natur., Lisboa, (2) ii. 1892. Cf. also Richard et Neuville, Mém. Soc. Zool., Paris, vol. x. p. 102 (1897).

little further, and surmise that while these impressions were left by the suckers, the patches of "striae" were produced by tentacular *hooks*—in short, that the cuttlefish which made both was a giant *Onychoteuthis*. And on closer inspection of Flower's figure (already quoted), we seem to see there also



both the rounded impressions of suckers and the deeper longitudinal scores of hooks. MM. Richard and Neuville, in the case of the grampus they describe, are inclined to ascribe both sets of markings to the action of suckers, and suppose them to have been made by an *Architeuthis*.

I am inclined to ascribe to a similar origin certain markings that various other authors have described without venturing to attribute them to a definite cause. Prof. Van Bambeke, in a paper on the hair-follicles of the upper jaw in *Tursiops* (Bull. Acad. Roy. Belg. 1888), has quoted certain of these

observations, pointing out that some, but not all, are to be looked upon as the traces of rudimentary hairs. For instance, Dr. A. Fjelstrup, of Copenhagen (Zool. Anz. xi. p. 14, 1888), writes as follows:—"Bei den meisten in Midvag getöleten *Globocephalen* zeigte die Haut, zumal in der Unter- und Oberkieferregion, eine Menge kreisförmiger Porenfiguren, in Grösse und Anordnung individuell sehr verschieden. Die Kreise haben meistens einen Durchmesser von 0.5–1 cm., einzelne bis über 1.5 cm. Die Anzahl der Poren in jedem Kreise variiert der Grösse gemäss von etwa 20–50; ihr Durchmesser ist durchschnittlich 0.16 mm. Es finden sich sowohl unvollständige, sich schneidende oder beinahe concentrische Kreise als vereinzelte Poren." The general description of these structures, their size, the manner in which the circles intersect or overlap, their irregular arrangement, in various parts and on some individuals only, and the further statement that no sign of them is visible in the foetus, all incline me to think that here also we have to do with scars left by a cuttlefish. Similar structures have evidently been observed in *Globocephalus* by Bennett, quoted by Eschricht and again by Fjelstrup:—"On the head, and chiefly around the lips, the skin is marked with many scattered circles, each the size of a sixpence, and composed of a single row of small depressed dots, which would appear to mark a disposition to the formation of vibrissæ or whiskers." I need hardly repeat that I do not agree with this interpretation of their cause.

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LXV.—*A List of Californian Diatoms.*

By C. MERESCHKOWSKY.

[Concluded from p. 480.]

133. *Campylodiscus Thuretii*, Bréb. San Pedro, Monterey, not rare. [M.]
134. *Striatella unipunctata*, Agardh. San Pedro, Monterey, not rare. [M.]
135. *Rhabdonema lineare*, Mer. Common in Northern California; Monterey, rare; San Pedro, very rare. [M.]

This species has been described and figured in my paper "On Polynesian Diatoms" (see chapter iv.).

136. *Rhabdonema*, sp.? (Pl. V. figs. 21, 22.) Northern California, rather rare. [M.]

Valve linear-rhombic or rhombic, strongly gibbous in the

*Ann. & Mag. N. Hist.* Ser. 7. Vol. vii. 35

middle, with rounded ends; length 0.04–0.140 mm., breadth 0.022–0.028 mm. Structure composed of costæ, which, however, are very indistinct, almost invisible with an ordinary magnifying-power, the intercostal alveoli forming parallel striæ becoming radiate near the ends, which are smooth. Pseudoraphe very narrow, sometimes indistinct. Number of striæ 5.5–6.5 in 0.01 mm. Number of puncta 8 in 0.01 mm. Girdle-face as in *R. arcuatum*, but with finer transverse costæ, usually 8 (from 6 to 10) in 0.01 mm.

Fig. 21 shows a valve as it appears under an ordinary magnifying-power, the costa not being seen and the rows of puncta resembling those of *Achnanthis brevipes*; fig. 22 is a part of the valve under a greater magnifying-power.

This species, which has probably already been described\*, but which for lack of necessary books I am unable to determine, is very frequent in the Aleutian Islands, and I possess it also in a slide labelled "California," without further indication of locality. Other species which this slide contains indicate that it comes from Northern California.

137. *Entopyla incurvata* (Arn.), Grun. Not rare in Southern California (Catalina; Clemente Islands and the coast, *Haliotus* washings); Californian guano. [M.]

Length 0.121–0.217 mm.; girdle-face of a large specimen 0.01 mm.; distance between two costæ 0.007 mm.

138. *Gephyria media*, Arn. Redondo Beach, not rare; Monterey, rare. [M.]

Length 0.196 mm., breadth of the girdle-face attaining 0.057 mm.; striæ 5 in 0.01 mm. Endochrome granular, composed of 30–40 large granules.

139. *Grammatophora angulosa*, Ehr. San Pedro, very rare. [M.]

140. *Grammatophora angulosa*, var. *hamulifera*, Kütz. San Pedro, Monterey, very rare. [M.]

141. *Grammatophora arctica*, Cl. Not rare in Monterey and in Northern California, rare in Southern (*Haliotus* washings). [M.]

Valve linear, very slightly attenuated towards the apices, breadth 0.007 mm.; striæ distinct, 12 in 0.01 mm., composed of distinct puncta; length of the frustule 0.028–0.054 mm., breadth 0.013–0.021 mm.; septa forming two or

\* If not, its proper name would be *R. gibbosum*.

three undulations, upper end bent in a hook as in *Gr. angulosa*.

142. *Grammatophora costata*, Mer., sp. n. (Pl. V. figs. 15, 16.) Monterey, very rare. [M.]

Valve somewhat broad, perfectly linear, with broadly rounded apices; structure composed of costæ 8·5 to 9 in 0·01 mm.; intercostal spaces with a double row of small but distinct puncta forming decussating rows, pseudoraphe rather indistinct. Length 0·0417–0·0565 mm., breadth of the valve 0·0115–0·0133 mm.; diameter of the openings 0·0076–0·013 mm.

I have seen only three valves of this species, which has the same structure of the valves as in *Achnanthes longipes* or *Diploneis Smithii*. The septa, as can easily be seen from fig. 16, form more than one undulation (probably two or three); the openings of the septa are quadrangular, in small specimens they are rounded.

143. *Grammatophora decussata*, Mer. Monterey, very rare. [M.]

For the description of this species see my paper "On Polynesian Diatoms."

144. *Grammatophora marina*, var. *communis*, Grun. San Pedro, Redondo, common; Monterey, not rare. [M.]

145. *Grammatophora marina*, var. *hawaiensis*, Mer. Monterey, rare. [M.]

Length 0·065 mm., breadth of the girdle-face 0·024 mm., diameter of openings 0·0065 mm. Described and figured in "Polynesian Diatoms."

146. *Grammatophora marina*, var. *macilentata*, W. Sm. San Pedro. [M.]

147. *Grammatophora maxima*, Grun. San Pedro, very rare. [M.]

This might be the *G. robusta*, Dippel. I do not understand the difference existing between the latter and *G. maxima*.

There are a number of other species and varieties of *Grammatophora* to be found in California, which, however, require further examination and a careful comparison with similar forms from other localities.

148. *Plagiogramma californicum*, Grev. San Pedro, very rare; Calif. guano. [Gv., M.]

Occurs in Californian guano. *Plagiogramma inaequale*, Greville, seems to me to be the same as this species.

149. *Plagiogramma pulchellum*, Grev. Californian guano. [Gv.]
150. *Plagiogramma pulchellum*, var. *ornata*, Grev. Californian guano. [Gv.]
151. *Plagiogramma validum*, Grev. Californian guano. [Gv.]
152. *Climacosphenia pacifica*, Mer. San Pedro, very common. [M.]

This species has been described and figured in my paper "On Polynesian Diatoms." The stypes are broad, elongated, and always contain in great number a small parasitic *Navicula*, so that at first glance the frustules of *Climacosphenia* appear to be sessile and fixed on some *Schyzonema*.

153. *Licmophora californica*, Grun. San Pedro, very common; Catalina Island, common; Redondo Beach, common; Monterey, rare. [G., M.]

Endochrome composed of numerous rounded granules. Stypes short, structureless, with dichotomic ramification, colonies small.

154. *Licmophora capensis*, Grun. Rather rare. [G., M.]

A sessile form.

155. *Licmophora debilis* (Kütz.), Grun. San Pedro, common; Catalina Island, very common on *Macrocystis*. [M.]

156. *Licmophora dubia*, Grun. San Pedro, very common; Catalina Island, rare; Monterey, rare. [M.]

Grunow considers this *Licmophora* as being a variety of *L. Jürgensii*, from which it differs by the strictly superficial septa, with septal puncta disposed on the extreme upper margin of the frustule. This characteristic, as well as a few others, being very constant in *L. dubia*, I prefer to regard it as a separate species, the more so as *L. Jürgensii* does not occur in the Pacific Ocean, while *L. dubia* is very common. This species seems to be a widely distributed one, reaching even the Indian Ocean (Sumatra).

In California the frustules are always sessile, while in the Black Sea they are fixed on somewhat elongated structureless stypes.

157. *Licmophora dubia*, var. *latior*, Mer. (Pl. V. figs. 10, 11.) Catalina Island, on *Macrocystis*, common. [M.]

Valve rather broad, cuneate, or elongated-ovoid, slightly and gradually attenuated from the summit to the inferior



apex, which is broad and rounded\* ; margins straight, superior apex broadly rounded. Pseudoraphe indefinite; striæ very fine, not less than 24–25 in 0.01 mm. Girdle-face narrow, cuneate, with rather delicate margins, upper angles rounded. Septa superficial, very thin, straight, septal puncta small, strongly marginal. Endochrome granular. Length 0.031–0.041 mm., breadth of the girdle-face 0.0077–0.0125 mm., breadth of the valve 0.010–0.011 mm.

This variety differs from the type species, into which it gradually passes, by its broader valves and the more delicate appearance of the frustule. The breadth of the valves of *L. dubia* is about 0.009 mm., sometimes only 0.006 mm. (and even 0.0053 mm.), while here they are never below 0.01 mm., and their form is somewhat different, being more ovoid.

158. *Licmophora flabellata* (Carm.), Agardh. Common. [M.]

159. *Licmophora flabellata*, var. *parva*, Mer. (Pl. V. figs. 12–14.) San Pedro, not rare; Monterey, very common. [M.]

I have quite a number of slides containing *L. flabellata* from the Black Sea, the Adriatic, the Mediterranean, the Californian coast, &c., in which this species, although greatly varying in size, is never represented by specimens below 0.117 mm., varying from 0.117 to 0.437 mm. In one gathering from Monterey, however, I found in great number a small form varying from 0.064 to 0.146 mm., usually being about 0.075–0.1 mm., in which larger individuals are very scarce, and this same form frequently occurs also in several gatherings from San Pedro and in one from Sumatra. These facts prove undoubtedly that such forms cannot be considered merely as small-sized individuals of *L. flabellata*, but rather represent a separate variety, peculiar as it seems to the Pacific and Indian Oceans.

The form of the valve, in the smaller specimens at least, is also somewhat different and the girdle-face is broader and more cuneate. I give here a series of individual measurements:—

Length :	0.064	0.068	0.068	0.072	0.082	0.083	0.090
Breadth of the frust. :	0.020	0.025	0.031	×	0.019	0.024	0.027
		0.094	0.098	0.100	0.127	0.146	
		0.021	0.020	0.031	×	0.020	

Breadth of the valve 0.007–0.008 mm.

\* Fig. 10 has been represented by the engraver as being slightly asymmetrical, which is not the case. The upper margin of fig. 11 ought to be straight.

160. *Licmophora lata*, Mer. (Pl. V. figs. 1-3.) San Pedro, Redondo Beach, very common; Monterey, common. [M.]

Valve broad, bottle-shaped, upper part somewhat linear or slightly attenuated to the summit, abruptly attenuated towards the lower third or fourth, becoming conical; lower apex somewhat narrow, rounded, upper broadly rounded. Pseudoraphe rather broad, very distinct, striæ very fine. Girdle-face moderately broad, cuneate, upper angles subrounded, upper margin convex; septa very deep, 0.012 mm. in average, arcuate; septal puncta distinct, round. Endochrome granular. Forming numerous colonies on long stypes composed of two layers, an external and a thinner but denser inner one; mode of ramification the same as in *L. dalmatica*, *L. gracilis*, and *L. paradoxa*. Length 0.055-0.077 mm., breadth of the girdle-face 0.028-0.041 mm., breadth of the valve 0.014-0.020 mm.

This species is nearly allied to *L. paradoxa*, from which it differs by the much broader valves of a somewhat different shape; the granules of the endochrome are rounded, while in *L. paradoxa* they are usually elongated, bacilliform, and the colonies are symmetrical, while in *L. paradoxa* one side of the colony is always more developed than the other.

161. *Licmophora Monksii*, Mer. (Pl. V. figs. 8, 9.) San Pedro, common; Redondo Beach, not rare. [M.]

Valve broad in the middle, slightly attenuated towards the superior apex, which is truncate, sometimes broadly rounded, more considerably attenuated towards the lower end, which is narrow; lower part forming an elongated cone with usually straight margins. Striæ fine, except at the lower end, where they are distinct under an ordinary magnifying-power, about 12-13 in 0.01 mm. Girdle-face (fig. 9) cup-shaped, with more or less convex margins, upper angles rounded. Septa very deep (average 0.007 mm.), very fine, almost straight and parallel, somewhat divergent above the septal puncta, the latter small, round, very distinct; secondary puncta large, adjoining the septa. Endochrome granular. Forming small colonies on short structureless stypes. Length 0.017-0.043 mm. (usually 0.025-0.035 mm.), breadth of the girdle-face 0.012-0.021 mm., breadth of the valve 0.007-0.008 mm.

The cup-shaped girdle-face of this species is a very peculiar character, not to be found in any other species. The secondary septal puncta (*a, a* in fig. 9), which usually are situated inwards of the septa, are here so close to the latter that, if not carefully examined, they can easily be mistaken for the septal

puncta themselves, the more so as they are larger than these latter. The deepness of the septa and their parallelism below the puncta, as well as the distinct striæ at the lower part of the frustule, contribute to make out of this species a very peculiar one. It has some relation only to *L. profunde-septata*, Mer., from the Mediterranean.

162. *Licmophora montereyana*, Mer. (Pl. V. fig. 6.) Monterey, very rare. [M.]

Valve narrow, linear in its upper half, abruptly attenuated in the middle, becoming again linear and very narrow in the lower quarter; superior apex broadly rounded, inferior inflated. Pseudoraphe invisible; striæ very fine, about 23 or more in 0.01 mm. Septa deep (0.0175 mm.). Length 0.119 mm., breadth of the valve 0.008 mm.

The valve of this species has a form similar to that of *L. remuloides*, Mer., from the Black Sea, but it is a very distinct species, the septa being deep and the lower apex inflated. It differs from *L. grandis* by the indefinite pseudoraphe, which is very distinct in the latter; the valve is also different. It has no close relation to any other species.

163. *Licmophora pacifica*, Mer. (Pl. V. figs. 4, 5.) San Pedro, not rare. [M.]

Valve broad, cuneate, ovoid in small individuals, sometimes slightly attenuated towards the summit, gradually tapering from the summit, which is broadly rounded, towards the narrow and subacute inferior apex; margins straight. Pseudoraphe and striæ distinct, the latter about 11–12 in 0.01 mm. Girdle-face broadly cuneate, with upper angles rounded, walls thick, inferior apex broad. Septa comparatively deep (average 0.0053 mm.), moderately arcuate; septal puncta round, very distinct. Endochrome granular. Sessiliform. Length 0.028–0.046 mm., breadth of the girdle-face 0.028–0.036 mm., breadth of the valve 0.0085–0.01 mm.

This species has a certain resemblance to *L. Lyngbyei*, to which it seems to be allied; it differs by the valves being sometimes ovoid, by the septa, which are not so deep, and the absence of stypes. The valves of larger specimens resemble somewhat those of *L. capensis*, Grun., but the septa are much deeper than in the latter.

164. *Licmophora paradoxa*, var. San Pedro, common. [M.]

This is not the type species, as represented by a form which is extremely abundant in Villefranche (Mediterranean);

the Californian form differs from the latter by its greater size, attaining 0.1 mm., usually 0.07–0.085 mm. (the type varies from 0.035–0.088 mm., average of thirty-three cases 0.054 mm.), and by the endochrome, which is always composed of numerous moderately elongate elliptic granules, while in the Mediterranean form they are usually very elongate, bacilliform, and not numerous. I give no name to this variety, as it requires further examination.

165. *Licmophora Thumii*, Mer. (Pl. V. fig. 7.) Monterey, common. [M.]

Valve of medium breadth, strongly clavate, slightly arcuate and asymmetrical, rarely symmetrical; upper part inflated, attenuated towards the superior apex, which is broad, truncate, abruptly attenuated at the superior quarter, becoming narrow and almost linear, inferior apex slightly inflated. Pseudoraphe broad, very distinct; striæ 16–17 in 0.01 mm., at the lower end as well as in the middle. Girdle-face cuneate, with rather thick outlines, upper angles subacute. Septa deep (average 0.016 mm.), slightly arcuate, thin below the septal puncta, thick above them. Length 0.098–0.188 mm., breadth of the valve 0.0115–0.0180 mm.

It is to Mr. Ed. Thum of Leipzig, the celebrated mounter of diatoms, who on many occasions assisted me in my studies, that I dedicate this species. It has no close relation to any other.

166. *Eunotogramma*, sp.? (Pl. V. figs. 24–27.) San Pedro, rare; Hawaii, rare. [M.]

I give the figures of a species of *Eunotogramma* which I have met many times, and which, for lack of necessary books, I am unable to determine. The striæ are sometimes fine, invisible with an ordinary magnifying-power (figs. 26, 27), sometimes distinct (figs. 24, 25), about 9 or 10 in 0.01 mm. Length 0.0175–0.023 mm., breadth of the girdle-face 0.011–0.013 mm., breadth of the valve about 0.007–0.008 mm.

167. *Raphoneis amphicerus*, var. *rhombica*, Grun. San Pedro, rare. [M.]

168. *Opephora pacifica* (Grun.), Petit. San Pedro, Monterey, common. [M.]

169. *Clavicula recens*, Mer. Northern California, very rare. [M.]

See my paper "On Polynesian Diatoms," chapter iv.

170. *Fragilaria (striatula, var. ?) californica*, Grun. [G.]

171. *Fragilaria coccochroma*, Mer. San Pedro, rare. [M.]

See my paper on the Diatoms of the Black Sea.

172. *Fragilaria hyalina* (Kütz.), Grun. San Pedro, rare. [M.]

173. *Fragilaria spicula*, Mer., sp. n. (Pl. V. fig. 17.) Santa Monica, rare. [M.]

Valve very narrow, lanceolate, with ends acute, length about 0.01 mm., striae invisible. Girdle-face very narrow, linear-lanceolate, with ends truncate. Forming small colonies in zigzag on very short narrow stipes, parasitic on *Nitzschia*. Endochrome composed of two narrow elongated plates asymmetrically disposed—one plate nearer to one end of the frustule, the second plate to the other end.

174. *Synedra affinis*, Kütz. San Pedro, not rare. [M.]

175. *Synedra affinis*, var. *parva*, Kütz. San Pedro, somewhat rare. [M.]

176. *Synedra grandis*, Mer. Monterey, common. [M.]

See my paper on the Diatoms of the Sea of Azof.

177. *Synedra investiens*, W. Sm. Santa Monica, on *Macrocystis*, very common. [M.]

