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THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

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AND

WILLIAM FRANCIS, F.L.S.

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VOL. XIX.—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.]

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

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No. 109. JANUARY 1907.

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I.—*Descriptions of new Pyralidæ of the Subfamilies Hydrocampinæ and Scopariinæ.* By Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S., &c.

[Concluded from vol. xviii. p. 472.]

Genus PSEUDLITHOSIA, nov.

Palpi upturned, short, not reaching vertex of head, smoothly scaled, the third joint moderate; maxillary palpi minute, filiform; frons rounded; antennæ simple in both sexes; legs long and slender, the spurs short; retinaculum of male a corneous bar. Fore wing very long and narrow; vein 3 from angle of cell; 4, 5 from angle; 6 from well below upper angle; 7 from angle; 8, 9, 10 stalked from long before angle. Hind wing with veins 3 and 5 separate, 4 absent; 6 from upper angle; 7 from well before upper angle and anastomosing with 8.

(1.) *Pseudlithosia Schausi*, sp. n.

♂. Head and thorax black-brown; abdomen fulvous-brown. Fore wing black-brown. Hind wing pale brown.

*Ann. & Mag. N. Hist.* Ser. 7. Vol. xix. 1

♀. Fore wing with diffused white scales forming traces of antemedial, medial, and subterminal bands.

*Hab.* MEXICO, Jalisco, Guadalajara (*Schaus*), 1 ♀ type.  
*Exp.*, ♂ 32, ♀ 40 mm. Type ♂ in Coll. Schaus.

(4.) *Daulia argyrophoralis*, sp. n.

Mid tibia of male without groove and tuft of hair; fore wing with vein 10 from cell or stalked with 8, 9.

Head and thorax ochreous tinged with brown; fore legs tinged with fuscous; abdomen white slightly tinged with ochreous. Fore wing ochreous yellow irrorated with a few black scales, more thickly on disk; a silvery fascia below base of cell, then obliquely bent downwards to middle of inner margin; some silvery scales in middle and end of cell and beyond discocellulars, on which there is a slight fulvous lunule; a silvery subterminal slightly curved band defined on each side by fine black lines; a narrow silvery terminal band defined on inner side by a slight black line; cilia yellow at base, silvery white at tips. Hind wing uniform ochreous white.

*Hab.* ARGENTINA, Florenzia, Gran Chaco (*S. R. Wagner*), 2 ♂, 1 ♀ type. *Exp.* 20 mm.

(4 a.) *Luma flavimarginalis*, sp. n.

Head and thorax orange-yellow; palpi with the second joint black above; abdomen fuscous, the extremity and ventral surface yellow. Fore wing fuscous brown with a purplish gloss; the base orange-yellow; an orange-yellow terminal band expanding widely to costa, the outer edge of brown area being strongly curved. Hind wing fuscous brown with a slight purplish gloss; an orange-yellow terminal band expanding slightly to costa.

*Hab.* CEYLON, Maskeliya (*Green, de Mowbray*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 28, ♀ 36 mm.

(6 a.) *Luma holoxantha*, sp. n.

♀. Head, thorax, and abdomen orange-yellow. Fore wing uniform glossy yellow. Hind wing pale glossy yellow.

*Hab.* MASHONALAND, Salisbury (*Marshall*), 1 ♀ type.  
*Exp.* 30 mm.

(2.) *Margarochroma fuscalis*, sp. n.

Antennæ annulate.

♂. Black-brown; pectus, legs, and ventral surface of

abdomen whitish; wings mixed with greyish. Fore wing with a pale subterminal line, oblique with an inward curve from costa to vein 5, then minutely dentate and indistinct to tornus. Hind wing with indistinct minutely dentate subterminal line.

*Hab.* CELEBES, Bonthain, Mdrulaman, 2300' (Everett).  
*Exp.* 14 mm. Type in Coll. Rothschild.

(6 a.) *Dracænura chrysochroa*, sp. n.

♂. Head, thorax, and abdomen orange-yellow; palpi white at base, black at tips; lower part of frons blackish; pectus and ventral surface of abdomen white; mid tibiæ black at base. Fore wing orange-yellow, rather deeper orange towards termen, the costa tinged with fuscous; a slight, dark, somewhat sinuous and oblique antemedial line; a black point in middle of cell and slender discoidal bar; a brown postmedial line, slightly bent outwards to costa, then erect; cilia black at base, grey at tips. Hind wing orange-yellow, deeper orange towards termen; a slight obliquely curved brown line from below middle of costa to above tornus; cilia black at base, white at tips.

*Hab.* S.W. NEW GUINEA, Kapaur (Doherty), 2 ♂ type.  
*Exp.* 22 mm.

(6 b.) *Bradina costalis*, sp. n.

♀. White; palpi brown at tips; neck brown; shoulders with a brown stripe; abdomen dorsally tinged with brown. Fore wing with dark brown moderately broad costal fascia; both wings with diffused brown terminal band, narrowing to a point at submedian fold of hind wing; the cilia white.

*Hab.* SOLOMONS, Guadalcanar. *Exp.* 26 mm. Type in Coll. Rothschild.

(17 a.) *Bradina glaucinalis*, sp. n.

Head, thorax, and abdomen fuscous brown, the last with white segmental rings; pectus, legs, and ventral surface of abdomen whitish. Fore wing pale glossy grey-brown, with traces of dark discoidal point and oblique postmedial line; a fine dark terminal line; cilia brownish white, with dark line at base. Hind wing uniform pale glossy grey-brown, with fine dark terminal line; cilia brown at base, whitish at tips.

*Hab.* NEW GUINEA, Kapaur (Doherty), 1 ♂, 1 ♀ type;  
SOLOMONS, Florida I. (Meek), 1 ♀. *Exp.* 22-30 mm.

(18 a.) *Bradina dentalis*, sp. n.

Pale silky brownish ochreous; palpi and frons fuscous; anal tuft white. Fore wing with the costal area suffused with purplish fuscous; an antemedial black line bent inwards to costa; a point in middle of cell and discoidal lunule; a minutely dentate postmedial line, bent outwards below costa, then oblique. Hind wing with oblique discoidal striga; a minutely dentate curved postmedial line.

*Hab.* SUMBA (*Doherty*); SELARU (*Micholitz*), 1 ♂ type. *Exp.* 22-24 mm.

(26 a.) *Bradina pumilialis*, sp. n.

Head, thorax, and abdomen grey tinged with brown and irrorated with black; palpi and legs banded with black; abdomen with dorsal black band before anal tuft. Fore wing grey tinged with brown and irrorated with black; the costa blackish to beyond middle; diffused black subbasal and antemedial lines, the latter expanding into a patch below cell; a rather x-shaped black discoidal spot; postmedial line black, diffused, rather maculate, excurved between veins 5 and 3, then retracted to below end of cell; a terminal series of blackish striæ. Hind wing grey suffused with fuscous brown.

*Hab.* SUMBAWA (*Doherty*), 1 ♂ type; PURA (*Doherty*), 1 ♀. *Exp.* 10 mm.

(27 a.) *Bradina punctilinealis*, sp. n.

♂. Very pale yellow; abdomen dorsally tinged with fuscous at middle. Fore wing with black point in middle of cell and slight oblique discoidal lunule; a curved postmedial series of minute black streaks on the veins. Hind wing with oblique postmedial series of minute dark streaks on veins 6-2.

*Hab.* FIJI, Navua I. (*de la Garde*), 1 ♂ type. *Exp.* 22 mm.

(28 a.) *Bradina neuralis*, sp. n.

♂. Head and thorax whitish tinged with brown; palpi black at tips; antennæ ringed with brown; fore tibiæ and tarsi banded with black; abdomen white tinged with brown, the terminal half dorsally banded with fuscous. Fore wing white, the costal and apical areas suffused with cupreous brown, the veins streaked with brown; a dark spot on costa

near base; an elongate spot in middle of cell, with diffused brown band from it to inner margin; a dark discoidal spot; a dark postmedial line excurved between veins 5 and 2. Hind wing white; the veins streaked with brown except at base; a discoidal point; a postmedial line excurved between veins 5 and 2; apical area suffused with brown, narrowing to a point at vein 2.

*Hab.* SAMOA, Pago I. (*de la Garde*), 1 ♂ type. *Exp.* 22 mm.

(30 a.) *Bradina hemiphæalis*, sp. n.

♂. Head and thorax fuscous black; pectus and abdomen whitish suffused with fuscous brown. Fore wing deep fuscous brown with slight dark irroration; faint traces of a darker discoidal spot and postmedial line excurved at middle; cilia rather paler fuscous brown. Hind wing white slightly tinged with fuscous brown; traces of a slightly diffused postmedial line, excurved at median nervules, then obsolete; a rather diffused fuscous terminal line from apex to vein 2; cilia white, with faint brown line near base towards apex; the underside more strongly tinged with fuscous brown, the costal area fuscous, the terminal area suffused with fuscous.