178. *Synedra kamschatica*, Grun. Monterey, common. [M.]

179. *Synedra minuta*, Mer. San Pedro, not rare. [M.]

See my paper on the Diatoms of the Black Sea, parts i. & ii.

180. *Synedra nitzschioides*, Grun. San Pedro, not common. [M.]

A small form 0.053–0.056 mm. in length. Girdle-face quite straight. Endochrome granular.

181. *Synedra undulata* (Bail.), Greg. San Pedro, somewhat rare. [M.]

182. *Asterionella formosa*, Harr. (var. ?). Northern California. [M.]

183. *Chætoceros californicus*, Grun. (fossil?). From Wolle, Diat. Amer. pl. lxxv. fig. B.

184. *Chætoceros diadema* (Ehr.), Grun. San Pedro; Northern California. [M.]

185. *Chætoceros incurvus*, var. *angusta*, Mer. (Pl. V. fig. 23.) San Pedro, very rare. [M.]

Amongst the many endocysts of *Ch. incurvus* which I

have observed\* I have never seen such narrow elongated valves as represented in fig. 23. It seems therefore advisable to distinguish it as a separate variety. The puncta of the valve are also much larger, and there is a punctum to be seen at the bifurcation of the awns which does not exist in the type species. General length 0.031 mm., length of the body 0.018 mm., breadth 0.007 mm.

186. *Chætoceros lyra*, Mer. Northern California, very rare. [M.]

See my paper "On Polynesian Diatoms," chapter iv.

187. *Rhizosolenia setigera*, Brightw. San Pedro, rare. [M.]

Bristles very long, straight or arcuate, with a small bright punctum at the summit of the calyptra, or without it. Length of the frustule (without the bristles) 0.1 mm.

188. *Rhizosolenia Stolterfothii*, Per. San Pedro, rare. [M.]

189. *Rhizosolenia styliformis*, Brightw. San Pedro, rare. [M.]

190. *Skeletonema costatum* (Grev.), Cl. San Pedro, not rare. [M.]

191. *Stephanopyxis ferox*, Grev. San Pedro, rare; Calif. guano. [Gv., M.]

192. *Stephanopyxis turgida*, Grev. Calif. guano. [Gv.]

193. *Anaulus birostratus*, Grun. [V. H.]

194. *Biddulphia* (*Triceratium*) *alternans*, var. *tenuipunctata*, Mer. Northern California, very rare. [M.]

See my paper "On Polynesian Diatoms," chapter iv.

195. *Biddulphia* (*Triceratium*) *antediluviana* (Ehr.), V. H. San Pedro, very rare. [M.]

I have seen only one specimen, which was almost identical with the figure of Brightwell representing *Amphitetras tessellata* †, and could therefore be determined as well as *B. tessellata*. I fail, however, to see any difference between this latter species and *B. antediluviana*, except in the alveoli of the first species being less coarse (which is also the case in the specimen from San Pedro) and the margins of the valve less concave than in the second one, although in this regard *B. antediluviana*

\* I have given a figure of *Ch. incurvus* in my paper "Note on Diatoms from Chinchá Guano," in Ann. & Mag. Nat. Hist., November 1900.

† 'Diatomeentafeln zusammengestellt für einige Freunde,' pl. iii. fig. 11.

varies greatly. If the lesser coarseness should prove to be a constant character, then, of course, a separate variety—var. *tessellata*—could be established, as the true *B. antediluviana* of Europe has invariably very coarse alveoli; but having seen only one individual of that kind, I regard this case as an accidental one. Therefore the best would be, in my opinion, to unite *B. tessellata* and *B. antediluviana* in one species.

196. *Biddulphia* (*Triceratium*) *arctica*, Brightw. Northern California; Monterey, not rare. [G., M.]
197. *Biddulphia* (*Triceratium*) *arctica*, var. *tetragona*, Grun. Northern California, common; Monterey, rather rare. [G.]
198. *Biddulphia* (*Triceratium*) *montereyi*, Brightw.\* San Pedro, rare; Northern California. [G., M.]
199. *Biddulphia* (*Triceratium*) *sanpedroana*, Mer., sp. n. (Pl. IV. fig. 27.) San Pedro, not rare. [M.]

Differs from *B. (Amphitetras) punctata*, Grev.†, which is found in Ceylon, by the puncta or alveoli being more rounded and not so closely disposed, the margins of the valve not so deeply concave, and the processes less elongated, broader, and more rounded. There seems to be a difference also in the central part of the valve, which in *B. punctata* shows a well-defined central area with a few scattered granules.

The puncta are sometimes a little larger than represented in my figure, sometimes they are smaller and more distant, but the valve has always about the same shape, its processes never being so prominent and acute as in the type species. The central part of the valve is concave and the concavity has sometimes a quadrangular form with angles opposite to the middle part of the concave margins; if in such individuals the puncta are at the same time very small, they greatly resemble *B. elegans*, Grev. *B. (Triceratium) sanpedroana* is no doubt nearly allied to *B. (Triceratium) antediluviana*.

Number of puncta usually 3·5 in 0·01 mm. (from 3 to 4), greatest diameter (along a diagonal) 0·063–0·119 mm., smallest diameter 0·049–0·091 mm.

This diatom is widely distributed all over the Pacific Ocean. I have found it also in the fossil deposit of Redondo (California).

200. *Biddulphia* (*Triceratium*) *uncinnata*, Grun. (See Wolle, Diat. Amer. pl. cii. fig. 12.)

\* *Loc. cit.* pl. i. fig. 18.

† *Loc. cit.* pl. xliii. fig. 8.

201. *Biddulphia aurita* (Lyngb.), Bréb. San Pedro, rare ; Monterey, common. [M.]
202. *Biddulphia Baileyi*, W. Sm. San Pedro, rare. [M.]
203. *Biddulphia Edwardsii*, Febiger. Northern California, common. [G., M.]

Usually with 2-4 very robust spines.

204. *Biddulphia lævis*, var. *minor*. San Pedro, common ; Northern California, rare. [M.]

Diameter attaining 0.112 mm.

205. *Biddulphia longicrucis*, Grev. (Diatomeentaf. zus. f. e. Fr. pl. xxii. fig. 10). Calif. guano. [Gv.]
206. *Biddulphia pulchella*, Gray. San Pedro, very common. [M.]
207. *Biddulphia reticulata*, Roper. San Pedro, somewhat rare. [M.]
208. *Biddulphia reticulata*, var. *rhombica*, Mer. Northern California, very rare. [M.]
209. *Biddulphia Roperiana*, Grev. San Pedro, not very rare ; Calif. guano. [Gv., M.]
210. *Biddulphia simplex*, Mer., sp. n. (Pl. IV. figs. 28-30.) San Pedro, rare. [M.]

Valve delicate, membranaceous, elliptic-lanceolate, with ends acute, without spines or any visible structure. Girdle-face with lateral margins straight (fig. 29) or with valves being separated by only a very slight concavity (fig. 30, *a, a*) from the connecting membrane ; processes short, acute, middle part of the valve slightly convex, showing two concave arcuate lines uniting in the centre. Length of the valve 0.042 mm., breadth 0.018 mm.

211. *Biddulphia tumida*, Roper. (Diatomeent. zusamm. f. e. Fr. pl. xxvi. figs. 18, 19). Calif. guano. [Gv.]
212. *Biddulphia Tuomeyi*, Bail. Calif. guano ; San Pedro, rare. [Gv., M.]

In San Pedro I have seen a narrow valve 0.187 mm. in length and 0.042 mm. in breadth, probably belonging to a variety of this species.

213. *Biddulphia* (*Cerataulus*) *turgida*, W. Sm. San Pedro, rare. [M.]
214. *Porpeia quadrata*, Grev. (Diatomeentaf. zus. f. e. Fr. pl. lxxvii. fig. 20). San Pedro, very rare. [M.]



215. *Isthmia nervosa*, Kütz. Monterey, Santa Barbara, very common; San Pedro, very rare. [M.]
216. *Melosira Borreri*, Grev. San Pedro, very common. [M.]
217. *Melosira Jurgensii*, Ag. San Pedro, rare. [M.]
218. *Melosira nummuloides* (Bory), Ag. San Pedro, rare. [M.]
219. *Melosira sol*, Kütz. (*Cyclotella radiata*, Br. Diatomeent. zus. f. ein. Fr. pl. xxix. fig. 11.) San Pedro, common; Monterey, somewhat rare. [M.]
220. *Podosira Febigerii*, Grun. (Arct. Diat. p. 119). [G.]
221. *Podosira fusca*, Mer. San Pedro, rather rare. [M.]  
See my paper on the Diatoms of the Black Sea.
222. *Podosira maxima*, var. *californica*, Grun. (Arct. Diat. p. 118). [G.]
223. *Hyalodiscus subtilis*, Bail. Northern California, very common; San Pedro, not rare. [G., M.]
224. *Hyalodiscus subtilis*, var. *scotica* (Kütz.), Grun. San Pedro, not very rare. [M.]
225. *Eupodiscus californicus*, Grun. (V. Heurck, Synops. pl. cxviii. fig. 8). Gulf of California. [V. H.]
226. *Aulacodiscus circumdatus*, A. S. (A. S., Atlas, pl. xxxv. fig. 5; Wolle, Am. Diat. pl. lviii. fig. 7). [A. S.]
227. *Aulacodiscus Kittonii*, Arn. San Pedro, very common. [M.]
228. *Aulacodiscus oregonus*, Grev. San Pedro and Northern California, common. [V. H., M.]
229. *Aulacodiscus orientalis*, Grev. San Pedro and Northern California, very rare and somewhat doubtful. [M.]
230. *Auliscus sculptus*, var. *cœlata*, Bail. San Pedro, not rare; Northern California. [M.]
231. *Auliscus sculptus*, var. *punctulata*, Mer. Northern California, not very rare. [M.]  
See my paper "On Polynesian Diatoms," chapter iv.
232. *Actinoptychus heliopelta*, Grun. San Pedro, rare. [M.]
233. *Actinoptychus splendens* (Schadb.), Ralfs. San Pedro, not very rare. [M.]
234. *Actinoptychus undulatus*, Ehr. San Pedro, not rare. [M.]

235. *Asteromphalus elegans*, Grev. (Diatomeentaf. pl. xxi. fig. 6). Calif. guano. [Gv.]
236. *Asteromphalus flabellatus*, Grev. (Diatomeentaf. pl. xxi. figs. 4, 5). Calif. guano. [Gv.]
237. *Asteromphalus heptactis* (Bréb.), Ralfs (*Spatangidium Ralfsianum*). Calif. guano. [Gv.]
238. *Arachnoidiscus Ehrenbergii*, Bail. San Pedro, rather rare; Northern California, common. [M.]
239. *Arachnoidiscus ornatus*, Ehr. San Pedro, rather common. [M.]
240. *Stictodiscus californicus*, Grev. Calif. guano; San Pedro, not rare. [Gv., M.]
241. *Actinocyclus Ehrenbergii*, Ralfs. San Pedro, rare. [M.]
242. *Actinocyclus subtilis* (Greg.), Ralfs. Monterey, common. [M.]
243. *Coscinodiscus curvatulus*, Grun. Northern California, not very rare. [M.]
244. *Coscinodiscus excentricus*, Ehr. Northern Pacific, rather rare. [A. S., M.]
245. *Coscinodiscus gigas*, Ehr. San Pedro, rare; Northern California, very common. [M.]
246. *Coscinodiscus lineatus*, var. *leptopus*, Grun. San Pedro, rare; Northern California, rather rare. [M.]
247. *Coscinodiscus nitidus*, Greg. San Pedro, rare. [M.]
248. *Coscinodiscus nitidus*, var. *radiata*, Mer. San Pedro, rare. [M.]
249. *Coscinodiscus radiatus*, Ehr. San Pedro, very common; Northern California, not rare. [M.]
250. *Coscinodiscus radiatus*, var. *centralis* (Ehr.), Rattr. San Pedro, rare. [M.]
251. *Coscinodiscus radiatus*, var. *concinna*, W. Sm. Northern California, rather rare. [M.]
252. *Coscinodiscus radiatus*, var. *oculus iridis*, Ehr. San Pedro, rare; Northern California, not rare. [M.]
253. *Coscinodiscus subtilis* (Ehr.?), Grun. San Pedro, not rare; Northern California, rather common. [M.]

## EXPLANATION OF THE PLATES.

## PLATE IV.

- Fig. 1. *Nitzschiella tenuirostris*, Mer. (typica). San Pedro.  $\frac{600}{1}$ .
- Fig. 2. Ditto. *a*, valve; *b*, girdle-face. San Pedro.  $\frac{600}{1}$ .
- Fig. 3. Ditto. San Pedro.  $\frac{600}{1}$ .
- Figs. 4, 5. *N. tenuirostris*, forma *directa*. San Pedro.  $\frac{600}{1}$ .
- Fig. 6. *N. tenuirostris*, var. *hamulifera*, Mer. Mediterranean (Villefranche).  $\frac{600}{1}$ .
- Fig. 7. Ditto. Diagram showing the spiral torsion of the ends.
- Fig. 8. *N. tenuirostris*, var. *parva*, Mer. Valve. Black Sea (Theodosia, Crimea).  $\frac{600}{1}$ .
- Fig. 9. Ditto. Girdle-face of the same individual.
- Fig. 10. Ditto. San Pedro.  $\frac{600}{1}$ .
- Fig. 11. *N. tenuirostris*, forma *minutissima*. San Pedro.  $\frac{600}{1}$ .
- Fig. 12. *Nitzschiella gracilis*, Mer. (typica). Valve. San Pedro.  $\frac{600}{1}$ .
- Fig. 13. Ditto. Girdle-face of the same individual.
- Fig. 14. *N. gracilis*, var. *reversa*, Mer. San Pedro.  $\frac{600}{1}$ .
- Figs. 15-17. *Nitzschiella biplacata*, var. *pacifica*, Mer. Figs. 15 & 17, valves; fig. 16, girdle-face. San Pedro.  $\frac{600}{1}$ .
- Figs. 18-20. *Nitzschiella californica*, Mer. Fig. 18, valve; figs. 19 & 20, girdle-faces. Redondo, California.  $\frac{600}{1}$ .
- Fig. 21. *Cylindrotheca gracilis* (Bréb.), Grun. San Pedro.  $\frac{600}{1}$ .
- Figs. 22, 23. *Mastogloia (Orthonoia) Wrightii*, O'Meara. Northern California.  $\frac{900}{1}$ .
- Fig. 24. Optical section through a frustule of *Navicula forcipata*, Grev.  $\frac{900}{1}$ .
- Fig. 25. *Navicula (Rhoiconoia) genuflexa*, Kütz., with cell-contents. San Pedro.
- Fig. 26. *Diploneis papula*, A. S., with cell-contents. San Pedro.
- Fig. 27. *Biddulphia (Triceratium) sanpedroana*, Mer. San Pedro.  $\frac{600}{1}$ .
- Figs. 28-30. *Biddulphia simplex*, Mer. San Pedro. Figs. 28 & 29  $\frac{600}{1}$ .

## PLATE V.

- Figs. 1-3. *Licmophora lata*, Mer. San Pedro.  $\frac{600}{1}$ .
- Figs. 4, 5. *Licmophora pacifica*, Mer. In fig. 4 the striæ are not represented. San Pedro.  $\frac{660}{1}$ .
- Fig. 6. *Licmophora montereyana*, Mer. Monterey.  $\frac{600}{1}$ .
- Fig. 7. *Licmophora Thumii*, Mer. Monterey.  $\frac{600}{1}$ .
- Figs. 8, 9. *Licmophora Monksii*, Mer. San Pedro.  $\frac{900}{1}$ .

- Figs. 10, 11. Licmophora dubia*, var. *latior*, Mer. Santa Catalina Island.  $\frac{600}{1}$ .
- Figs. 12-14. Licmophora flabellata*, var. *parva*, Mer. *Figs. 12 & 13*, San Pedro; *fig. 14*, Monterey.  $\frac{600}{1}$ .
- Figs. 15, 16. Grammatophora costata*, Mer. Monterey.  $\frac{600}{1}$ .
- Fig. 17. Fragilaria spicula*, Mer., fixed on a *Nitzschia*. Santa Monica.  $\frac{900}{1}$ .
- Figs. 18-20. Nitzschia spiralis*, Mer.; the same frustule in three different positions. San Pedro.  $\frac{600}{1}$ .
- Fig. 21. Rhabdonema*, sp. Northern California.  $\frac{600}{1}$ .
- Fig. 22. Ditto.* Part of a valve at  $\frac{900}{1}$ .
- Fig. 23. Chatoceros incurvus*, var. *angusta*, Mer. San Pedro.  $\frac{600}{1}$ .
- Figs. 24-27. Eunotogramma*, sp. San Pedro.  $\frac{900}{1}$ .

LXVI.—*Two new Genera of Coleoptera belonging to the Cupesidæ and Prionidæ.* By CHAS. O. WATERHOUSE, F.E.S.

THE British Museum has lately received a small collection of Coleoptera from Rio Janeiro. It contained two remarkable genera, which I have no hesitation in describing as new. One belongs to the Cupesidæ, but differs from all known species in the form of the head and in having smooth antennæ; the other to the aberrant Prionidæ, and is allied to *Mysteria*.

Cupesidæ.

TETRAPHALERUS, gen. nov.

General form and characters of *Cupes*. Head elongate, narrowed anteriorly. Eyes somewhat prominent. Antennæ smooth and shining, nearly as long as the head and thorax taken together, widely separated, placed in a deep impression near the base of the mandible, the impression continued posteriorly beneath the head close to the eye and forming a deep channel, so that the antenna can lie in it when at rest. The two grooves are rather wider posteriorly, so that the flat under surface of the head between them is narrower behind than in front. The mentum is small, concave, longer than broad, obliquely narrowed in front, rectilinear at the sides. [The palpi are wanting.] The maxillary palpi have the apical joint fusiform, rather more narrowed at the base than at the apex. Mandibles very prominent, incurved and enlarged at the apex, where they are bisinuate. Thorax a

little narrower than the head, arcuately narrowed in front, a little longer than broad, margined. Scutellum small, rounded posteriorly. Elytra elongate, gradually widened posteriorly and then arcuately acuminate. Metasternum large, rather flat; the episterna wide, a trifle narrower posteriorly than in front. Anterior coxæ subglobose, moderately prominent. Intermediate coxæ contiguous, gently convex, parallel, longer than broad. Posterior coxæ triangularly enlarged interiorly, attenuate towards the sides. Tarsi rather long, hairy beneath, five-jointed, the posterior pair with the basal joint as long as the three following taken together; the second and third joints rather broad, crescent-shaped, with the apical angles produced; the fourth joint somewhat similar, but smaller and narrower. The abdomen is very gently convex, even, not transversely folded. Body clothed with scales.

This remarkable insect is closely related to *Cupes*, but differs in the extraordinary form of the head. The antennæ are smooth and shining, and when at rest lodge in two deep grooves on the underside of the head. The structure of the tarsi is also different, and they are more hairy beneath.

*Tetraphalerus Wagneri*, sp. n.

Elongatus, griseo-fuscus, opacus; capite elongato, pone oculos quadricristato; antennis piceis, nitidis; thorace elongato, anticè arcuatim angustato, supra tuberculis nonnullis piceis ornato, marginibus cariniformibus, obtuse serrulatis; elytris carinatis. Long. 15 mm.

*Hab.* Rio Janeiro, Cerra das Organas (*E. R. Wagner*).