*Hab.* BR. E. AFRICA, Kikuyu, Nairobi Plains (*Crawshay*), 1 ♂ type. *Exp.* 30 mm.

(34.) *Bradina purpurascens*, sp. n.

♀. Deep purplish fuscous; palpi below, pectus, and ventral surface of abdomen white. Fore wing with oblique antemedial black line, slightly angled on median nervure; a point in cell and discoidal lunule; the postmedial line slightly excurved below costa, oblique to vein 5, bent outwards between veins 5 and 2, retracted to below end of cell, and slightly excurved above inner margin, defined by white on outer side between costa and vein 5; the apical area suffused with black. Hind wing with the postmedial line bent outwards between veins 5 and 2, then retracted to below end of cell and excurved above inner margin; cilia white at tips. Underside purplish grey.

*Hab.* JAMAICA. *Exp.* 20 mm. Type in Coll. Rothschild.

(4.) *Coptobasis lophocera*, sp. n.

Antennæ of male without tuft and excision at base, the shaft with large tuft of hair at three fourths from base; fore

femora and mid tibiæ with tufts of hair; hind tibiæ flattened, greatly curved and shortened, the tibiæ, spurs, and tarsi with immensely developed tufts of hair.

♂. Uniform very dark brown; palpi at base below, pectus, legs, and ventral surface of abdomen whitish; fore tibiæ with fuscous band.

*Hab.* S. CELEBES (*Doherty*), 1 ♂ type. *Exp.* 36 mm.

(5.) *Cælorhyncidia purpurea*, sp. n.

Hind tibiæ of male with tufts of hair on inner side and a thickly scaled process on outer side at extremity.

Black suffused with brilliant purple; palpi and legs at base and underside of abdomen white. Fore wing with indistinct curved antemedial black line; both wings with discoidal spot; the postmedial line excurved from costa to vein 2, then retracted to lower angle of cell. Hind wing with the cilia white. Underside with the discoidal spots and postmedial line defined by whitish.

*Hab.* AMBOINA (*Doherty*), 1 ♂ type. *Exp.* 24 mm.

(6.) *Cælorhyncidia nitidalis*, sp. n.

Head, thorax, and abdomen glossy grey slightly tinged with brown; palpi blackish, white below; pectus, legs, and ventral surface of abdomen white; fore tibia at extremity and terminal joints of tarsus black. Fore wing uniform glossy grey slightly tinged with brown. Hind wing rather paler glossy grey with a faint brown tinge; the underside pure white.

*Hab.* NEW GUINEA, KAPAU (*Doherty*), 1 ♀, Milne Bay (*Meek*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 26, ♀ 30 mm.

(7.) *Diathrausta cymialis*, sp. n.

♂. Head and thorax cupreous brown; palpi white below; pectus and legs whitish; abdomen cupreous brown with slight white segmental rings, the ventral surface white. Fore wing cupreous brown irrorated with fuscous; some white scales below the cell near base; antemedial line whitish defined on each side by black scales, excurved; the medial area somewhat whiter except costal area; an obscure dark spot at upper angle of cell; postmedial line white defined on each side by black, oblique to vein 7, inwardly oblique to vein 2, retracted to upper angle of cell, incurved and outwardly oblique to vein 1 and erect to inner margin; a slight white mark on costa towards apex; termen blackish, with some irregular white marks, the mark above vein 6 some-

what dentate; cilia cupreous at base, with black medial line and whitish tips. Hind wing cupreous brown suffused in parts with fuscous; an indistinct blackish discoidal bar defined on each side by whitish; a whitish line from lower angle of cell to inner margin defined on each side by black; a curved white postmedial line defined on each side by black; a white subterminal line defined on each side by black, ex-curved from costa to discal fold, where it is interrupted, then oblique, and ending on termen at vein 1; cilia cupreous at base, with black medial line and whitish tips.

*Hab.* BRAZIL, Castro Paraña (*Jones*), 1 ♂ type. *Exp.* 16 mm.

(2.) *Deuterophysa micralis*, sp. n.

Antennæ of male annulate; fore wing with the apex not produced and without fovea above vein 7.

♂. Purplish grey; palpi fuscous, white at base; legs whitish; wings glossy, with very fine striæ. Fore wing with the first line almost medial, fine, brown, somewhat oblique from costa to submedian fold, where it is slightly bent inwards; postmedial line brown, curved; cilia dark brown. Hind wing with slight discoidal striga; a faint line from beyond lower angle of cell to inner margin; an obliquely curved line from costa beyond middle to termen at submedian fold; cilia reddish at base, followed by a black line and white tips; the underside whitish.

*Hab.* JAMAICA, Runaway Bay (*Walsingham*), 1 ♂ type. *Exp.* 12 mm.

GENUS LASIOGYIA, nov.

Palpi porrect, straight, the second joint about twice length of head and fringed with hair above, the third about length of head; frons with pointed conical prominence; antennæ minutely ciliated; fore femora and tibiæ of male fringed with rough hair above, the first tarsal joint very long and the joints fringed with very long hair on both sides; abdomen long, with slight lateral expansion towards extremity. Fore wing with vein 3 from close to angle of cell; 4, 5 from angle; 7 straight and well separated from 8, 9, 10. Hind wing with the cell short; vein 3 from close to angle; 4, 5 somewhat approximated for a short distance; 6, 7 from upper angle, 7 anastomosing with 8.

(1.) *Lasiogyia xanthozonata*, sp. n.

♂. Head and thorax orange-fulvous, with patches of pale yellow on head, tegulæ, patagia, and metathorax; fore legs

with the tufts brown; abdomen orange, with pale yellow dorsal band on first segment and segmental white lines on the others. Fore wing fuscous, becoming fulvous at margins; a yellow spot at base; a broad yellow medial band with wavy edges, contracting somewhat below the cell. Hind wing fuscous, the inner area yellowish; a medial yellow band, with two small teeth on its outer edge beyond lower angle of cell; cilia fulvous.

*Hab.* N. GUINEA, Fergusson I. (*Meek*). *Exp.* 22 mm. Type in Coll. Rothschild.

(3 a.) *Stenia desertalis*, sp. n.

♀. Head and thorax ochreous tinged with brown; palpi rufous, white below; antennæ ringed brown and white; abdomen white. Fore wing ochreous white irrorated with brown and faintly tinged with rufous towards costa; a dark diffused antemedial line, oblique from costa to below cell and obsolescent towards costa; a slight dark discoidal lunule; post-medial line rather diffused, obliquely excurved from costa to below angle of cell, then erect; a slight dark terminal line; cilia white, with faint dark lines at middle and tips. Hind wing white, with traces of postmedial line towards costa and slight terminal line; the underside with slight dark spot at upper angle of cell and diffused postmedial line from costa to vein 5, then slight and excurved to vein 2.

*Hab.* CAPE COLONY, Zuurberg (*Bairstow*), 1 ♀ type. *Exp.* 24 mm.

(7 a.) *Stenia costalis*, sp. n.

*Blepharomastix colubralis*, Druce, Biol. Centr.-Am., Het. ii. p. 268 (part.), nec Guen.

White; palpi and vertex of head fuscous; patagia with fuscous spots; abdomen dorsally suffused with fuscous except towards base, leaving white segmental rings. Fore wing with the costal area fuscous brown; a dark antemedial line obsolescent towards inner margin; a point in middle of cell and discoidal lunule; the postmedial line bent outwards between veins 5 and 2, then retracted to below end of cell and sinuous to inner margin; a terminal series of dark points. Hind wing with fuscous discoidal spot; the postmedial line bent outwards between veins 5 and 4, then retracted to below end of cell and ending at tornus, obsolescent except towards costa; a terminal series of points.

*Hab.* GUATEMALA, Vera Paz (*Champion*), 2 ♂ type; COSTA RICA, Irazu (*Rogers*), 2 ♂, Godman-Salvin Coll.; COLOMBIA, R. Dagua (*Rosenberg*). *Exp.* 26 mm.

(7 b.) *Stenia semifuscalis*, sp. n.

White; head, front of thorax, and abdomen dorsally fuscous except at base. Fore wing with the costal half fuscous, expanding on terminal area to tornus; a dark antemedial line, obsolete towards inner margin; a point in cell and discoidal lunule; a line from vein 2 below end of cell to inner margin; a nearly straight line from costa beyond middle to tornus; a fine pale line at base of cilia. Hind wing with discoidal point; a fine postmedial line bent outwards between veins 5 and 2, then retracted to below end of cell and obsolescent; the apex tinged with fuscous.

*Hab.* ECUADOR, Cachabé (*Rosenberg*), 1 ♂, 1 ♀; Paramba (*Rosenberg*), 1 ♂ type. *Exp.* 22-26 mm.

(7 c.) *Stenia interruptalis*, sp. n.