The head in front of the eyes is slightly narrowed, flattened above, truncate in front; behind the eyes it is wider, longitudinally impressed between the posterior crests. Above each eye there is a short transverse crest, and at the back of the head on each side a longer, slightly curved, oblique crest. The antennal grooves beneath are very strong and have on the outer angle of the posterior opening a somewhat triangular prominence, which is visible when looking at the insect from above. The mandibles are very prominent, vertically compressed and dilated, bisinuate at the apex. The antennæ are scarcely so long as the head and thorax together, slender, smooth; the basal joint is not very large, the second smaller, the third and fourth slightly elongate, the following joints longer, the terminal one somewhat acuminate. The thorax is a little narrower than the head, longer than broad, arcuately narrowed in front, gently convex, clothed with grey scales, with a few scattered pale sandy scales; the sides posteriorly

subparallel, with a serrulate margin. The front margin has two dark lamelliform tubercles; there are two smaller ones in the middle of the base; and the front half of the disk has two converging lines of small tubercles, with three dark ones on each side. The elytra are one and three quarters the length of the thorax and head taken together, clothed with fuscous scales, with a few sandy-coloured ones here and there on the costæ and at the sides. The suture is raised and it projects slightly at the apex. Each elytron has three marked costæ, the one arising from the shoulder not so distinct as the others.

**Prionidæ** (aberrant).

**PATHOCERUS**, gen. nov.

Head rather small. Eyes slightly separated above, nearly touching each other below. Antennæ the length of the elytra, the third to tenth joints emitting a long branch. Labial palpi with the basal joint very small, the second very long; the third a little shorter than the second, slightly enlarged towards the apex. The maxillary palpi very long: the basal joint short; the second very long, at least as long as the two following joints taken together, rather slender; the third and fourth joints subequal; the apical joint widened moderately at the apex, which is arcuately rounded. Mandibles very prominent, falcate, strongly angular about the middle on the outer side (the right mandible with a triangular expansion), the apices acute, the inner edge bidentate. The epistome acuminate. Thorax rather small, rather flat, a little broader than long, broadest a little in front of the middle, obliquely narrowed in front, slightly narrowed posteriorly, the anterior part of the margin reflexed. Scutellum obtuse at the apex, almost truncate. Elytra three times the length of the head and thorax taken together, at the base much broader than the thorax, narrowed towards the apex; each elytron with four slightly raised costæ. Prosternal process rather narrow, grooved, curved down posteriorly. Metasternum rather large, the episterna broad at the base, acuminate posteriorly. Legs long and slender. Tarsi slender, the middle pair a little longer than the tibiæ, the posterior pair a little shorter than the tibiæ; the first and second joints elongate, narrow, the second a little shorter than the first; the third shorter, elongate-triangular, emarginate at the apex; the fourth very small, but distinct.

This genus is closely allied to *Mysteria*; it differs chiefly in having the antennæ branching, and in the form of the palpi.

*Pathocerus Wagneri*, sp. n.

Elongatus, pallide piceus, nitidus; thorace disco sat planato, sat crebre evidenter punctato, lateribus impressis, confertim subtilius punctatis; elytris crebre sat fortiter punctatis, quadricostatis, singulo ad apicem spina brevi armato; pectore fulvo-pubescenti. Long. 30 mm.

*Hab.* Rio Janeiro, Cerra das Organas (*E. R. Wagner*).

The antennæ have the two basal joints shining, the rest are entirely dull; the eleventh joint is one third the length of the whole antenna, compressed, curved; the branches of the preceding joints resemble the eleventh joint in form, but diminish gradually in length from the ninth to the third. The thorax is rather flat on the disk, impressed at the base, moderately closely punctured; the sides slope away from the disk and are densely and more finely punctured; the reflexed margins, however, are smooth. The elytra are slightly dilated below the shoulders, rather closely and strongly punctured, and towards the sides and apex obliquely rugulose.

LXVII.—*Descriptions of Seventeen new Genera of Ichneumonidæ from India and One from Australia.* By P. CAMERON.

[Concluded from p. 487.]

MYERMO, gen. nov.

Hind coxæ with a stout tooth on the underside at the apex. Mandibles with one longish apical tooth. Clypeus convex, separated from the face. Antennæ slightly dilated towards the apex. Scutellum flat. Median segment completely areolated, its spiracles linear, not greatly elongated. Areolet large, 5-angled, wide at the top. Legs of normal size, the tarsi thickly spinose. Abdomen with seven segments, the apical large, uniformly projecting above and at the sides, its apex sharply pointed; the petiolar spiracles placed on the middle of the postpetiole; the ventral keel on the second and third segments only.

The suture separating the clypeus from the face is wide and shallow; the labrum is hidden, the occiput is margined. Legs stout; the tarsi spinose; the tooth on the hinder coxæ is large, is placed on the apex, and is rounded behind on the

side nearest the trochanters. The postpetiole is broad, somewhat as in the *Platyuri*; the apical segment of the abdomen is not quite so bluntly pointed as in the *Amblypygi*, but blunter than in the *Oxygygi*; it is large, fully two thirds the length of the penultimate; the ovipositor projects.

This genus seems to be intermediate in some respects between the *Amblypygi* and the *Oxygygi*; the apex of the abdomen is not quite so bluntly pointed as in the typical *Amblyteles*, but it is fully developed as in that genus; the antennæ are pretty much as in the *Joppina*. Its nearest ally is perhaps *Setanta* of the genera having the mandibles with only one apical tooth. *Setanta* may be known from it by the labrum being visible, by the apex of the mandibles being blunter, by the occiput not being so deeply excavated; the abdomen is longer, being fully twice the length of the thorax, whereas in *Setanta* it is not much longer than it; the apex of the femora does not reach to the apex of the third segment, while in *Setanta* the femora reach beyond the sixth.

Of the four Nearctic and Palæarctic genera of Heresiarchini, *Plagiotrypes*, Ashm., may be known from it by the large head, strongly concave behind the temples, the "cheeks full, buccate," and the metathorax bidentate; *Heresiarches* has the metathoracic areola semicircular, smooth, and shining, and the gastrocœli are linear and placed longitudinally; *Rhexidermus* has the scutellum margined laterally to beyond the middle, and the thyridia occupy the entire breadth; and *Stenodontus* has the metathoracic, basal, and lateral areas confluent. Characteristic is the stout tooth on the posterior coxæ.

*Myermo rufipes*, sp. n.

Niger, albo-maculatus; pedibus ferrugineis, coxis, trochanteribus tarsisque nigris, basi coxarum alba; alis fere hyalinis, stigmatibus testaceo, nervis fuscis. ♀.

Long. 13 mm.

Antennæ black, the seventh to eighteenth joints of the flagellum white, the apex of the flagellum fuscous, slightly compressed, and distinctly narrowed. Head black; the sides of the clypeus, the inner orbits (broader below than above), and the lower third of the outer broadly yellow. Face and clypeus closely and somewhat strongly punctured, the clypeus thickly covered with short silvery pubescence; the lateral foveæ large; the apex rufous; palpi yellowish, darker at the base. Thorax closely punctured; a line on the pronotum, extending from near the base to the apex, two small somewhat ovate marks in the middle of the mesonotum, the



scutellum, postscutellum, a large mark on the metapleuræ behind the spiracles and reaching to and enclosing the spines, the tubercles, and a square mark (smaller than the one on the metapleuræ) on the base of the mesopleuræ on the lower side, yellow; the apex of the propleuræ closely longitudinally striated in the middle; the metanotum closely rugosely punctured; the sides on the apical slope stoutly irregularly reticulated; the supramedian area is large, wider than long; the sides at the base rounded, the apex transverse; the base of the posterior median area is closely reticulated, the apex more strongly, irregularly, transversely striated. Legs rufous; the coxæ and trochanters black; the knees are black and the tarsi also, except the anterior at the base; the anterior femora and tibiæ are tinged with yellow in front; the calcaria dark rufous. Wings hyaline, their basal half with a distinct fulvous tinge; the stigma and nervures testaceous; the arcolet 5-angled, at the top it is one third the length of the bottom; the recurrent nervure is received shortly beyond the middle. Abdomen black, the apex of the petiole and a large mark on the sides of all the segments at the apex yellow; petiole smooth and shining, except a shagreened space on the base of the postpetiole; the second and third segments are minutely and closely punctured; the basal slope of the gastrocœli bears stout curved striæ.

#### FILEANTA, gen. nov.

Mandibles without teeth, becoming gradually narrowed to the apex, which is rounded. Clypeus not separated by a suture from the face, which is flat; the apex of the clypeus transverse, foveate at the sides above. Occiput sharply margined. Scutellum roundly convex, not carinate. Median segment completely areolated. Spiracles linear. Abdomen bluntly rounded at the apex, the ventral keel extending to the apex of the fourth segment; there are seven segments. Legs, and especially the posterior, long, the tarsi spinose. Wings as in *Ichneumon*. Antennæ long, serrate towards the apex. Labrum hidden. Gastrocœli shallow. Head largely developed behind the eyes and sharply and obliquely narrowed there.

The legs, and especially the hinder pair, are longer than usual; the apex of the hinder femora reaches to the end of the third segment; the claws are long. The postscutellum is not depressed laterally at the base.

I unfortunately only know the male of this genus. In the mandibles having no teeth it agrees with the *Heresiarchini*.

From *Myermo* it may be known by the convex scutellum, by the hinder coxæ having no tooth, the head is less strongly developed behind, and the gastrocœli are smaller and shallower. The nervure on the cubital discoidal nervure is distinct; the transverse basal nervure is not interstitial; the areolet is 5-angled and narrowed at the top; the last ventral segment is nearly as long as the penultimate and is well developed all round; the areola on the metathorax is wider than long, is rugose and angled where the keels are received; all the areæ are clearly separated and there is no lateral tooth. The occiput is transverse, in which respect it differs from *Myermo*; the ocelli are placed well back, the hinder behind the eyes.

*Fileanta balteata*, sp. n.

Nigra; antennis fulvis, ore, facie, mandibulis, palpis, linea pronoti, scutello, pedibus anterioribus, abdominisque segmentis late, flavis; femoribus tibiisque posticis rufis; alis fulvo-hyalinis, stigmatibus testaceo. ♂.

Long. 15 mm.

*Hab.* Simla.

Antennæ fulvous, distinctly tapering and darker towards the apex; the scape yellow, closely punctured. Face and clypeus strongly punctured, sparsely haired; the apex of the clypeus smooth, transverse, the sides rounded; the labrum not visible. Mandibles and palpi yellow, the base of the mandibles punctured; the apex black, indistinctly bidentate; the lower part of the head next to the mandibles with a distinct leaf-like projecting border and clearly separated from and at a lower level than the lower outer orbits, which are margined; the vertex punctured, the front transversely striated. Thorax black; the edge of the pronotum, the tegulæ, and scutellum yellow. Mesonotum closely and strongly punctured, thickly covered with short blackish hair; the parapsidal furrows not indicated, the middle lobe not defined. Scutellum roundly raised, shining, smooth, almost glabrous, the sides not carinate, the depression at its base of equal width throughout, narrow, smooth, and shining. Postscutellum closely shining, depressed at the base, the sides of the depression keeled. Median segment rugosely punctured; the basal areæ as long as the posterior median, which is wider than long; the sides at the base and apex slightly and obliquely narrowed; the lateral basal areæ are open on the outer side and are more strongly and more distinctly punctured than the middle; the apex of the segment is transversely rugosely punctured; the keels bounding the posterior median area are indistinct; the

teeth are blunt; the spiracular area rugosely punctured. The upper part of the propleuræ shining, bearing large distinctly separated punctures, the lower closely rugosely punctured, the lower edge yellow; there is an upper yellow line on the base and apex and an interrupted one in the centre. Mesopleuræ closely, strongly, and uniformly punctured; the basal keel yellowish on the underside; the apical depression crenulated; the tubercles elongate, yellow. The four anterior legs entirely lemon-yellow; the hinder coxæ black, punctured; the trochanters yellow; the femora rufous; the basal half of the tibiæ yellowish, the apical rufous, darker towards the apex; the tarsi yellowish. Wings fulvo-hyaline, the stigma fulvous, the nervures darker; the areolet narrowed at the top, being there in width not one half of the length of the space bounded by the first transverse cubital and the recurrent nervures. Petiole entirely black, the apex in the centre raised, shining, closely longitudinally striated, the depressed sides finely, closely, obliquely striated. The second and third segments closely punctured, the gastrocœli shallow except on the outer side; the base with a few stout keels; the second, third, and fourth segments are broadly yellow at the base; the apical segments are dull ferruginous, the basal ventral segments yellow, the others more or less blackish.

PÆCILOCRYPTUS, gen. nov.

Antennæ longish, the apical third distinctly thickened; the first three joints of the flagellum much lengthened. Parapsidal furrows distinct, reaching beyond the middle. Scutellum not much raised, its sides not keeled. Post-scutellum largely depressed on either side at the base. Median segment completely areolated; there are three rows of areæ, the central area is square; the segment is smooth and shining; the spiracles large, elliptical, behind them is a large curved keel which forms an area; in all there are eight areæ on the segment. Pterostigma large; the transverse basal nervure is interstitial or nearly so; the areolet is elongated, narrow, of equal width at base and apex; the cubito-discal nervure is slightly angled near the middle, where there is an indication of a stump of a vein; the apical abscissa of the radius is straight and oblique; the transverse median nervure in the hind wings is not broken, the subdiscoidal nervure being entirely absent. Legs stout, rather short, the claws simple. Abdomen smooth and shining; the petiole is not much dilated towards the apex and is slightly curved; the spiracles are placed shortly beyond the middle; there are

no gastrocelli or transverse depressions; the last segment is largely developed all round; the ovipositor is elongate.

The eyes are large and converge slightly above; the malar space is moderately large; the clypeus is separated from the face by a curved suture; the face is flat; the apex of the clypeus is depressed, clearly separated, and rounded. Mandibles bidentate. The mesosternum is largely, deeply, and triangularly depressed at the apex; there is a distinct longitudinal furrow on the lower side of the mesopleuræ. The head is narrower than the thorax; it is not much developed behind the eyes; the occiput is not quite transverse. The last dorsal segment is semicircularly depressed at the base; the metathorax is not produced beyond the insertion of the hind coxæ.

This genus is somewhat isolated and may, for the present, be placed in the Phygadeuonini; but it does not appear to have any near relationship with any known genus. Its characteristic features are the long semiclavate antennæ, the distinct parapsidal furrows, areolated metathorax, longish narrow areolet, and obsolete subdiscoidal nervure in hind wings. It has the appearance of a *Zanthopimpla*. The spiracles are placed further back (nearer the middle) than usual with the Cryptina, but not between the middle and the ase as with the Pimplides.

*Pæcilocryptus nigromaculatus*, sp. n.

Fulvus, late nigro-maculatus; pedibus flavis; coxis femoribusque posticis nigro-maculatis; alis hyalinis, nervis stigmatateque nigris. ♀.

Long. 9-10 mm.; terebra 5-6 mm.

*Hab.* Australia.

Antennæ black. Head smooth, shining, and bare; the centre of the face bordered by two shallow furrows. Mandibular teeth black. On the basal two thirds of the middle of the mesonotum is a large black line, which is somewhat dilated at the base and apex; there is a shorter broader mark close to the tegulæ, and the apex, with the scutellar depression, is black. The basal three areæ of the median segment are broadly black. Pleuræ smooth, bare, and shining; the middle of the mesopleuræ is roundly raised and bordered by shallow furrows above and below; the furrow over the mesosternum is wide and smooth. The basal three areæ on the median segment are wider than long, the middle three almost square; the middle apical is slightly and gradually narrowed towards the apex. The base of the hinder coxæ is

marked with a roundish black spot; the hinder femora have a large black mark on the inner and outer sides near the apex. The extreme base of the petiole is black; there is a large mark, slightly narrowed and narrowly incised on the middle, on the base of the second, two large marks roundly narrowed on the inner side on the third and fourth, a broad line, somewhat interrupted in the middle, on the fifth, a narrower, straight, complete line on the sixth, and a mark, rounded at the apex, on the seventh, black. The wings are clear hyaline and brightly iridescent; the stigma and nervures are deep black; the recurrent nervure has a sharply oblique slope towards the apex of the wing, and is received near the apex of the basal third of the areolet.

The recurrent nervure having an oblique slope is probably a characteristic feature with this genus. The radial cellule is deeper in the middle compared with its length than in *Cryptus* or *Phygadeuon*.

#### *The Genus Labium, Brullé.*

This genus was founded by Brullé in 1846 on a male insect from New Guinea (Hymén. iv. p. 316). It was placed by Brullé next to *Tryphon*, and does not appear to have been noticed by any subsequent author. I have in my collection a male from Australia which agrees in the main with the generic description of the French writer. The genus cannot be placed in the Tryphonides; if anywhere, it should be placed in a tribe of the Ichneumoninæ either as a separate tribe or as an aberrant member of the Joppini. It has the metanotal characters of the latter, and agrees with that tribe more particularly in having a depression between the metanotum and the postscutellum, and in the areola being confluent with the petiolar area. It differs, however, from the Joppini and from the Ichneumonini in the male antennæ not being long, slender, and more or less serrate, but short, stout, almost clavate, and not like the usual male antennæ at all. Noteworthy is the large projecting labrum; the postpetiole is not so clearly separated as it is in most Joppini, but this is a point in which that tribe shows some variety. The spiracles are certainly placed nearer the middle than in *Joppa*. The recurrent nervure is peculiar from its being sharply angled backwards in the middle and from being interstitial. In view of so little being known of the genus, and as Brullé's description omits many important peculiarities, I have ventured to give a detailed description of the genus:—

♂. Antennæ short, not much longer than the abdomen, stout, becoming perceptibly thickened towards the apex; the basal

three joints of the flagellum elongate, distinctly longer than broad and becoming successively shorter, the last one is conical and longer than broad; the intermediate joints are short, broader than long. Head obliquely narrowed behind the eyes; the occiput margined. Eyes reaching to the clypeal foveæ; the malar space as long as the scape of the antennæ. Face flat; the clypeus is more roundly convex; the foveæ deep; the apex of the clypeus is broadly rounded. Labrum largely projecting, nearly as long as the clypeus; its apex is rounded. Mandibles ending in a rather large somewhat triangular tooth; the subapical tooth is blunt and does not project. The middle of the mesonotum is raised at the base, but there are no parapsidal furrows. Scutellum roundly convex, large; its basal depression large and deep. Postscutellum roundly convex. Median segment obliquely depressed at the base, so that there is a hollow behind the postscutellum; it is regularly areolated, except that the basal two central areas are confluent; the spiracles are long, curved, and rounded at the base and apex. There is no suture separating the mesopleuræ from the mesosternum. Legs stout; the hinder femora are much thicker than the others; the hinder coxæ are large, their apical half is roundly dilated; the basal joint of the hinder trochanters is much larger than the other and is almost transverse at the apex, its inner side is broadly rounded; the outer joint is long and becomes gradually narrowed towards the base. The calcaria are short; the tarsi spinose; the claws are long, bare, and curved. Areolet 4-angled, the top half the length of the bottom; the recurrent nervure is angled backwards in the middle; the upper and lower parts have a straight oblique slope and form a sharp angle; there is no stump of a nervure on the disco-cubital nervure; the transverse basal nervure is interstitial; in the hind wings the subdiscoidal nervure issues from halfway between the middle and the bottom. Petiole longer than the second segment; the apical part becomes obliquely and gradually widened towards the apex from the stigmas, which are placed shortly behind the middle; above it forms a broad curve. There are eight abdominal segments; except the basal two they are all broader than long; there are no gastrocœli; the ventral fold is large and extends to the fifth segment; the last segment is short, broad, and transverse at the apex.

*Labium ferrugineum*, sp. n.

Ferrugineum, facie, clypeo, labro, coxis trochanteribusque flavis; alis hyalinis, nervis stigmatæque nigris. ♂.

Long. 10 mm.

Scape of antennæ pale yellow beneath; the flagellum black, the apical half brownish beneath. Face, clypeus, and labrum smooth and shining, the middle sparsely and minutely punctured. Mandibles black towards the apex. Front and vertex smooth. Pro- and mesothorax smooth and shining; the scutellum is yellow, except in the middle at the base. The base, upper part, and centre of the median segment smooth and shining, the rest rugosely punctured; the posterior median area becomes gradually narrowed from the base to the apex and is keeled down the middle. Pro- and mesopleuræ smooth and shining; the tubercles are large and pale yellow, and there is a yellow mark below them; the upper half of the metapleuræ is smooth, the rest closely and distinctly punctured. Legs coloured like the body, except that the four anterior are more or less pale yellow in front; the hinder tarsi are black towards the apex, as are also the hinder tibiæ. Wings clear hyaline, the stigma and nervures black. Abdomen smooth and shining; the ventral fold pale yellow.

LXVIII.—*Rhynchotal Notes*.—X. Heteroptera:  
Fam. Lygæidæ. By W. L. DISTANT.

THE present contribution relates to the subfamily Lygæinæ as contained in the collection of the British Museum, with a revision of Walker's determinations in this group. All further study strengthens the opinion that when Walker's types are obtainable his species (if valid) should stand; but his descriptions are often so imperfect—as they are especially in this family—that where the types are not to be found such descriptions should be considered as non-existent, a course not necessarily harsh when the vast synonymy already created is realized and the loose location of the species is remembered.

LYGÆINÆ.

Genus ASTACOPS.

*Astacops dorycus*.

*Astacops dorycus*, Boisd. Voy. Astrol., Ent. ii. p. 638, pl. xi. fig. 16 (1835).

*Serinetha spurcata*, Walk. Cat. Het. iv. p. 147. n. 11 (1871).

*Astacops fascicollis*.

*Serinetha fascicollis*, Walk. Cat. Het. iv. p. 147. n. 12 (1871).

*Astacops delineatus*, Walk. loc. cit. v. p. 35. n. 10 (1872).

*Astacops spinipes*, Walk. loc. cit. p. 36. n. 11.

*Astacops Fieberi*.*Astacops Fieberi*, Stål, Ann. Soc. Ent. Fr. 1865, p. 187.*Serinetha immunis*, Walk. Cat. Het. iv. p. 148. n. 14 (1871).*Astacops anticus*.*Serinetha antica*, Walk. Cat. Het. iv. p. 147. n. 10 (1871).*Astacops turbatus*.*Serinetha turbata*, Walk. Cat. Het. iv. p. 148. n. 13 (1871).*Astacops Walkeri*, n. nom.*Astacops anticus*, Walk. Cat. Het. v. p. 35. n. 9 (1872), nom. præocc.*Astacops thoracicus*, sp. n.

Ochraceous; pronotum, scutellum, apical angle of corium, sternum, and abdomen beneath black; apex of scutellum, central area of prosternum, and the abdominal segmental margins ochraceous; rostrum ochraceous, its apex broadly black.

Long.  $S\frac{1}{2}$  millim.*Hab.* New Guinea, Dory (Brit. Mus.).Allied to *A. villicus*, Stål, differing by the unicolorous pronotum &c.*Astacops abdominalis*, sp. n.

Sanguineous; abdomen above and beneath black; sternum ochraceous; membrane piceous, its apical area pale bronzy. Antennæ sanguineous, the fourth joint ochraceous and about equal in length to second joint; rostrum with the basal joint sanguineous, remaining joints piceous; the margins of the meso- and metasternum more or less levigate; legs sanguineous.

Long. 11 millim.

*Hab.* Louisiade Archipelago; St. Aignan (*Basil Thomson*, Brit. Mus.).A distinctly marked species belonging to the group represented by *A. Fieberi*, Stål.*Astacops malayanus*, sp. n.

Stramineous; abdomen above and beneath black; prosternum stramineous; meso- and metasternum ochraceous, with their margins stramineous; antennæ, legs, and posterior margin of corium reddish ochraceous; membrane fuscous; rostrum, posterior lateral margin of corium, and base of



membrane black; abdominal segmental margins narrowly and obscurely ochraceously pilose.

Long. 11–12 millim.

*Hab.* Malay Archipelago; Ké Island (*Wallace*, Brit. Mus.). Allied to *A. abdominalis*, Dist.

### Genus SCOPIASTES.

#### *Scopiastes nigripes*, sp. n.

Sanguineous; antennæ, apex of eyes, more than basal half of pronotum, scutellum, posterior margin of corium, meso- and metasternum, posterior margin of prosternum, apical segment and a longitudinal fascia on each side of abdomen beneath black; apex of head, rostrum, and legs dark fuscous; membrane fuscous, with the inner margins piceous.

Posterior area of pronotum very coarsely punctate; apical joint of antennæ longest and stoutest.

Long. 6 millim.

*Hab.* Australia; Queensland, Gayndah (Coll. Dist.).

Allied to *S. Degeeri*, Stål, but differing by the colour of the legs, unspotted corium, &c.

#### *Scopiastes affinis*, sp. n.

Sanguineous; antennæ, apex of eyes, rather less than basal third of pronotum, scutellum, membrane, meso- and metasternum, and apex of abdomen black; rostrum and legs dark fuscous.

Posterior area of pronotum very coarsely punctate; apical joint of antennæ longest and stoutest.

Long. 5 millim.

*Hab.* West Australia, Roebuck Bay (*J. J. Walker*, Brit. Mus.).

Allied to *S. nigripes*, Dist., but separable by the different markings to the pronotum and abdomen beneath, smaller size, &c.

#### *Scopiastes bicolor*, sp. n.

Black; eyes (excluding apex), a little less than anterior half of pronotum, connexivum, and body beneath ochraceous; a spot near intermediate coxæ, a spot on each side of the second and third basal segments, and the whole discal area of the fourth, fifth, and sixth abdominal segments black, the last with their transverse margins ochraceous; central area of meso- and metasternum fuscous.

Posterior area of pronotum very coarsely punctate; head

centrally sulcate; posterior tarsi with the basal joint only very slightly longer than the second and third joints.

Long.  $8\frac{1}{2}$  millim.

*Hab.* Australia, Queensland (Brit. Mus.); Gayndah (Coll. Dist.).

In form and colour much resembling *Astacops Walkeri*, Dist.

*Scopiastes militaris*, sp. n.

Dark fuscous; about anterior third of pronotum, scutellum, outer median area of corium, head beneath, coxæ and trochanters, and posterior areas of meso- and metasternum dark sanguineous; abdomen beneath ochraceous; apical margins of membrane pale hyaline.

Posterior area of pronotum coarsely punctate; head centrally sulcate; posterior tarsi with the basal joint about equal in length to the second and third joints.

Long.  $7\frac{1}{2}$  millim.

*Hab.* Australia, Queensland (Brit. Mus.).

In form and structure allied to the preceding species, *S. bicolor*, Dist.

Genus ONCOPELTUS.

*Oncopeltus quadriguttatus*.

*Cimex 4-guttatus*, Fabr. Syst. Ent. p. 720. n. 116 (1775).

*Lygæus sordidus*, Dall. List Hem. ii. p. 536. n. 8 (1852).

*Lygæus contiguus*, Walk. Cat. Het. v. p. 62. n. 136 (1872).

*Pyrrhobaphus contiguus*, Leth. & Sev. Cat. Gén. Héin. t. ii. p. 150 (1894).

*Oncopeltus jucundus*.

*Lygæus jucundus*, Dall. List Hem. ii. p. 537 (1852).

*Transvaalia lugens*, Dist. Nat. in Transvaal, Append. p. 253, pl. iii. fig. 12 (1892).

*Oncopeltus dispar*.

*Lygæus dispar*, Walk. Cat. Het. v. p. 60. n. 125 (1872).

This very variable species may prove to be but forms of *Lygæus* (*Oncopeltus*?) *amboinensis*, Mayr., while *O. rubricatus*, Stål, may possibly prove to be another variety.

*Oncopeltus maoricus*.

*Lygæus maoricus*, Walk. Cat. Het. v. p. 64. n. 143 (1872).

*Oncopeltus castaneipes*.

*Lygæus castaneipes*, Dall. List Hem. ii. p. 536. n. 10 (1852).

*Lygæus innotatus*, Dall. loc. cit. p. 537. n. 12.

*Oncopeltus purpurascens*, sp. n.

Ochraceous; head, antennæ, anterior area of pronotum (sometimes connected by a central line with a basal spot), base of scutellum, a broad medial fascia across corium, legs, margins of sternal incisures, and apical area of abdomen beneath purplish brown; membrane dark fuscous, the inner angle and a transverse discal spot creamy white.

Pronotum and scutellum with a distinct central longitudinal ridge; apex of head, lateral margins of pronotum, basal lateral margins of corium, and the tibiæ rather longly pilose.

Long.  $7\frac{1}{2}$ –8 millim.

*Hab.* Baudin Island, N.W. Australia (*J. J. Walker*, Brit. Mus.).

## Genus LYGÆUS.

*Lygæus xanthostaurus*.

*Lygæus xanthostaurus*, Herr.-Schäff. Wanz. Ins. viii. p. 104, fig. 874 (1848).

*Lygæus maurus* (nec Stål), Walk. Cat. Het. v. p. 48. n. 68 (1872).

*Lygæus furcatus*.

*Cimex furcatus*, Fabr. Mant. ii. p. 301 (1787).

*Lygæus angulifer*, Walk. Cat. Het. v. p. 55. n. 103 (1872).

*Lygæus concinnus*.

*Lygæus concinnus*, Dall. List Hem. ii. p. 542 (1852).

Var. *Lygæus campestris*, Dist. Nat. in Transvaal, Append. p. 252, pl. iii. fig. 10 (1892).

*Lygæus analis*.

*Lygæus analis*, Dall. List Hem. ii. p. 540. n. 25 (1852).

*Lygæus ruficeps*, Stål, Stett. ent. Zeit. xxiii. p. 309. 198 (1862).

In Biol. Centr.-Amer., Rhynch. vol. i. p. 179 (1882), I stated that the type of Dallas was not in its place in the National Collection and that it probably represented the species described by Stål. I have now discovered the type of *L. analis*, and found that my supposition was correct.

*Lygæus inæqualis*.

*Lygæus inæqualis*, Walk. Cat. Het. v. p. 49. n. 70 (1872); Stål, En. Hem. iv. p. 107. n. 22 (1874).

Stål evidently, as was sometimes his practice with Walker's species, adopted the name, but gave his own description. This, however, does not justify the species standing in Stål's name, as it does in Lethierry and Severin's Cat. Gén. Hém.

tom. ii. p. 143, and where again Walker's species is placed (p. 147) as a synonym of *L. turcicus*, Fabr.

*Lygæus biguttatus*.

*Cimex biguttatus*, Fabr. Syst. Ent. p. 720 (1775).

*Lygæus divisus*, Walk. Cat. Het. v. p. 62. n. 138 (1872).

The Fabrician type is in the Banksian collection contained in the British Museum.

*Lygæus mactans*.

*Lygæus mactans*, Stål, Berlin. ent. Zeit. x. p. 162 (1866).

*Lygæus ruficeps*, Walk. Cat. Het. v. p. 63. n. 139 (1872).

Walker writes of his *L. ruficeps*:—"The entirely red head of this species and the red spot on each side of the prothorax distinguish it from *L. mactans*." All the six specimens, however, which he had before him when he wrote his description exhibit the apex of the central lobe to the head as black or fuscous, and there is also the black spot at inner margins of eyes, as described by Stål. The red spot of Walker "on each side of the hind border" of pronotum would have been better described as occupying the posterior lateral margins, and thus equal the "lateribus thoracis pone medium" of Stål.

*Lygæus Bettoni*, sp. n.

Pale ochraceous; antennæ, legs, apex of head, eyes and oblique basal area on each side of head behind eyes, pronotum with the anterior area and two large discal spots not reaching posterior margin, connected anteriorly and with the anterior area, and also connected with the lateral margins by a short transverse fascia, scutellum (excluding apex), about apical half of clavus and outer claval margin, lateral margins of corium (not reaching apex) emitting a short central transverse fascia extending about half across the corium, black. Sternum black, its segmental margins and the lateral margins of meso- and metasternum cretaceous white, with three large segmental spots on each side and the posterior lateral angles of prosternum pale ochraceous. Abdomen beneath reddish ochraceous, with its apex black.

Pronotum coarsely punctate, principally on the black markings, and with an oblique transverse incision on each side of anterior area.

Long.  $9\frac{1}{2}$  millim.

*Hab.* British East Africa (*C. S. Betton*, Brit. Mus.).

## Genus TROPIDOTHORAX.

*Melanospilus*, Stål, Hem. Fabr. i. pp. 72 & 75 (1868), nom. præocc.

*Tropidothorax*, Bergr. Ann. Soc. Ent. Belg. xxxviii. p. 547 (1894),  
n. nom.

*Tropidothorax concisus*.

*Lygæus concisus*, Walk. Cat. Het. v. p. 60. n. 127 (1872).

Head black, with a lateral spot behind and in front of the base of the antennæ and a central basal spot red; pronotum reddish ochraceous, with two large rounded transverse basal black spots, almost reaching the basal and lateral margins, which are ochraceous, the spots divided centrally by a raised reddish-ochraceous line; apex of clavus and the corium ochraceous, the last with a large oblique discal black spot.

This species is very variable in the character of the discal spot to the corium. The one most pronounced in the specimens now before me is the type from Lombok; those with the smallest (very small) spot are from Flores. Two specimens from Sumbawa in my own collection are intermediate in that respect.

## Genus GRAPTOSTETHUS.

*Graptostethus servus*.

*Cimex servus*, Fabr. Mant. Ins. ii. p. 300 (1787).

*Lygæus inæqualis*, Walk. Cat. Het. v. p. 57. n. 116 (1872).

*Graptostethus quadratomaculatus*.

*Lygæus quadratomaculatus*, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 98 (1891).

*Graptostethus diffusus*.

*Lygæus diffusus*, Walk. Cat. Het. v. p. 59. n. 124 (1872).

*Graptostethus maculatus*.

*Lygæus maculatus*, Dall. List Hem. ii. p. 545. n. 42 (1852).

*Graptostethus? verticalis*.

*Lygæus verticalis*, Dall. List Hem. ii. p. 548. n. 49 (1852).

The type is in bad condition and now without rostrum, thus rendering its generic position doubtful.

*Graptostethus grandis*, sp. n.

Reddish ochraceous; extreme apex of head, centre of anterior margin, and two large basal subquadrate spots with

their bases almost extended to the posterior angles of the pronotum, basal and lateral margins of scutellum, apical margins of clavus, a transverse central fascia to corium, membrane, anterior and lateral margins of prosternum, anterior margins of meso- and metasternum, anterior margin of apical segment, and extreme apex of abdomen, rostrum, legs, and antennæ, black; a spot near the lateral margins of pro- and mesosternum, a spot near posterior coxæ, and a larger transverse spot on each side of metasternum deep shining black.

Shape and structure of *G. rufifemoratus*, Dall.

Long.  $11\frac{1}{2}$  millim.; max. lat.  $4\frac{1}{2}$  millim.

*Hab.* Nyasaland, Fort Johnson (*P. Rendall*, Coll. Dist.).

*Graptostethus pictus*, sp. n.

Reddish ochraceous; base and a central longitudinal fascia to head, centre of anterior margin and two large basal subquadrate spots extending to and occupying the posterior angles of the pronotum, scutellum (excluding apex), an elongate spot on posterior area of clavus, a central transverse spot joined to outer margin of corium, membrane, spots to connexivum, three lateral spots on each side of sternum, legs, antennæ, and rostrum, black. Membrane with a central and apical white spot. Antennæ with the second joint a little longest, third and fourth joints subequal in length.

Long.  $6-6\frac{1}{2}$  millim.

*Hab.* Port Natal (Brit. Mus.); Transvaal, Pretoria (Coll. Dist.).

Allied most closely to the Indian species *G. maculatus*, Dall.

An apparently scarce species. The British Museum has long possessed one specimen from Natal, and I met with but one example during four years' collecting in the Transvaal.

Genus NICUESA.

*Nicuesa affinis*, sp. n.

Black; pronotum, prosternum, lateral margins of the corium, and apical margins of the membrane (narrowly) stramineous. Antennæ finely pilose, the second and fourth joints subequal in length; pronotum reticulately carinate and with a short central black fascia on anterior margin.

Long. 7 millim.

*Hab.* Ecuador, Paramba, 3500 feet (*Rosenberg*, Brit. Mus.).

Allied to *N. speciosus*, Dist., from which it can be at once separated by the different colour of the pronotum and prosternum.

## Genus AROCATUS.

*Arocatus rusticus*.

*Tetralaccus rusticus*, Stål, Berl. ent. Zeit. x. p. 163 (1866).

*Astacops? caligatus*, Walk. Cat. Het. v. p. 36. n. 14 (1872).

*Lygæus subjectus*, Walk. loc. cit. p. 62. n. 137.

*Lygæus ruficollis*, Walk. loc. cit. p. 64. n. 142.

## Genus CÆNOCORIS.

*Cænocoris Nerii*.

*Lygæus Nerii*, Germ. Faun. Eur. p. 24.

*Cænocoris Nerii*, Fieber, Europ. Hem. p. 166 (1861).

*Lygæus semirubens*, Walk. Cat. Het. v. p. 58. n. 117 (1872).

I possess specimens from Sind, which may probably be the locality of the "E. Indian" specimens in the British Museum. My Sind examples are indistinguishable from others collected by Mr. Trovey Blackmore in Morocco.

## Genus NYSIUS.

*Nysius jamaicensis*.

*Nysius jamaicensis*, Dall. List Hem. ii. p. 555 (1852).

*Nysius providus*, vars., Uhler, Proc. Zool. Soc. 1893, p. 705.

*Nysius providus*, Uhler, loc. cit. 1894, p. 182.

Prof. Uhler enumerated the species in 1893 (*supra*), but described it in the following year (1894). The specimens he first denominated as *providus*, vars., he returned labelled *N. scolopax*, Say, var.; but Uhler remarks "the true *N. scolopax*, Say, has a rostrum which reaches to the middle of the venter, which is not the case in the species here described."

*Nysius scolopax*.

*Lygæus scolopax*, Say, New Harm. Ind., Dec. 1831; Compl. Writ. i. p. 330. 8 (1859).

*Belonochilus? scolopax*, Stål, En. Hem. iv. p. 122 (1874); Leth. & Sev. Cat. Gén. Hém. t. ii. p. 156 (1894).

*Nysius scolopax*, Uhler, Proc. Zool. Soc. 1894, p. 182.

*Species not belonging to the Lygæidæ.*

## Coreidæ.

*Serinetha subrufescens*.

*Lygæus subrufescens*, Kirby, Proc. Zool. Soc. 1888, p. 553; Monogr. Christmas Island, p. 128. n. 3.

Mr. Kirby was evidently misled by the displacement of a

Walkerian type. He writes, "Allied to *L. longiusculus*, Walk." This type is missing, and a specimen of a *Serinetha* was in its place. The figure given in the Monogr. Christ. Isld. pl. xv. fig. 3, by the appearance of the pronotum is of practically little assistance.

*Summarized Disposition of Walker's Genera and Species  
belonging to the Subfam. Lygæinæ.*

*Species considered valid and described under correct Genera.*

- Astacops anticus*, Walk. Cat. Het. v. p. 35. n. 9 (1872), nom. præocc.  
(*A. Walkeri*, Dist., n. nom.).  
*Lygæus californicus*, Walk. loc. cit. p. 42. n. 25.  
— *inequalis*, Walk. loc. cit. p. 49. n. 70.  
— *incertus*, Walk. loc. cit. p. 64. n. 145.  
*Nysius contiguus*, Walk. loc. cit. p. 69. n. 25.