♀. Head, thorax, and abdomen white tinged with brown; palpi black above, white below. Fore wing white, the costal area suffused with fuscous brown, at base extending to median nervure; the apical area broadly fuscous brown down to vein 3, the white extending to termen between vein 3 and submedian fold, the tornal area fuscous brown to near postmedial line; an indistinct erect brown antemedial line; a small brown annulus in middle of cell; a brown discoidal lunule with white centre; postmedial line slightly waved, erect from costa to vein 5, bent outwards between veins 5 and 2, then retracted to lower angle of cell and erect to inner margin; a terminal series of blackish points; cilia white, tinged with fuscous brown at tips. Hind wing white; a slight discoidal dark lunule with white centre; a slight dark postmedial line, erect from costa to vein 5, excurved and obsolescent between veins 5 and 2, then retracted to lower angle of cell and oblique to tornus; a large apical fuscous-brown patch; a slight dark mark on termen at submedian fold.

*Hab.* ECUADOR, Chimbo, 1 ♀ type. *Exp.* 20 mm.

(7 d.) *Stenia fuscilunalis*, sp. n.

*Blepharomastix colubralis*, Druce, Biol. Centr.-Am., Het. ii. p. 268 (part.) nec Guen.

♂. Head, thorax, and abdomen white suffused with brown; palpi black above, white below; pectus, legs, and ventral surface of abdomen white. Fore wing white; the costal area suffused with fuscous brown; the apical area

suffused with fuscous brown to vein 4; a slight erect antemedial line; a dark point in middle of cell and small dark discoidal lunule; postmedial line minutely waved, erect from costa to vein 5, bent outwards between veins 5 and 2, retracted and obsolescent to lower angle of cell, then erect to inner margin; a terminal series of dark points; cilia brownish white, with a dark line near base. Hind wing white; a slight dark discoidal lunule, with an oblique line from it to tornus; postmedial line erect from costa to vein 5, then bent outwards and oblique to termen at submedian fold; the apex slightly suffused with brown, a dark line on termen, and slight brown line through cilia towards apex.

♀. Fore wing with the terminal points more distinct; hind wing with the apex not suffused with brown and with punctiform terminal line from apex to vein 2.

*Hab.* GUATEMALA, Vera Paz (*Champion*), 1 ♀; COSTA RICA, Irazu (*Rogers*), 1 ♂ type, Caché (*Rogers*), 1 ♂, R. Sucio (*Rogers*), 1 ♂; PANAMA, Chiriqui (*Champion*), 2 ♀. Godman-Salvin Coll. *Exp.*, ♂ 24, ♀ 20 mm.

(7 e.) *Stenia irroratalis*, sp. n.

♂. Head, thorax, and abdomen whitish suffused with brown; palpi blackish, white below; genital tufts ochreous white. Fore wing whitish tinged and irrorated with yellow-brown, the costal area and terminal area to vein 3 suffused with brown; traces of a dark antemedial line; a slight dark discoidal lunule; a faint, dark, postmedial, minutely waved line, erect from costa to vein 5, bent outwards to vein 2, then retracted and almost obsolete to lower angle of cell and erect to inner margin; a terminal series of slight dark points; cilia ochreous white, with a slight brown line through them. Hind wing tinged with ochreous; a faint dark discoidal lunule; traces of a postmedial line erect from costa to vein 5, bent outwards to vein 2, retracted to lower angle of cell and oblique to tornus; some slight dark points on termen towards apex.

*Hab.* GUATEMALA, Cerro Zunil (*Champion*), 3 ♂ type, Godman-Salvin Coll.; BRAZIL, Rio Janciro, 1 ♂. *Exp.* 26 mm.

(8 a.) *Stenia biannulalis*, sp. n.

♂. Head, thorax, and fore wing white slightly tinged with pale red-brown; palpi black above; fore tibiæ and tarsi tinged with fuscous. Fore wing white; the costal edge pale reddish brown; a diffused subbasal reddish-brown line from

costa to submedian fold; antemedial line reddish brown, rather diffused, obliquely curved; an annulus in middle of cell defined by rather diffused reddish brown and a similar elliptical discoidal annulus; postmedial line reddish brown, diffused, with small black spot at costa, incurved from costa to vein 2 near termen, then retracted to lower angle of cell and rather outwardly oblique to inner margin; a diffused red-brown terminal band except at apex and tornus; a dark striga on termen from apex, followed by a series of slight points; cilia white, brownish at tips. Hind wing white; a diffused pale reddish-brown antemedial line; a diffused pale reddish-brown postmedial line excurved between veins 5 and 2 and ending on termen above tornus; a diffused pale reddish-brown band just before termen from apex to vein 2; cilia white faintly tinged with red-brown except towards tornus; the underside with rather quadrate discoidal annulus.