*Species considered valid, but requiring generic revision.*

- Lygæus anticus*, Walk. (part.), Cat. Het. v. p. 46. n. 51 (1872), belongs to gen. *Jadera*.  
— *diffusus*, Walk. loc. cit. p. 59. n. 124, belongs to gen. *Graptostethus*.  
— *dispar*, Walk. loc. cit. p. 60. n. 125, " " *Oncopeltus*.  
— *concisus*, Walk. loc. cit. n. 127, " " *Tropidothorax*.  
— *maoricus*, Walk. loc. cit. p. 64. n. 143, " " *Oncopeltus*.

*Species treated as synonymic.*

- Astacops delineatus*, Walk. Cat. Het. v. p. 35. n. 10 (1872), = *Astacops fascicollis*, Walk.  
— *spinipes*, Walk. loc. cit. p. 36. n. 11, = *Astacops fascicollis*, Walk.  
— *nigricornis*, Walk. loc. cit. n. 12, = *Serinetha vicina*, Dall.  
— ? *caligatus*, Walk. loc. cit. n. 14, = *Arocatus rusticus*, Stål.  
*Lygæus marginalis*, Walk. loc. cit. p. 45. n. 45, = *Jadera hematoloma*, H.-S.  
— *dimidiatus*, Walk. loc. cit. n. 46, = *Lygæus bicolor*, H.-S.  
— *anticus*, Walk. (part.), loc. cit. n. 51, = *Jadera sanguinolenta*, Fabr.  
— *conspersus*, Walk. loc. cit. p. 47. n. 57, = *Jadera æola*, Dall.  
— *maurus*, Walk. (nec Stål), loc. cit. p. 48. n. 68, = *Lygæus xanthostaurus*, H.-S.  
— *marginifer*, Walk. loc. cit. p. 55. n. 102, = *Lygæus furcatus*, Fabr., var. *Fairmairei*, Sign.  
— *angulifer*, Walk. loc. cit. n. 103, = *Lygæus furcatus*, Fabr.  
— *inequalis*, Walk. loc. cit. p. 57. n. 116, = *Graptostethus servus*, Fabr.  
— *senirubens*, Walk. loc. cit. p. 58. n. 117, = *Cænocoris Nerii*, Germ.  
— *contiguus*, Walk. loc. cit. p. 62. n. 136, = *Oncopeltus quadriguttatus*, [Fabr., var.  
— *subjectus*, Walk. loc. cit. n. 137, = *Arocatus rusticus*, Stål.  
— *divisus*, Walk. loc. cit. n. 138, = *Lygæus biguttatus*, Fabr.  
— *ruficeps*, Walk. loc. cit. p. 63. n. 139, = *Lygæus mactans*, Stål.  
— *ruficollis*, Walk. loc. cit. p. 64. n. 142, = *Arocatus rusticus*, Stål.  
*Nysius proximus*, Walk. loc. cit. p. 69. n. 26, = *Nysius contiguus*, Walk.



To be treated as non-existent.

Species the types of which are not now to be found in the British Museum.

*Lygæus cognatus*, Walk. Cat. Het. v. p. 49. n. 69 (1872).

— *japonicus*, Walk. loc. cit. p. 58. n. 118.

— *longiusculus*, Walk. loc. cit. p. 60. n. 126.

— *singularis*, Walk. loc. cit. p. 63. n. 140.

*Nysius mundus*, Walk. loc. cit. p. 69. n. 27.

— *subcinctus*, Walk. loc. cit. p. 70. n. 31.

— *pallipennis*, Walk. loc. cit. p. 71. n. 32.

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LXIX.—New *Myotis*, *Artibeus*, *Sylvilagus*, and *Metachirus* from Central and South America. By OLDFIELD THOMAS.

*Myotis simus*, sp. n.

A small short-haired *Myotis*, with very much the general facies of a *Pipistrellus* or one of the smaller *Scotophilii*.

Size small. General build and appearance very different to those of other American species of *Myotis*, and more as in *Pipistrellus* or *Scotophilus*. Head broad and flat, muzzle swollen and tumid. Ears rather short, reaching when laid forward about halfway between the eye and the tip of the nose; their inner margin evenly convex for their proximal three fourths, slightly concave above; tip narrow; outer margin concave for the upper and convex for the lower half; antitragal notch scarcely perceptible; basal lobe forming a prominent thickened point projecting forwards. Tragus pointed, slightly curving outwards above, its inner margin convex, its outer concave above, convex below; a small triangular lobule at the outer base.

Wing-bones comparatively stout, as also are the tibiæ. Wings attached to the ankle. Postcalcareaal lobule practically absent. Tail included in interfemoral membrane to the extreme tip.

Fur of body short and sparse (hairs of back about 2.5 mm. in length), not extending on the wing-membranes, and only on the interfemoral for its basal third, above and below. No fringe on interfemoral.

Colour above and below pale tawny brown, about as in some of the small pale species of *Scotophilus*. Wing-membranes darker brown, without lighter edging.

Skull rather broader than usual, with a shorter muzzle. In the ordinary small American *Myotis* the distance across the palate at the outer corners of  $m.^2$  is just equal to the length

of the tooth-row from the front of the canine to the back of *m.*<sup>3</sup>, but in *M. simus* this breadth decidedly exceeds the same longitudinal dimension. Distinct sagittal and lambdoidal crests present.

Upper incisors of about equal length; the inner triangular in section, with one longer anterior and two shorter posterior cusps; outer incisor with its slanting postero-external face surrounded by five or six crenulations or minute cusps, but how far these are the result of wear I am unable to say. Small upper premolars drawn inwards from the tooth-row, the second, minute, one entirely hidden behind the anterior end of the large premolar. Middle lower premolar about two thirds the height of the anterior one, which in turn is about two thirds the height of the posterior.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 36·5 millim.

Head and body 46; tail 33; head 15·7; ear 12·5; tragus on inner edge 4·5; third finger, metacarpal 33, first phalanx 10, second phalanx 11; lower leg 14·5.

Skull: occipito-nasal length in middle line 11·9; basi-palatal length 10·3; interorbital breadth 4; mastoid breadth 7·5; palate length 5·4.

*Hab.* Sarayacu, Peru.

*Type.* Female (in spirit). B.M. no. 81. 5. 12. 2. Collected in 1876 by Mr. W. Davis and presented by Messrs. Veitch.

The short hair and comparatively stumpy build of this bat give it so different an appearance to the other members of *Myotis* that no one at first sight would suppose it to belong to that genus; but the detailed structure of the ears and the characters of the teeth are typically those of *Myotis* and there is no reason to distinguish it generically from that group.

No described species of the genus appears to have any resemblance to it.

#### *Artibeus Watsoni*, sp. n.

Size about as in *A. cinereus*, dentition as in *A. glaucus*.

Nose-leaf similar to that of *A. glaucus*, but apparently rather narrower. Ears higher and narrower than in that species; inner margin evenly convex, tip narrowly rounded; outer margin deeply concave in its upper half, then convex, ending below in a slightly angular antitragal lobe. Tragus more sharply pointed than in *A. glaucus*, and the projections on the outer margin more prominent.

Fur close and fine, extending on the proximal half of the

forearm and, very thinly, on the interfemoral membrane, legs, and feet. General colour, as usual in this group, very variable, varying from smoky greyish to buffy; Ridgway's "hair-brown" and "wood-brown" nearly represent two of the phases. Individually the hairs are whitish, tipped with some shade of brown. Face with four fairly well-marked white streaks in the usual positions.

Skull smaller, lighter, and more delicately built than in *A. glaucus*, which it resembles in its general form, narrower in the muzzle than in *A. cinereus*.

Teeth closely similar in their proportions to those of *A. glaucus*\*, the molars of the broadened shape found in that species, and therefore different from those of *A. Rosenbergi*, in which also  $m.^2$ , both above and below, is proportionally very much smaller than  $m.^1$ .

Dimensions of the type:—

Forearm 38 millim.

Skull: greatest length (approximate) 19; zygomatic breadth 11·7; intertemporal breadth 4·5; mastoid breadth 9·5; palate, length 8·5, breadth across molars 8·3; front of upper canine to back of  $m.^2$  6·2.

Other dimensions of a specimen softened and placed in spirit:—

Ear, length 15, breadth from most convex point of inner to most concave part of outer margin 9; third finger, metacarpal 36, first phalanx 14, second phalanx 20; lower leg 17; depth of interfemoral in centre 11.

*Hab.* Bogava, Chiriqui, Panama. Altitude 250 m.

*Type.* Male. B.M. no. 0. 7. 11. 19. Original number 47. Collected 24th October, 1898, by Mr. H. J. Watson. Four specimens examined.

By the presence of the minute posterior lower molar this species differs from the common Central-American *A. cinereus* and its allies, and resembles the larger *A. glaucus* of Peru. *A. Rosenbergi*, of which the only known specimen has this tooth on one side and not on the other, may be distinguished by the different proportions of its molars.

#### *Sylvilagus surdaster*, sp. n.

A dark-coloured hare with very short blackish ears and minute bullæ.

Size about as in *S. Gabbi*, which appears to be the nearest ally. Fur thick, close, and rather harsh, the longer hairs of the back about 20 millim. in length. General colour

\* Described and figured, P. Z. S. 1893, p. 336, pl. xix. figs. 7-9.

above dark, evenly grizzled buffy and black, the combined tone darker than in any of the allied species, rather paler on flanks. Of the longer hairs of the back, the basal fourth is light grey, darkening to brown on the second fourth; the third fourth is ochraceous buff, the end being shining black. The woolly underfur is greyish white basally, brown terminally. Face more ochraceous than back, owing to the black tips to the hairs being less prominent; sides of face rather paler and again darker below the eye, but no prominent light or dark orbital or cheek-markings are present. Ears remarkably short, shorter than in any known hare (except *Romerolagus* and *Nesolagus*); the anterior halves of their outer surface grizzled rufous just at their bases, but otherwise nearly wholly black; posterior halves of outer and whole of inner surfaces pale rufous. Nape-patch rufous, rather duller than Ridgway's "cinnamon rufous." Chin dull whitish, the hairs slaty basally. Chest grizzled grey buffy and blackish. Belly dull whitish or whitish buff, not sharply defined laterally. Fore limbs dull rufous, whitish like the belly on their inner side above. Long hairs of palm smoky brown. Hind limb grizzled like back on outer side of thigh and lower leg, more rufous on upper surface of foot; inner side whitish or buffy, almost ochraceous buffy along the edge of the body-colour; long hairs of soles smoky brown. Tail reduced to a mere stump, barely half an inch in length, its upper side black, its lower buffy.

Skull on the whole most like that of *S. Gabbi*. Frontal region low and flat. Interorbital space slightly concave. Postorbital processes long and broad, close to the brain-case and pressed against it terminally, but not anchylosed with it. Upper surface of brain-case unusually rough and coarsely pitted. Sides of muzzle fairly complete, about as in *S. andinus*. Palatal foramina large and widely open, comparatively narrow posteriorly, broadest just behind their middle. Bullæ exceedingly small, far smaller than in any allied species, so low that a line from the top of one to that of the other hardly clears the basioccipital.

Enamel of incisors thin, not penetrating into the tooth mesially, but evenly following the line of its anterior surface. Front surface of anterior upper and lower premolars more or less coarsely fluted.

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

Head and body 388 millim.; tail (c.) 12; hind foot, s. u. 77, c. u. 83; ear 43.

Skull: greatest length 72; basilar length to back of *i*.<sup>1</sup> 57;

greatest breadth 37; nasals 29 (diagonally)  $\times$  13.7; inter-orbital breadth 17, breadth of occipital shelf 9; diastema 22; length of palate 29.5; palatal foramina 17.5  $\times$  7.3; greatest antero-posterior diameter of bulla 7.3.

*Hab.* Carondelet, Rio Bogotá, Province of Esmeraldas, N. Ecuador. Altitude 20 m.

*Type.* Female. Collector's number 94. Killed 14th October, 1900. Two specimens examined.

This interesting little hare, the first described from the low country west of the Andes, may be readily distinguished from all others by its short, nearly black ears, minute bullæ, rudimentary tail, and general dark coloration.

*Metachirus nudicaudatus phœurus*, subsp. n.

Similar in general characters to the typical form, but the tail uniformly dark brown to the tip.

Colour of the usual buffy grey-brown; dark dorsal area well marked. Supraorbital spots prominent, yellowish white. Middle line of face, crown, and nape blackish. Under surface dull buffy white, not sharply defined laterally. Upper surface of wrists and metacarpals brown, of hind feet greyish. Tail uniformly blackish brown throughout, except that there are a few indistinct whitish mottlings along the middle line below.

Dimensions of the type (not fully adult, measured in the flesh):—

Head and body 214 millim.; tail 251; hind foot 39; ear 29.

Skull: greatest length 52; basal length 48; zygomatic breadth 26.5; nasals 27.5  $\times$  7.2; intertemporal breadth 8.7; breadth of brain-case on squamosals 17; combined length of three anterior molariform teeth 9.

*Hab.* St. Javier, Lower Cachavi River, N.W. Ecuador. Altitude 20 m.

*Type.* Male. B.M. no. 1. 3. 19. 44. Original number 24. Collected 19th May, 1900.

This form presents a remarkable parallel to *M. opossum melanurus*, Thos.\*, from the same district, which, exactly as in the present case, agrees with its allies elsewhere in all respects, except that it has a wholly dark instead of a white-tipped tail.

The material at my disposal is not sufficient for me to criticize Dr. Allen's separation of *M. Tschudii* and *M. n. colombianus* from the typical *M. nudicaudatus*, but both, like the latter, have white-tipped tails.

\* Ann. & Mag. Nat. Hist. (7) iv. p. 285 (1899).

LXX.—*Further Descriptions of new Reptiles collected by Mr. P. O. Simons in Peru and Bolivia\**. By G. A. BOULENGER, F.R.S.

*Stenocercus variabilis*.

Pterygoid teeth. Anterior border of ear denticulated. Upper head-scales smooth; some of the supraoculars feebly enlarged transversely; occipital not enlarged; temporal scales feebly keeled. Side of neck with folds enclosing shallow pockets covered with granular scales; antehumeral fold very strong, with a serrated edge on its lower half. Body depressed. A very slight dorsal crest. Dorsal scales rather large, strongly imbricate, sharply keeled, shortly mucronate; the keels forming continuous lines, which are parallel or slightly oblique on the posterior part of the back; lateral scales passing gradually into the smaller smooth ventrals; 67 to 69 scales round the middle of the body. The adpressed hind limb reaches the ear or a little beyond; fifth toe not extending as far as second. Tail about twice as long as head and body, tapering, scarcely compressed, the scales a little larger than on the body, and forming rings. Green, spotted with whitish on the sides, or greyish, spotted with black above and on the sides or on the sides only; whitish beneath, throat marbled with olive; one specimen with a black bar across the scapular region and the throat and belly nearly entirely black.

	millim.
Total length .....	262
Head .....	22
Width of head .....	16
Body .....	70
Fore limb .....	39
Hind limb .....	65
Tail .....	170

Several specimens from Palca, Bolivia, 10,000 feet.

Closely allied to *S. cupreus*, Blgr., from which it differs in the smaller dorsal scales.

*Liolæmus annectens*.

Nostril supero-lateral. Upper head-scales small, smooth; two longitudinal series of scales on the frontal region; interparietal and parietals small, subequal; three to five supraoculars feebly enlarged transversely; a single series of scales

\* Cf. 'Annals,' vol. vi. 1900, p. 181.

between the labials and the subocular; anterior border of ear granular. Sides of neck granular, strongly folded. Dorsal scales rather small, rhomboidal, not longer than broad, weakly keeled, feebly imbricate; lateral scales a little smaller, smooth or feebly keeled; ventral scales a little larger than dorsals, strongly imbricate, smooth, rounded; 60 to 70 scales round the middle of the body. The adpressed hind limb reaches the axil or the shoulder; hinder side of thighs uniformly granular. Male with 6 or 7 anal pores. Tail once and one fourth to once and a half as long as head and body; scales about as large as those on the body. Coloration very variable—green, grey, or brownish above, spotted or marbled with blackish, or with six regular longitudinal series of black spots; lower parts whitish, spotted or marbled with olive-grey.

	millim.
Total length.....	196
Head .....	19
Width of head .....	15
Body.....	67
Fore limb.....	28
Hind limb .....	46
Tail .....	110

Several specimens from Caylloma and Sumbay, 11,300 to 13,600 feet.

This species is very nearly related to *L. multiformis*, Cope, from which it is to be distinguished by the larger dorsal scales. The two species establish a passage from *Liolaemus* to *Ctenoblepharis*, especially through *C. Jamesii*, Blgr.

#### *Liocephalus rhodogaster*.

Upper head-scales small, faintly pluricarinate; nostril supero-lateral; nasal separated from the rostral by one series of scales; three or four supraoculars feebly enlarged transversely; parietals broken up; no distinct denticulation on anterior border of ear. Sides of neck slightly plicate, covered with small imbricate scales; a strong fold in front of the shoulder. A feeble but very distinct dorsal crest. Dorsal scales rather small, mucronate, strongly keeled, the keels forming slightly oblique longitudinal lines; lateral scales a little smaller, strongly keeled, the keels forming oblique lines directed upwards; ventral scales quite as large as dorsals, smooth; 73 or 75 scales round the middle of the body. Gular scales as large as dorsals. The hind limb, stretched forwards, reaches the eye. Tail feebly compressed, crested like the back. Olive or brown above, with a dorsal

series of transverse, rhomboidal, darker spots; scapular region darker, with a light vertical line; a dark, light-edged, oblique streak on the upper lip, below the eye; male with the chin, the breast, the præanal region, and the lower surface of the limbs whitish, the throat, the flanks, and the middle line of the belly grey, the belly and the lower surface of the tail of a bright pink; female with the throat greenish and the rest of the lower parts whitish.

	millim.
Total length.....	210
Head.....	20
Width of head.....	15
Body.....	65
Fore limb.....	39
Hind limb.....	70
Tail (reproduced).....	125

Two specimens (male and female) from Merced, Perené River, 3250 feet.

Most nearly related to *L. erythrogaster*, Hallow., but distinguished by the smaller scales.

#### *Liocephalus scapularis*.

Upper head-scales moderately large, feebly keeled or striated; nostril supero-lateral; nasal separated from the nostril by one series of scales; four transversely enlarged supraoculars, separated from the supraorbitals by one series and from the supraciliaries by three series of scales; a pair of interparietals followed by two occipitals; parietals broken up into small shields; a feebly serrated ridge above the temple; two or three feebly projecting scales on the anterior border of the ear. Sides of neck not folded, covered with small, imbricate, keeled scales. A feeble but very distinct dorsal crest; a weaker lateral crest on each side of the anterior part of the back and on the sacral region. Dorsal scales moderately large, pointed, smooth; lateral scales smaller, feebly keeled; ventral scales as large as dorsals, strongly keeled; 57 scales round the middle of the body. Gular scales as large as dorsals, strongly keeled. The hind limb, stretched forwards, reaches the nostril. Tail scarcely compressed, with a serrated upper edge at the base. Greyish brown above, with a series of chevron-shaped darker markings pointing backwards; scapular region dark brown, sharply defined above and behind by an angulate white line; a large round dark brown spot between the shoulders; a broad dark



brown, white-edged streak, widening beneath, extending obliquely backwards from the eye to the edge of the mouth; greyish beneath, with white spots on the limbs; incomplete whitish annuli on the tail.

	millim.
Total length.....	210
Head.....	19
Width of head.....	14
Body.....	51
Fore limb.....	37
Hind limb.....	62
Tail.....	140

A single specimen (probably immature), from Perené, 2600 feet.