*Hab.* BRAZIL, Amazonas, Pebas, 1 ♂ type. *Exp.* 20 mm.

(8 b.) *Stenia aphenice*, sp. n.

*Lederia aphenice*, Druce, Biol. Centr.-Am., Het. ii. p. 249 (nec Cram.).

♂. Head and thorax purplish fuscous; antennae yellowish white with some dark points on shaft; abdomen purplish fuscous, the medial segments and ventral surface ringed with white; anal tuft yellowish; wings white. Fore wing with purplish-fuscous costal fascia; an inwardly oblique straight antemedial band; both wings with outwardly oblique medial and postmedial bands terminating before and above tornus; a terminal band expanding towards apex.

*Hab.* MEXICO, Vera Cruz (*Schaus*), 1 ♂ type. *Exp.* 24 mm.

(8 c.) *Stenia mallaleuca*, sp. n.

♂. Pure white. Fore wing with some dark points on costa; the lines pale yellow-brown, the antemedial curved, the postmedial excurved between veins 5 and 2, then retracted to below end of cell; traces of a discoidal spot. Hind wing with indistinct discoidal spot; the postmedial line excurved between veins 5 and 2, then retracted to below end of cell.

*Hab.* BRAZIL, Castro Paraña, 1 ♂ type; São Paulo. *Exp.* 22-26 mm.

(10 a.) *Stenia photospilalis*, sp. n.

♂. Head and thorax brownish grey; pectus white in front; fore legs except tarsi fuscous; abdomen grey. Fore wing brownish grey irrorated with a few black scales; a very oblique punctiform black antemedial line; a slight blackish spot in middle of cell and another at upper angle; post-medial line black, rather punctiform, excurved from costa to vein 3, then strongly incurved, and with blackish patch from it to tornus below vein 2; a terminal series of slight black points. Hind wing semihyaline whitish tinged with brown, the termen slightly browner except towards tornus.

*Hab.* BR. E. AFRICA, Teita (F. J. Jackson), 2 ♂ type.  
*Exp.* 14 mm.

(3 a.) *Piletocera albipictalis*, sp. n.

Antennæ of male with a tuft of hair at one third, followed by a ridge of hair, then a tuft at two thirds, followed by a sinus; fore wing with the basal half of costa lobed; hind wing with the termen excised below vein 3 and produced to a rounded lobe at vein 1, the tornus truncate; fore femora with tuft of hair at extremity.

♂. Head black-brown, the vertex pure white; antennæ whitish, with the tufts at one third and two thirds blackish; thorax white, the outer edge of tegulæ and patagia and the tips of patagia dark brown, the dorsum of thorax tinged with brown; pectus and legs black-brown, the hind tarsi white; abdomen black-brown, the first three segments with white dorsal bands, the two terminal segments with white dorsal spots, the ventral surface white, the genital tufts ochreous. Fore wing black-brown, the cell and basal half of inner area pure white, confluent with a triangular patch between veins 5 and 2 extending to postmedial line; a black point in middle of cell and quadrate spot in end of cell, with its lower edge indented by white; a brown striga on vein 1a at inner margin; postmedial line defined by white on outer side, somewhat excurved below costa, slightly bent outwards between veins 5 and 2, then retracted to near base of vein 2, oblique and sinuous to middle of inner margin; a white point on termen above tornus; cilia white at tips towards tornus. Hind wing black-brown; some whitish at base of inner area; a pale, oblique, minutely waved medial line, obsolescent on costal half, whitish on inner half; an irregularly quadrate white patch on terminal area between veins 5 and 2, leaving a dark terminal line; cilia white from

vein 3 to the lobe; the underside with maculate white medial band from costa to vein 2.

*Hab.* SOLOMONS, Bougainville I. (*Meek*), 2 ♂ type. *Exp.* 26 mm.

(3 b.) *Piletocera stygialis*, sp. n.

Antennæ of male with a tuft of hair at one third, followed by a ridge of hair, then another tuft, followed by a sinus; fore femora with tuft of hair at extremity; fore wing with the basal half of costa lobed.