This species is allied to *L. aculeatus*, O'Sh., but differs in the smaller head-shields, the smaller dorsal scales, and the interrupted lateral crest.

#### *Euspondylus Simonsii.*

Very closely allied to *E. maculatus*, Tschudi. Distinguished by the more slender form, the undivided transparent disk of the lower eyelid, the distinctly striated dorsal scales, and by the proportions and dispositions of some of the head-shields. Interparietal much larger than the frontal, in contact with an azygous occipital; third pair of chin-shields widely separated from each other. 34 scales round the middle of the body, 36 from occiput to base of tail. Brownish above, whitish beneath, dotted with greyish; a dark streak on each side of the head and neck; a dark, light-edged, festooned band along each side of the tail.

	millim.
Total length.....	113
Head.....	11
Width of head.....	5
From end of snout to fore limb.....	16
From end of snout to vent.....	48
Fore limb.....	12
Hind limb.....	16
Tail.....	65

A single female specimen from Puntoyacu, Perené River, 5000 feet.

LXXI.—*A few further Remarks upon the Erythrean Molluscan Fauna, with Descriptions of Seven Species from Aden, in the Collection of Commander E. R. Shopland, R.I.M.* By JAMES COSMO MELVILL, M.A., F.L.S.

[Plate IX.]

SINCE the time when, about five years ago, Commander Shopland published\* a list of the marine Mollusca noticed by him at or near Aden, he has received from his correspondents several further parcels, and been able to increase the sum total to between 720 and 750 species in all. There still, naturally, remained several doubtful forms, and lately he forwarded the whole of these to me, and many have been now satisfactorily determined. Deducting then various hardly adolescent species and several too imperfect to do otherwise than note their probable generic affinities, the following seven seem worthy of description, all coming from Aden, in or near the harbour. I have no particulars at what depth they were dredged.

It is interesting to record at the same time that certain new and rare forms described during the past few years, being some of the results of the explorations of Mr. F. W. Townsend in the Persian Gulf and Arabian Sea, likewise are among the latest acquisitions of Commander Shopland from the neighbourhood of Aden. Such are *Strombus belutschiensis*, Melv., *Pectunculus maskatensis*, Melv., *Donax Townsendi*, Sowb., *D. aperittus*, Melv., and, above all, *Conus clytospira*, M. & S.†, though only in juvenile condition—these, with several others, thus showing a very marked extension of range.

It was in March 1898 ‡ that I essayed a short bibliographical *résumé* of the Erythrean Molluscan fauna, inclusive of Aden, and since that date but little seems to have been effected by specialists towards further elucidation of this interesting subject, if we except the excellent monograph of Dr. R. Sturany on the 'Pola' Expedition in the Red Sea §.

These dredgings were carried out by Dr. Fr. Steindachner and Herr Friedrich Siebenroch, only the Pelecypoda being

\* Shopland, E. R., "List of Shells collected at Aden, 1892-96," Journ. Bombay Soc. x. pp. 217-235; with Addendum, *t. c.* pp. 503, 504.

† *Vide* Ann. & Mag. Nat. Hist. ser. 7, vol. iv. pp. 461-463 (1899).

‡ *Op. cit.* ser. 7, vol. i. 1898, pp. 194-206, pl. xii.

§ "Expedition L.M. Schiff 'Pola' in das Rothe Meer, 1895-96 und 1897-98," Zool. Ergebnisse, Lamellibranchiaten, von Dr. Rudolf Sturany: Wien, 1899, mit 7 Tafeln.

yet published\*, with a very few Gastropoda—the genera *Fusus* and *Nassa* mainly. This work leaves little or nothing to be desired for accurate elaboration of detail.

Dr. F. Jousseau, so well known for the close attention he has given to the Erythræan and Adenese Mollusca for a long period, in 1898 published an account of the Triforidæ † of the Red Sea, with descriptions of many new species and likewise various new genera which we have not seen, e. g. *Otitoma otitoma*, *Issina issina* ‡, and others.

Two new *Scalariæ* have been likewise lately described by Clessin § from this region. Bavay has written on the Mollusca of the Suez Canal || and Dall on those of the Gulf of Aden obtained by the Field Columbian Museum East African Expedition ¶.

Dr. E. von Martens, finally, in 1899 \*\* described three new Erythræan oysters (*Ostrea pectinata*, *dolabriformis*, and *oniscus*), collected long ago (1820–25) by Hemprich and Ehrenberg.

It is much to be hoped that Commander Shopland will, ere long, be able to issue a second edition of his invaluable catalogue, which will then furnish a most complete and up-to-date record of what was known at the commencement of the twentieth century of the Adenese Molluscan fauna. I would just add that it is my hope to be in a position before very long to draw some tangible comparisons between this fauna and that of the Persian Gulf, Gulf of Oman, and Arabian Sea, as evidenced by the Townsend collections mentioned above; but one must wait until the residue of both these large gatherings has been finally worked out.

*Sistrum indigoferum*, sp. n. (Pl. IX. fig. 1.)

*S.* testa ovato-fusiformi, solida, brunneo-cinerea, corrugata; anfractibus 5, quorum apicales . . . ? (in omnibus nostris speciminibus detriti), cæteris longitudinaliter nodulosi-costatis, costis percrassis,

\* Among the nov. sp. are 5 *Cuspidaria*, 1 *Raïta*, 1 *Lyonsia*, 1 *Cardita*, 2 *Amussium*, 3 *Gastrochæna*, 1 *Diplodonta*, 1 *Chione*, 2 *Scintilla*, 1 *Telina*, some dredged at great depths.

† Bull. Soc. Philom. ix. pp. 71–77.

‡ 'Naturaliste,' 1898, pp. 14 *et sqq.*

§ Martini and Chemnitz, System. Conch.-Cab., Scalariidæ, S. Clessin, pp. 49, 57.

|| Bavay, A., "Note sur les Mollusques du Canal de Suez," Bull. Soc. Zool. France, xxiii. pp. 161–164.

¶ Field Col. Mus. Zool. i. pp. 187–189 (1893).

\*\* 'Symbolæ Physicæ, seu Icones adhuc ineditæ . . . quæ ex itineribus per Libyam, Ægyptum, . . . F. G. Hemprich et C. G. Ehrenberg, annis 1820–25 redierunt. Zoologica. II. Mollusca.'

superne rotunde angulatis, ultimo anfractu circa novem costis prædito, spiraler arcu bino litarum ordine succinetis, interstitiis inter costas cavernosis; apertura ovato-oblonga, labro incrassato, intus 4-5-denticulato; columella fere recta, omnino cinereo-cærulescente, lapidis fissilis colore præsertim instar.

Long. 18, lat. 8.50 mm.

Though shouldered just below the sutures, the roundly noduled ribs of this species, thickly crossed by thin spiral lines, the interstices between the costæ being deeply cavernous, amply characterize it. Indeed, we know no species nearly comparable; and another very special point of distinction is the slate or dull indigo-coloured aperture, labial and columellar area, which seems constant, being present, without any deviation, in all the examples I have examined. The only *Sistrum* at all comparable appears to be *S.anaxares*, Duclos, formerly esteemed a *Purpura*.

*Natica (Eunatica) tela-araneæ*, sp. n.

(Pl. IX. fig. 2.)

*N.* testa subperforata, ovato-conica, solida, alba, castaneo-variegata; anfractibus 5, quorum apicales tres subvitrei, brunnescentes, nitidi, perlæves, cæteris ad suturas impressis, lævibus, infra (juxta suturas) spiraler flammis castaneis decoratis, inde ad basin intricacione intertexta notata, ultimo anfractu cæteros magnopere superante; apertura lunari, albida; peristomate albo, nitido, continuo, subeffuso, margine columellari obliquo, albo-brunnescente, callo nitido brunneo; umbilicum profundum semiobtegente.

Alt. 11, diam. 10 mm.

Allied to *N. Raynoldiana*, Récluz, than which it is much smaller, at the same time being differently marked and coloured. Indeed, the pattern is intricate and somewhat involved—a mesh of textile network, with occasional clear spaces disposed spirally, giving an obscurely white-banded effect, notably just below the sutures. The umbilicus is half hidden by a shining brown callus, the peristome being white, continuous, slightly effuse without. In the example taken as the type the greater part of the body-whorl is dorsally without the chestnut involved pattern; no doubt this is accidental. Another ally is *N. sanctæ-helenæ*, E. A. Sm.; both this, *N. Traillii*, Reeve, and *N. buriasensis*, Récluz, show slight points of relationship; the brown callus of *Traillii* is similar, but in all the pattern of marking is quite distinct, as also are the apical whorls.

*Cerithium Shoplandi*, sp. n. (Pl. IX. fig. 3.)

*C.* testa elongato-fusiforimi, solidula; spira supra multum attenuata, albo-cinerecente; anfractibus 10, sex supernis parvis, quatuor ultimis longitudinaliter irregulariter costulatis et varicosis, in ultimo hic costis omnino evanidis, illic a medio usque ad basin, varicibus albescentibus, anfractibus spiraliter duplicato sulcorum ordine præditis, interstitiis transversim et interruptim cinereo-nodulosis vel lineatis, sex in ultimo anfractu, tribus in penultimo ordinibus; apertura ovata, labro incrassato, intus quinque-sulcato, sulculis rubro-tinctis; columella obliqua, alba, incrassata, brevi rostrata.

Long. 18, lat. 8 mm.

An elegant *Cerithium*, most nearly allied, in my opinion, to the larger and coarser *C. moniliferum*, Dufr., from the Philippines, the chief distinctive characters besides those of size lying in the great attenuation of the upper whorls, the distinct ribs, white varices, and the fine red furrowed lines just below the inner edge of the outer lip.

Several examples. It gives me much pleasure to connect with this pretty species the name of its discoverer.

*Bittium chrysomallum*\*, sp. n. (Pl. IX. fig. 4.) 3

*B.* testa fusiformi, solida, alba, ochraceo-variegata; anfractibus decem, apicalibus . . .?, cæteris apud suturas multum impressis, arcte longitudinaliter costatis, costis regulariter, quasi spiraliter nodulosis, ultimo, penultimo, et antepenultimo anfractu quatuor, cæteris tribus gemmarum ordinibus præditis, in ultimo infra medium evanidis, inde, usque ad basin, pulchre spiraliter lirato; apertura breviter ovata, intus albescente, labro paullum effuso, subquadrato, margine columellari obliquo, ad basin brevissime rostrato.

Long. 6, lat. 2 mm.

A very delicately variegated *Bittium*, not nearly akin to any species with which I am cognizant. It is white, fusiform, with regular gemmate ribs, the disposition of these gemmæ giving an appearance of spirals round the whorls, so regularly are they disposed; there are three rows of these in the upper whorls, four in the three lowest; in the body-whorl the ribs disappear below the middle, whence to the base are to be seen spiral clear-cut liræ; the mouth is somewhat compressed, outer lip rather effuse, beak very short, columella oblique. The variegation of yellow-brown and white is most pronounced in the last two whorls.

\* χρυσόμαλλος, with fleece or sheen of gold; from the pattern.

*Delphinula diplacostira* \*, sp. n.  
(Pl. IX. figs. 5, 5 a, 5 b.)

*D. testa parva, profunde sed anguste umbilicata, albo-straminea, solidula, supra planata; anfractibus quatuor, quorum tres planati, depressi, simplices, ultimo rapide accrescente, effuso, apud peripheriam acute bicarinato, carinis arcte spinicostatis, superficie undique longitudinaliter tenuissime squamato-lamellosa; apertura rotunda; peristomate extus breviter spinoso, paullum effuso, margine columellari crassiusculo, nitido, albo, ad basin producto, basi circa umbilicum indistincte concentrico-striata, interstitiis undoso-gemmatis.*

Alt. 3, diam. 6 mm.

This little species, perhaps not quite fully grown, is distinct from all the others of the genus known to me, in its lamellate longitudinal striæ, double peripheral carinations, the upper keel possessing twelve, the lower seventeen coronals of short spines. The umbilicus is very deep and narrow, the concentric sulcation and waved gemmæ interposing at the base are characteristic, the columellar extension towards the base recalling other *Delphinulæ*. The colour is throughout pale stramineous. *D. stellaris*, Ad. & Reeve, is perhaps the nearest species in affinity.

*Donax (Serrula) epularis* †, sp. n.  
(Pl. IX. figs. 6, 6 a.)

*D. testa subtrigonalis, æquivalvis, inæquilateralis, alba; umbonibus parvis, sæpe violaceis, incurvis, approximatis; margine dorsali antice obliquo, extenso, postice multum abbreviato, ventrali subrotundato, conspicue multidenticulato, superficie omni arcte et pulcherrime decussata, costis longitudinalibus latus versus posticum magis conspicuis, sed antice nequaquam evanidis, sulcis spiraliter distinctis prædita, postico latere pulchre sulcifero et costato, costis breviter spiniferis, ad marginem bino spinarum longiorum ordine decorato, intus pagina nitida violaceo-tincta, postice radio nigro-violaceo magis conspicuo, sinu palliali indefinito.*

Alt. 5·50, lat. 8·50, diam. 4 mm. (sp. maj.).

An exceedingly highly decorated species, though it must be examined with a lens before its characters are very perceptible. All the specimens are small, and they have in all probability not yet attained their full growth; but the sculpture is unmistakable and more elaborate than in the other species of this large genus that are comparable with it.

\* *δίπλαξ στῆρα*, with double keel.

† *Epularis*, sumptuous.

*D. spinosus*, Chem., itself a delicately chased little shell, takes second rank without doubt; *D. obesus*, d'Orb., a finely decussate species, is also eclipsed; *D. semisulcatus*, Hanley, from the Indian Ocean, posteriorly similar in its sculpture, is anteriorly almost plain, the whole of the surface of our species being closely ribbed and spirally sharply sulcate, which gives a clear-cut character to the sculpture. The ventral margin is beautifully multidenticulate. Posteriorly, when the two closed valves are viewed laterally, the double row of long spined convergent ribs, with the inner ranks of costæ armed with shorter spines, form a beautiful heart-shaped surface, recalling *Cardium* (*Ctenocardia*) *hystrix*, Wood, in miniature. Indeed, after a minute comparison of the other species of the genus, to some of which allusion has just been made, *D. clathratus*, Desh. 1859 (cf. Reeve, Conch. Icon., *Donax*, t. 57), perhaps is the nearest ally; but the character of the decussating sculpture is seen, with a lens, to be of a different character, and it is more isosceles-shaped than our new form.

*Cumingia occatilla* \*, sp. n. (Pl. IX. figs. 7, 7 a.)

*C.* testa inæquilaterali, protea, ovato-oblonga vel fere rotunda, hic postice abbreviata, illic subquadrata, alba, delicata; umbonibus haud prominulis, contiguis, obliquatis, superficie omni concentrice tenui-lamellata, lamellis marginem apud ventralem sæpius condensatis, irregularibus, in medio regulariter dispositis, interstitiis longitudinaliter delicatissime et arcte striatis, speciminibus vetustis sæpe evanidis, postice compressis, intus pagina alba, nitida, margine antico simul ac ventrali pallide puniceo hic illic variegato, sinu palliali ad medium ascendente, ligamento interno, valvis ambabus dente uno cardinali, simul ac fossa elongata, oblique cochleari, præditis, in dextra quoque duobus dentibus lateralibus fortiter instructa.

Alt. 14, lat. 16, diam. 10 mm. (sp. max.).

This mollusk doubtless, in common with many other *Leptomyæ*, *Thyellæ*, and *Cumingiæ*, inhabits sponges and corals; hence the inequality of form, as protean indeed as any British *Saxicava*. The delicate sculpture is almost identical with that of *Thyella lamellosa*, A. Ad., but the hinge, with undoubted laterals in the right valve, seems more akin to *Cumingia* than to *Leptomya*, with which genus I had essayed at first to connect it.

The large ligamentary pit is obliquely elongate and spoon-shaped, most resembling that of *Leptomya*. An interesting

\* *Occatus*, harrowed; from the lamellated parallel ridges.

characteristic is the delicate pale pink blotching round the margins, both ventral and anterior, internally; the pallial sinus is large, extending almost to the centre of the interior.

A specimen identical with those from Aden has been dredged off the Mekran coast of Baluchistan, not very far from Karachi, by Mr. F. W. Townsend, and I purpose figuring this, as it is so much the largest, in company with one of Commander Shopland's types.

It is important that no confusion should exist between *Cumingia lamellosa*, Sowb., 1833, from Chili, and *C. (Thyella) lamellosa*, H. Ad. (= *Cumingia elegans*, Sowb.), from the Eastern Archipelago and Australia. In this latter the lateral teeth are absent in either valve.

\*                    \*                    \*                    \*

*Calyptrea (Galerus) Edgariana*, Melv.\* (Pl. IX. figs. 8, 8 a).—It is necessary to refigure this, the former delineation not having been very successful. This species has since been found by Mr. Townsend near Bushire and Maskat.

#### EXPLANATION OF PLATE IX.

- Fig. 1. Sistrum indigoferum.*  
*Fig. 2. Natica (Eunatica) tela-araneæ.*  
*Fig. 3. Cerithium Shoplandi.*  
*Fig. 4. Bittium chrysomallum.*  
*Fig. 5. Delphinula diplacostira.*  
*Figs. 6, 6 a. Donax (Serrula) epularis.*  
*Figs. 7, 7 a. Cumingia occatilla.*  
*Fig. 8. Calyptrea (Galerus) Edgariana, Melv.*

### LXXII.—*Descriptions of Brazilian* Coccidæ. By ADOLPH HEMPEL, S. Paulo, Brazil.

[Continued from p. 219.]

#### Genus CEROPLASTES, Gray.

##### *Ceroplastes amazonicus*, Hempel.

Adult female scale very convex, oval, with the lower lateral edges much produced. The anterior end is jointed and slightly produced; the posterior edge is slightly notched; the dorsum is obliquely truncated and slightly concave, the wax being a little higher behind than in front. The colour is dirty white, with a brownish tinge on the posterior portion.

\* Ann. & Mag. Nat. Hist. ser. 7, vol. i. p. 201 (1898).



Size of the largest individuals:—Length 11 millim., width 8.25 millim., height 8 millim. The wax is hard and brittle and is distinctly divided into seven plates, of which the dorsal plate is the largest. One small, elliptical, dark-coloured nucleus is situated in the centre of the dorsal plate. No other nuclei are present. The surface is roughened by concentric rings and slight lateral humps. Two white chalky lines are present on the ventral surface, but do not appear on the sides.

The adult female denuded of wax is 6.5 millim. long, 4.5 millim. wide, and 4 millim. high, with a slight notch on the margin at each stigmatal area, but without any distinct humps. The derm is light brown, thin, and chitinized. The caudal horn is light brown, 2 millim. long, and placed horizontally. Boiled in a solution of KOH the liquid becomes turbid and of an orange colour with a pinkish tinge. The dorsal derm remains hard, while the ventral derm is soft.

The antennæ are of eight joints, all except joints 3 and 4 bearing hairs. Length about .380 millim. Length of the joints: (1) 66, (2) 53–66, (3) 66–70, (4) 35–40, (5) 57–66, (6) 26, (7) 26, (8) 40. Approximate formula: (3 1 2 5) (8 4) (6 7). Legs ordinary, short. Length of joints: coxa 111, femur and trochanter 222, tibia 147, tarsus 79, claw 24, digitules of claw 40. Tarsal digitules fine, slightly longer than the digitules of claw, with the ends slightly expanded. Digitules of claw large, with widely expanded ends. Around the lateral margin of the body there is a thickly set row of short, sharp, conical spines. About each stigmatal area there is a group of fifty or more larger conical spines. The derm of both surfaces bears many small glands.

*Hab* Manáos, State of Amazonas. Presumably on an uncultivated shrub or tree.

### *Ceroplastes grandis*, Hempel.

Adult female scale very large, ovate, truncated and slightly excavated posteriorly, acuminate anteriorly. Dorsum very convex, coming to a point at the dorsal nucleus. The wax is very soft, containing much water, and has a characteristic pungent smell. It is white on the dorsum, turning to a salmon-pink on the sides and lower edge, and is distinctly divided into plates. Nuclei brown, the lateral ones not conspicuous. The surface is shiny and uneven, being depressed about the nuclei and caudal horn and slightly elevated on the other parts. Size of the largest specimens:—Length 18 millim.; width 14 millim.; height 11 millim.

Denuded of wax it is more or less elliptical, of a bright red colour, like sealing-wax, and 9 millim. long, 6·5 millim. wide, and 5·50 millim. high. The caudal horn is black, thick, and conical, with the tip slightly elevated, 2·25 millim. long and 2 millim. wide at the base. Around the lateral border there is a slight flange, which is excavated at the stigmatal areas and posterior end, thus making it five-lobed. There are six humps or tubercles present; these are very sharp and are situated one on the dorsum, one on the anterior end, and two lateral on each side. The derm is dotted with minute pits, is moderately shiny and soft, being chitinized only about the caudal horn and stigmatal areas. Boiled in a solution of KOH it colours the liquid red. The derm becomes soft and transparent.

The antennæ are 8-jointed; joints 2 and 5 each bear two very long hairs, joints 3 and 4 bear no hairs. Average length ·500 millim. Approximate formula: 5 3 (1 2) 8 4 (6 7) or (5 3) (1 2) 8 4 (6 7). Length of joints: (1) 66, (2) 66, (3) 84-88, (4) 40-44, (5) 84-93, (6) 31-40, (7) 31-40, (8) 44-48. Legs ordinary; trochanter long; coxa with two long subterminal hairs. Length of joints of first pair of legs: coxa 164, trochanter and femur 280, tibia 182, tarsus 106, claw 22, digitules of claw 44. Tarsal digitules long, slender, with expanded ends, reaching to the tips of the digitules of claw, the latter being large, with the ends rounded and widely expanded. Rostrum well-developed, placed behind the insertion of the first pair of legs. Mentum with eight hairs near the tip. Anal ring apparently with six large hairs. Anal plates with three hairs near the posterior end. Around the margin there is a single row of small hairs, each arising from a tubercle. The stigmatal areas are each characterized by seventy to eighty-five short bullet-shaped spines of different sizes and over a hundred small round spinnerets. The derm on the dorsal surface is thickly studded with short spine-like hairs and small spinnerets.

Male scale white, small, elliptical, with seven marginal and two dorsal tufts of white wax. The marginal tufts are arranged in a row of three on each side and one on the anterior end. The posterior end bears a few white filaments. Denuded of the tufts the scale is flat and very thin. Length 1·5 millim.; width ·80 millim. The male scales are usually placed close together on the underside of the leaves.

*Hab.* Ypiranga, S. Paulo, and Iguape, State of S. Paulo. On the branches of *Zanthoxylum* sp., *Ilex* sp., *Psidium* sp., *Raccharis* sp., *Mechelia flava*, and various other plants, especially those of the order Myrtaceæ.

*Ceroplastes novæsi*, Hempel.

Female scale very variable in size and colour, usually pinkish white, with two white lines on each side to the lateral nuclei. General shape ovate or subcircular or pentagonal; dorsum very convex. The dorsal nucleus conspicuous. The wax is depressed about the nuclei and elevated into three tubercles on the dorsum, causing a rough and irregular appearance. The wax is pinkish, yellowish, or purplish, and is not divided into plates, and contains little water. In the older specimens the dorsum becomes more convex and the waxy humps become less conspicuous. Length of the largest specimens 7.50 millim.; width 7 millim.; height 5.75 millim. The inside of the scale is yellowish.

Denuded of wax the adult female is smooth, dark coffee-brown, with a lighter area in the centre of the dorsum. Anal plates small; caudal horn short, stout, black. The derm is hard and shiny and is chitinized around the lateral nuclei and slightly elevated, forming two inconspicuous humps on each side and one on the anterior end. There is a small five-lobed flange around the lateral edge of the body, to correspond with the lateral tubercles. Length 5.75 millim.; width 5.25 millim.; height 4 millim. Boiled in a solution of KOH it colours the liquid light brown or reddish. The dorsal derm remains hard and semitransparent.

Antennæ variable, .206 millim. to .225 millim. long; of six joints. Approximate formula: 3 6 1 (2 4 5). Length of joints: (1) 31, (2) 26-31, (3) 70-75, (4) 22-26, (5) 22-26, (6) 35-40. Legs short and apparently deformed. The tibia of the first pair of legs and sometimes of the other legs also is concave on the outer edge. Length of joints of first pair of legs: coxa 66, trochanter and femur 93, tibia 64, tarsus 44, claw 18, digitules of claw 34. The tarsal digitules are slender, with expanded ends; the digitules of the claw are wide and of unequal size, with expanded ends. Rostrum small, placed behind the insertion of the first pair of legs. Rostral loop short. The stigmatal areas are characterized by about forty conical spines and many small spinnerets. The anal ring has six long hairs. The dorsal derm is homogeneous, but contains a number of small glands. The lateral margin has a simple row of small hairs.

*Hab.* Capoeira Grande, Campinas, Ypiranga, S. Paulo, Cachoeira, State of S. Paulo. On *Abutilon* sp., *Baccharis dracunculifolia*, *Baccharis* sp., and *Vernonia Riedelii*. It infests the branches and twigs, and seems to reproduce rapidly, as more than 1300 eggs were counted from one individual; many of the adult specimens are, however, parasitized.

*Ceroplastes communis*, Hempel.

Adult female scale oval in outline, dorsum convex; wax not shiny, pinkish white, usually covered with a black fungus, divided into seven distinct plates; hard and very thin, so that in the older specimens the derm is frequently exposed. When removed from the bark it leaves an oval patch of white wax behind. Length 6.25 millim.; width 5.50 millim.; height 4.75 millim. Denuded of wax the insect is oval; dorsum convex, dorsal nucleus present, elevated, the other nuclei not distinguishable. Derm light yellow, shiny, not smooth, slightly chitinous, and with few pits. No humps are present. Boiled in a solution of KOH it colours the liquid light yellow. The derm becomes softer and semitransparent.

Antennæ variable, usually of seven joints; frequently, however, an extra false joint is present. Length .460 millim. to .495 millim. All the joints except joint 3 bear hairs. Approximate formula: 4 (3 1 2) 7 (5 6). Length of joints: (1) 70-75, (2) 66-70, (3) 70-79, (4) 129-133, (5) 35-40, (6) 35-40, (7) 40-46. Legs ordinary; length of joints of first pair of legs: coxa 155, femur and trochanter 245, tibia 168, tarsus 114, claw 31, digitules of claw 48. Tarsal digitules slender, with expanded ends extending to the tips of the digitules of claw; the latter are wide and have round expanded tips. Rostrum well-developed, placed behind the insertion of the first pair of legs. Rostral loop short. Caudal horn very short and wide, inconspicuous. Anal ring with six long hairs. Stigmatal areas characterized by a horseshoe-shaped depression on the ventral surface, with about twenty conical spines and forty to fifty round spinnerets. The margin of the body is thickly set with a double row of short sharp conical spines and a few longer hairs. The dorsal derm is homogeneous without any apparent glands.

Eggs small, elliptical, smooth, shiny, almost white when laid, but becoming light yellow.

*Hab.* Ypiranga, State of S. Paulo. On the branches of *Maytenus* sp.

*Ceroplastes variegatus*, Hempel.

Adult female scale oval at base; dorsum elevated, forming a pyramid. Wax shiny, distinctly divided into seven plates, one dorsal and six lateral. Dorsal and lateral nuclei present, brown; wax depressed about the nuclei. Colour of wax on the surface white and pink in concentric rings around each

nucleus; on the margin and anterior end the colour is lighter. A number of fine lines radiate from the nuclei. Dorsal nucleus much depressed, but the wax grows over it from behind, thus forming a hood. The anterior end of the scale is acuminate, the posterior end truncate; both ends are slightly notched. The inside of the wax is salmon-pink in colour. In the older specimens the radiating lines and concentric rings become obsolete and the wax bleaches to a creamy white. Removed from the bark it leaves a scale of white wax behind. Length 8·25 millim., width 7·50 millim., height 5·75 millim.

Denuded of wax the derm is shiny, salmon-colour, not very hard, with two prominent humps on each side, one hump on the dorsum, and a small one on the anterior end. Caudal horn small, broad and flat, black. Dorsum longitudinally striate, with a row of deep gland-pits on each side. The abdominal margin is slightly granulated. Boiled in a solution of KOH it colours the liquid a light pink. In the old specimens the derm is of a chocolate-brown colour and the humps are nearly obsolete. Length 4·50 millim.; width 2·50 millim.; height 1·75 millim.

Antennæ of six joints, all bearing hairs. Length ·200 to ·220 millim. Length of joints: (1) 35-40, (2) 26-31, (3) 66-70, (4) 18, (5) 22-26, (6) 31-35. Approximate formula: 3 1 6 2 5 4 or 3 (1 6) (2 5) 4. Legs ordinary. Length of joints of first pair of legs: coxa 70, trochanter and femur 120, tibia 75, tarsus 48, claw 18, longest digitule of claw 26. The tarsal digitules are very long and slender, with expanded ends; one of the digitules of claw is large, wide, with rounded expanded tip; the other is about half as large. Rostrum large, situated between the first pair of legs. Rostral loop long, in some specimens extending to the third pair of legs. Each stigmatal area is characterized by about twenty short bullet-shaped spines and by sixteen to twenty large round spinnerets. The lateral margin of the body bears a few short hairs. Some small glands are scattered over the dorsal and ventral derm.

*Hab.* Ypiranga. On the branches of various shrubs of the order Myrtaceæ. The specimens are frequently covered by a black fungus.

[To be continued.]

LXXIII.—On a Collection of Butterflies from the Uganda Protectorate, forwarded by C. Stewart Betton, Esq., in 1900.  
By A. G. BUTLER, Ph.D.

ABOUT the end of last year two tins of Lepidoptera reached us from Mr. Betton. All the butterflies were collected at Eb Urru in April and May.

It is interesting to note that the whole of the variation of *Limnas chrysippus* is represented in the present series (the forms *L. chrysippus*, *alcippoides*, *alcippus*, *dorippus*, and *Klugii* being all present). Among rare species are both sexes of *Chrysophanus Abbotii*, the male of the southern *Uranotauma nubifer*, specimens of *Catochrysops negus* (which was new to the Museum collection), *Mylothris rubricosta*, *Phrisura phæbe*, the Arabian *Synchlœ glauconome*, and a fine example of *Papilio nobilis*. A very remarkable *Spindasis*, quite new to me, was secured, but unhappily it is too much worn to enable me to describe it with any certainty.

The following is a list of the species:—

Tirumala pëtiverana, <i>Dbf.</i>	<i>Colias electo</i> , var. <i>edusa</i> , <i>Fabr.</i>
<i>Limnas chrysippus</i> , <i>Linn.</i>	<i>Terias zoe</i> , <i>Hopff.</i>
<i>Precis clelia</i> , <i>Cram.</i>	<i>Teracolus gavisia</i> , <i>Wllgr.</i>
— <i>cebrene</i> , <i>Trim.</i>	— <i>omphale</i> , <i>Godt.</i>
<i>Pyrameis cardui</i> , <i>Linn.</i>	— <i>callidia</i> , <i>Gr.-Sm.</i>
<i>Hypolimnas misippus</i> , <i>Linn.</i>	— <i>aurigineus</i> , <i>Butl.</i>
<i>Atella columbina</i> , <i>Cram.</i>	<i>Catopsilia florella</i> , <i>Fabr.</i>
<i>Byblia ilithyia</i> , <i>Drury.</i>	<i>Belenois infida</i> , <i>Butl.</i>
<i>Neocœnyra Gregorii</i> , <i>Butl.</i>	— <i>mesentina</i> , <i>Cram.</i>
<i>Chrysophanus Abbotii</i> , <i>Holl.</i>	<i>Synchlœ glauconome</i> , <i>Klug.</i>
<i>Spindasis</i> , sp. n.	— <i>Johnstoni</i> , <i>Crowl.</i>
<i>Uranotauma nubifer</i> , <i>Trim.</i>	<i>Papilio demodocus</i> , <i>Esp.</i>
<i>Cacyreus lingeus</i> , <i>Cram.</i>	— <i>cenea</i> , <i>Stoll.</i>
— <i>palemon</i> , <i>Cram.</i>	— <i>nobilis</i> , <i>Rghfr.</i>
<i>Syntarucus telecanus</i> , <i>Lang.</i>	— <i>nireus</i> , <i>Linn.</i>
<i>Polyommatus bæticus</i> , <i>Linn.</i>	<i>Sarangesa eliminata</i> , <i>Holl.</i>
<i>Zizera knysna</i> , <i>Trim.</i>	<i>Eretis lugens</i> , <i>Rghfr.</i>
— <i>gaika</i> , <i>Trim.</i>	<i>Gegenes Letterstedti</i> , <i>Wllgr.</i>
<i>Mylothris agathina</i> , <i>Cram.</i>	<i>Parnara mathias</i> , <i>Fabr.</i>
— <i>rubricosta</i> , <i>Mab.</i>	<i>Rhopalocampta forestan</i> , <i>Cram.</i>

Such specimens as are required are presented to the collection of the British Museum.

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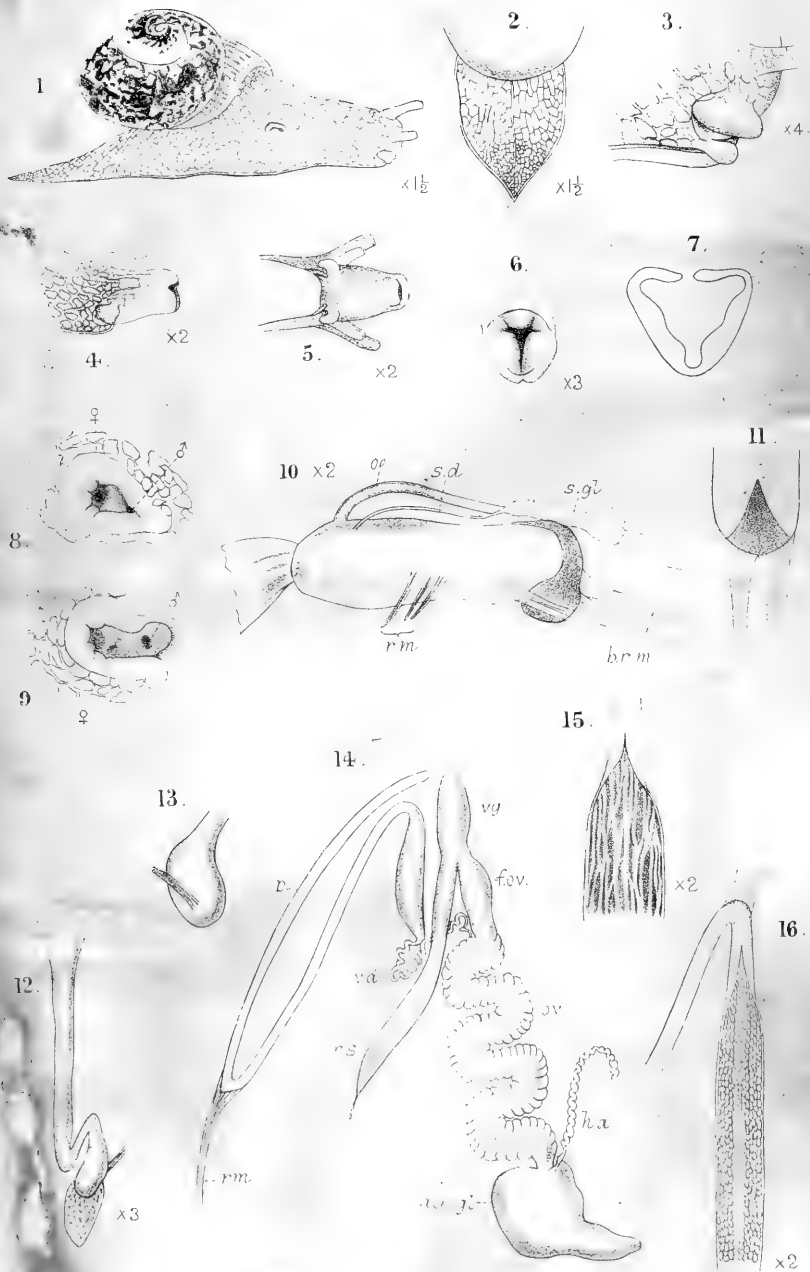


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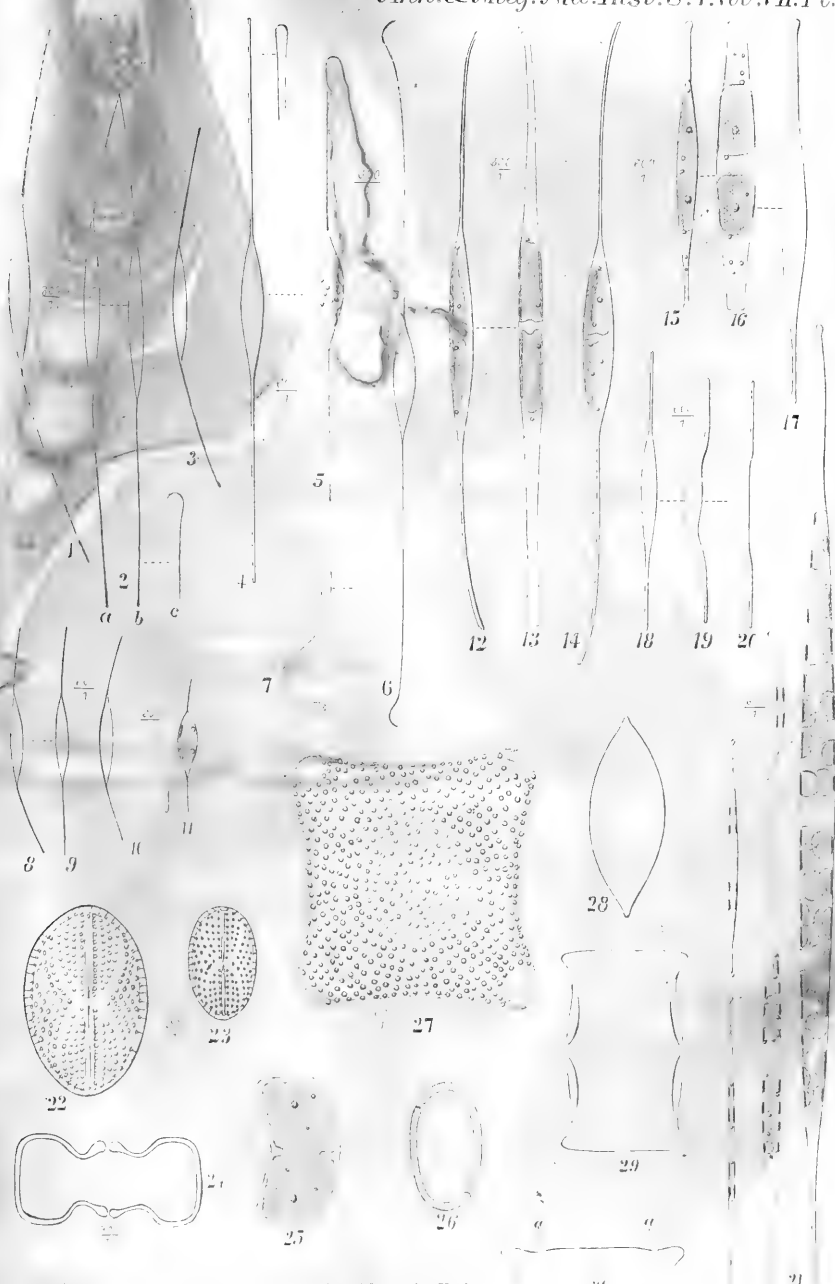