♂. Head, thorax, and abdomen black-brown; antennæ with the tuft at two thirds of shaft white, the shaft beyond it white above; tarsi with slight pale rings; abdomen with the terminal segment ochreous below, the genital tufts ochreous white; wings black-brown. Fore wing with very indistinct pale postmedial line, slightly excurved below costa, bent outwards between veins 5 and 2, then retracted towards lower angle of cell and again slightly excurved. Hind wing with very indistinct pale postmedial line, slightly excurved below costa, bent outwards between veins 5 and 2, then retracted to near lower angle of cell and oblique to tornus.

*Hab.* SOLOMONS, Choiseul I. (*Meek*), 1 ♂ type; Guadalcanar I. (*Meek*), 1 ♂; Kulambangra I. (*Meek*), 1 ♂. *Exp.* 24 mm.

(4 a.) *Piletocera denticostalis*, sp. n.

Fore wing with tufts of hair on inner area below projecting over hind wing.

♂. Head whitish; palpi with the extremity of second joint and the third joint brown; antennæ brown to beyond the tufts; thorax cupreous brown; pectus and legs white, fore legs with the tuft of scales at extremity of femora black. Fore wing cupreous brown; a small whitish spot in middle of cell, with others below it above and below vein 1; a whitish discoidal lunule; postmedial line with whitish bars at costa and inner margin, excurved and obsolescent between those points. Hind wing cupreous brown; a dark postmedial line defined by whitish on outer side, nearly straight from costa to termen at vein 2, then retracted to lower angle of cell and oblique to tornus; the underside with the basal area whitish, an indistinct discoidal annulus.

*Hab.* SOLOMONS, Gizo I. (*Meek*), 1 ♂ type. *Exp.* 20 mm.

(14 b.) *Piletocera infernalis*, sp. n.

Fore wing with tufts of hair on inner area below projecting over hind wing.

♂. Uniform black-brown.

*Hab.* SOLOMONS, Kulambangra I. (*Meek*), 2 ♂ type. *Exp.* 22 mm.

Subsp. 1.—Palpi at sides, except third joint, and outer side of fore legs whitish.

*Hab.* SOLOMONS, Guadalcanar I. (*Meek*), 1 ♂. *Exp.* 18 mm.

(14 a.) *Piletocera microdentalis*, sp. n.

♀. Head, thorax, and abdomen cupreous brown; palpi in front, pectus, legs, and ventral surface of abdomen whitish. Fore wing cupreous brown; traces of a dark antemedial line; a white bar across cell before the dark discoidal lunule with whitish centre; subterminal line white, somewhat punctiform, arising from costa towards apex nearly straight from costa to vein 2 near termen, except that it is toothed outwards at vein 5, retracted at vein 2 and almost obsolete except for a small whitish spot in submedian interspace; cilia whitish just below vein 2. Hind wing cupreous brown; postmedial line pale, arising from costa towards apex, sinuous to termen at vein 2 and toothed outwards below vein 5, below vein 2 retracted to lower angle of cell and almost obsolete, then again whitish and oblique to tornus; cilia with a fine white line at base; the underside with faint dark spot in middle of cell and discoidal annulus.

*Hab.* WOODLARK I. (*Meek*), 1 ♀ type. *Exp.* 18 mm.

(15 a.) *Piletocera hadesialis*, sp. n.

♂. Black; pectus and ventral surface of abdomen yellowish white. Fore wing with traces of a dark antemedial line; an ochreous point in middle of cell and discoidal somewhat 8-shaped spot. Hind wing with traces of dark discoidal spot and postmedial line retracted at vein 3 to angle of cell.

♀. Fore wing with the discoidal spot larger and with traces of a dark postmedial line on its outer edge, retracted below it.

*Hab.* PENANG (*Curtis*). *Exp.* 16 mm. Type in Coll. Rothschild.

(32 a.) *Piletocera phaeocraspedalis*, sp. n.

♀. Head and thorax orange-yellow tinged with brown; abdomen yellow, dorsally suffused with brown except at base, the ventral surface whitish. Fore wing orange-yellow, the terminal area broadly fuscous; the costa brown; two small brown spots in cell near base; a round spot in end of cell with a short streak below it; a yellow discoidal lunule defined by brown; postmedial line dark brown, somewhat dentate, expanding slightly to costa, oblique to vein 7, angled inwards in discal fold, then excurved to the dark terminal area, at vein 2 retracted towards lower angle of cell, then slightly excurved again; a yellowish mark on termen at vein 2; cilia dark brown, whitish above tornus. Hind wing orange-yellow, the terminal area broadly fuscous; a dark discoidal spot with oblique line from it to above tornus; a dark postmedial spot below costa with traces of the postmedial line from it excurved between veins 5 and 2; some yellow on termen at vein 2; cilia fuscous, whitish at submedian interspace; the underside with discoidal annulus defined by brown.