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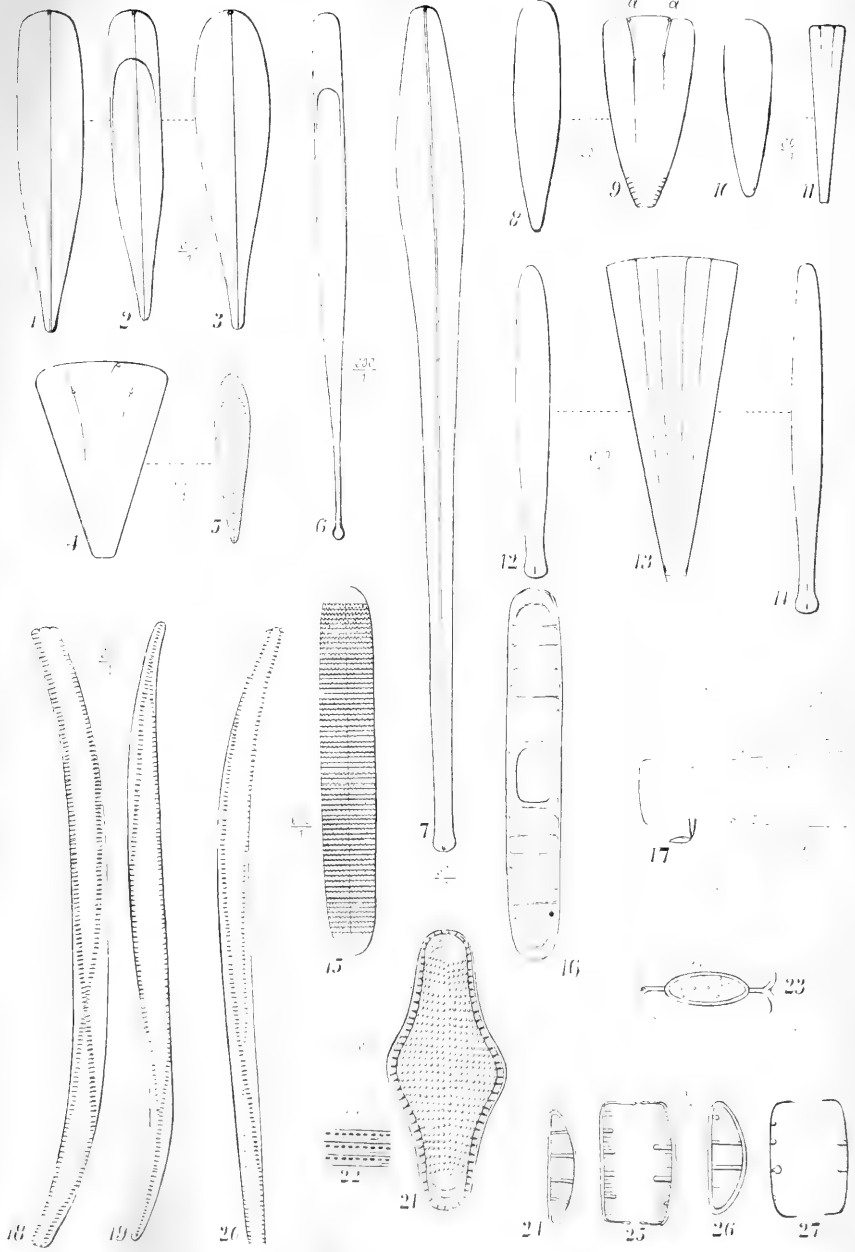
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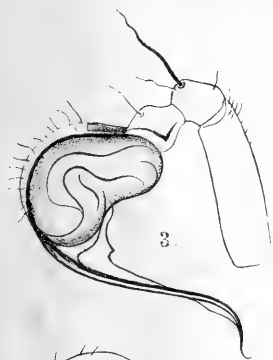












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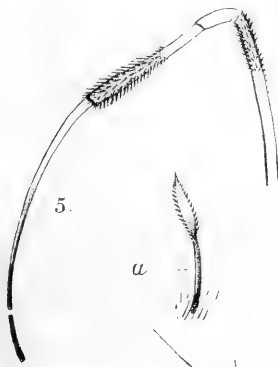
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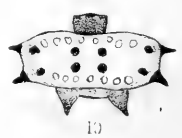
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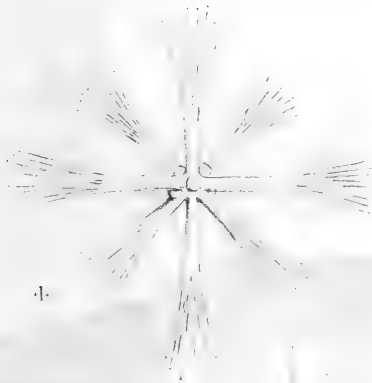
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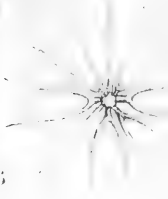


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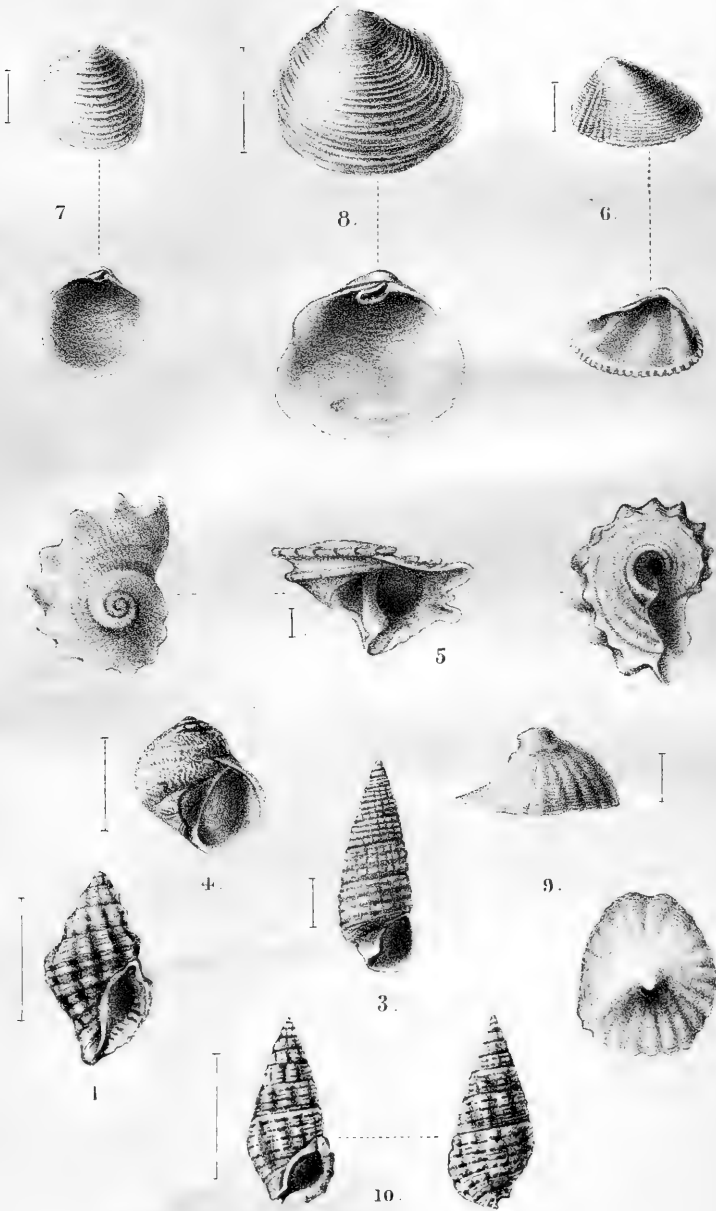
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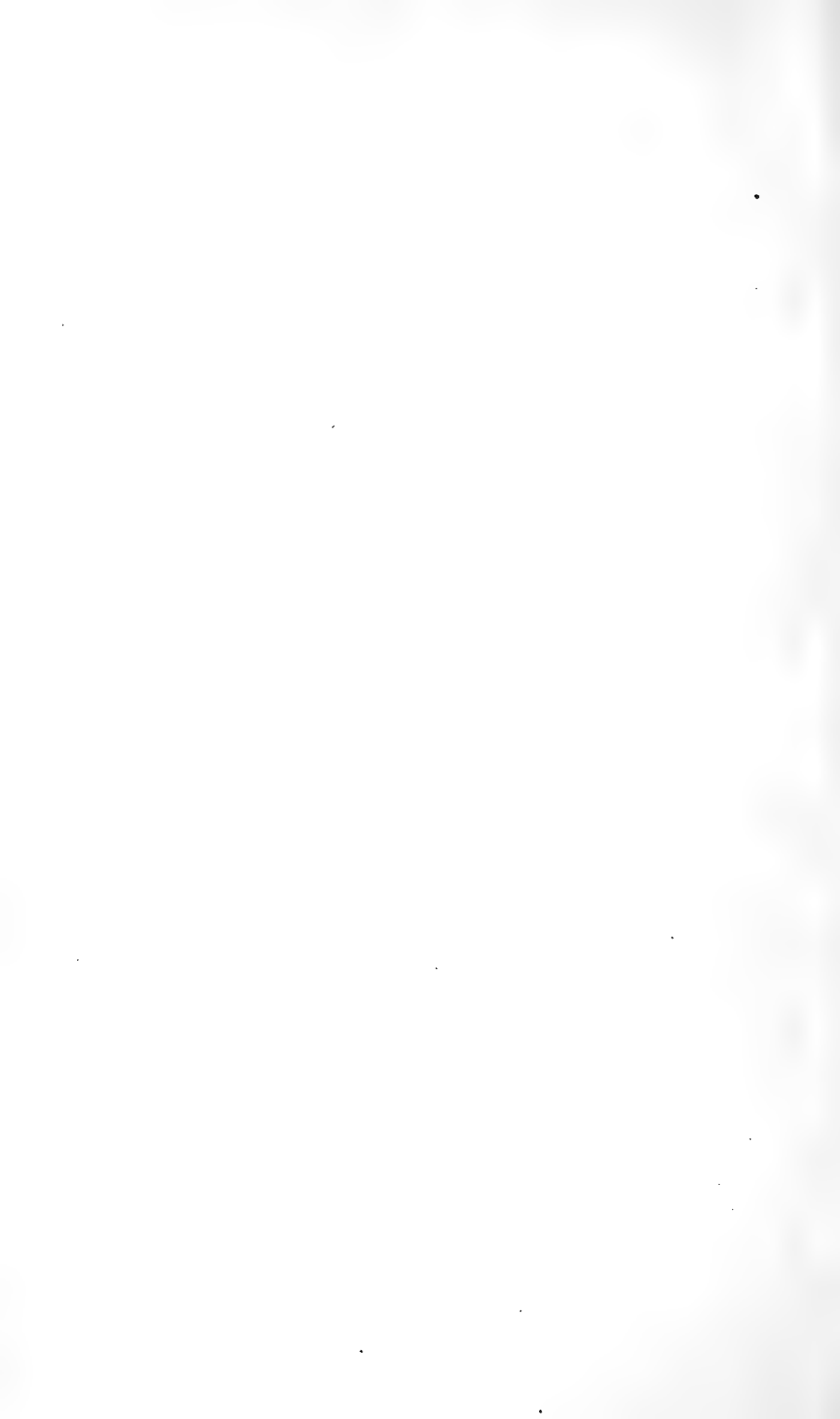
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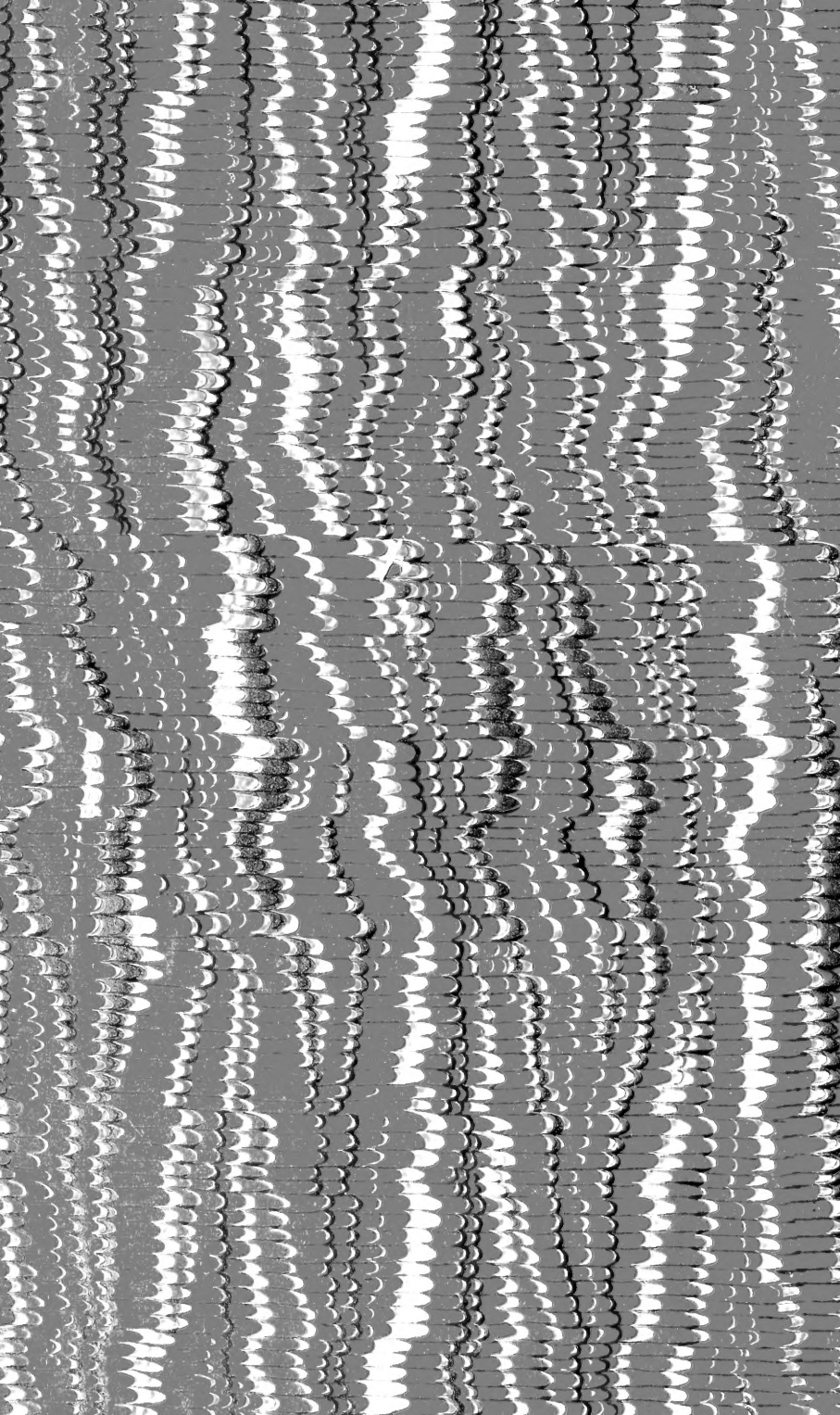


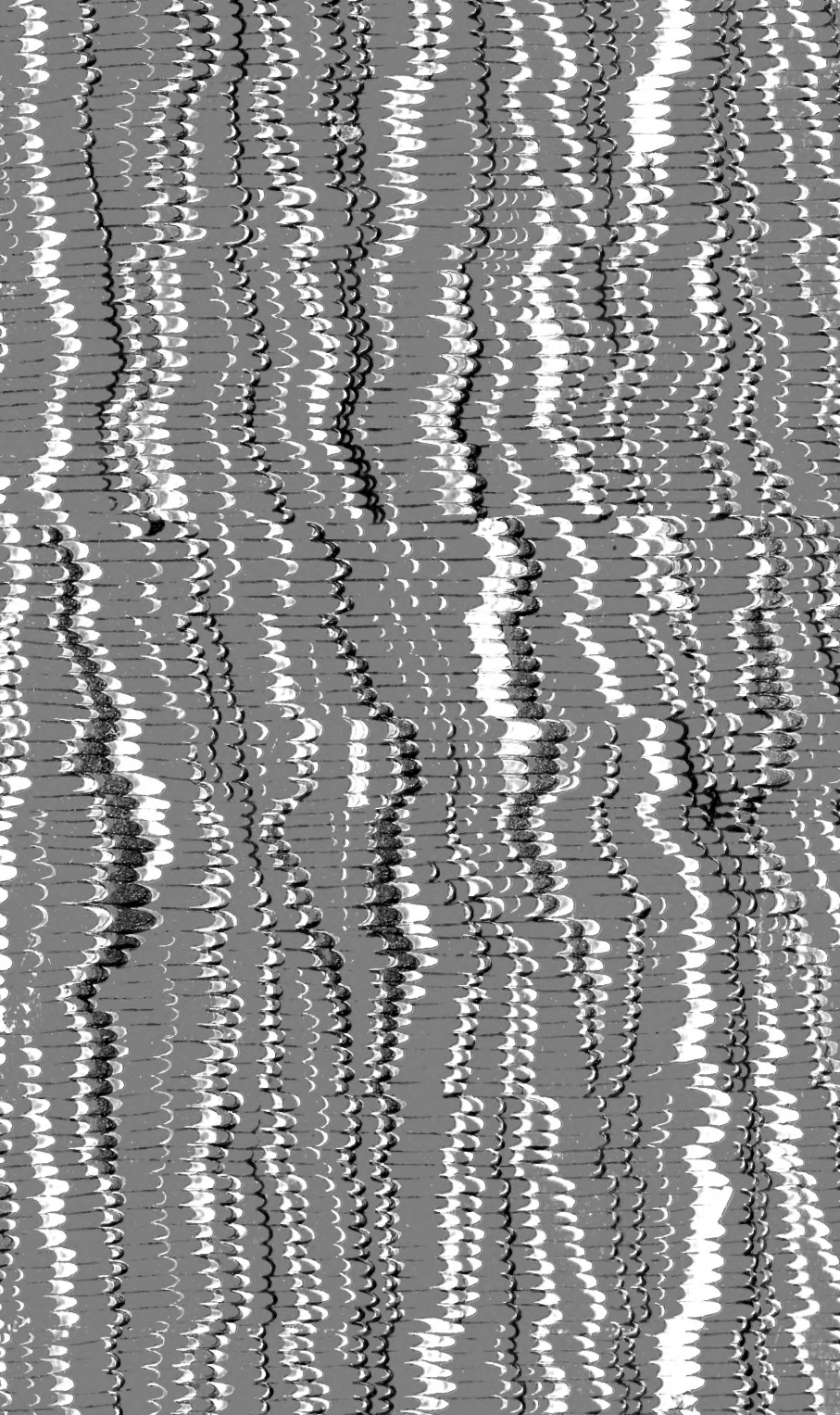












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