*Hab.* SOLOMONS, Choiseul I. (*Meek*), 1 ♀ type. *Exp.* 18 mm.

(34 a.) *Piletocera rotundalis*, sp. n.

♂. Very dark brown; palpi at base, pectus, legs, and ventral surface of abdomen whitish. Fore wing short and broad, the apex rounded; a dark-edged annulus at middle of cell and discoidal lunule with whitish spot between them; traces of an antemedial line; a minutely dentate postmedial line defined by pale brown on outer side, excurved between veins 5 and 2, then retracted to lower angle of cell. Hind wing with traces of ante- and postmedial lines. Underside of fore wing with fascia of black scales in and beyond upper angle of cell and whitish patch beyond the cell.

*Hab.* BALI (*Doherty*), 2 ♂ type. *Exp.* 16 mm.

Subsp. 1.—Fore wing more uniform dark brown, the markings obscured; the white spot reduced to a point; underside without the fascia of black scales, a small white spot beyond cell.

*Hab.* TALAUT (*Doherty*), 1 ♂; WOODLARK I. (*Meek*), 3 ♂; ST. AIGNAN (*Meek*), 1 ♂.

(37 a.) *Piletocera micralis*, sp. n.

Antennæ of male laminate; hind wing with the termen excurved at middle and excised below apex and towards tornus.

♂. Pale yellow; fore tibiæ with black band at extremity; abdomen with black dorsal line before anal tuft. Fore wing with black points at base on costa and below cell; an ill-defined fuscous subbasal line; antemedial line excurved from median nervure to inner margin; a small dark spot in middle of cell and discoidal lunule defined by fuscous, with small blackish spot above it on costa; two black points on postmedial part of costa, the postmedial line arising from the outer point, excurved below vein 5 and ending at tornus, towards which it is somewhat diffused; a rather strong black terminal line; cilia whitish with blackish tips. Hind wing with slight dark discoidal spot, with sinuous line from it to inner margin; postmedial line sinuous, excurved below vein 5 and ending at tornus; a rather strong blackish terminal line from apex to vein 2; cilia whitish, fuscous at tips on apical half.

*Hab.* BORNEO, Kuching (*Shelford*), 1 ♂ type. *Exp.* 8 mm.

(37 b.) *Piletocera cumulalis*, sp. n.

Antennæ of male laminate and without tufts; fore wing normal.

♂. Head, thorax, and abdomen pale yellow, slightly irrorated with fuscous; palpi with black bars at extremity of first and second segments; abdomen tinged with orange at extremity and with subdorsal black spots on terminal segment; pectus, legs, and ventral surface of abdomen whitish, the fore tibiæ with fuscous band at extremity. Fore wing pale yellow sparsely irrorated with black and with slight blackish suffusion on terminal area below apex; a black subbasal line, slightly angled inwards in cell, then oblique and somewhat maculate; antemedial line oblique from costa to just below median nervure, then erect; a small, rather indistinct, dark annulus in middle of cell; a discoidal lunule with yellow centre; postmedial line incurved from costa to vein 4, then erect to vein 2, then retracted to lower angle of cell and oblique to above inner margin; a terminal series of small black spots from costa to vein 4 and a spot above tornus; cilia fuscous at tips. Hind wing pale yellow with fuscous suffusion between lower angle of cell and tornus

and beyond the postmedial line below costa; a small black discoidal spot and line from lower angle of cell to inner margin near tornus; postmedial line bent outwards at vein 5 and again at vein 2, ending at tornus; a black terminal line from apex to vein 3 and towards tornus; cilia blackish at tips.

*Hab.* BORNEO, Kuching (*Shelford*), 1 ♂ type. *Exp.* 16 mm.

(38 a.) *Piletocera ranalis*, sp. n.

♂. Head and thorax fulvous yellow slightly tinged with brown; abdomen pale fulvous yellow, the anal tuft blackish. Fore wing fulvous yellow slightly tinged with brown, the basal costal area rather darker; a curved, slightly waved dark antemedial line; a black discoidal spot; postmedial line black, slightly angled outwards below costa and inwards in discal fold, then excurved, at vein 2 retracted towards lower angle of cell and again slightly angled outwards at vein 1; a series of small black spots just before termen; a fine terminal fuscous line; cilia whitish. Hind wing fulvous yellow slightly tinged with brown; a small oblique blackish discoidal spot; postmedial line blackish, excurved below costa, angled inwards in discal fold, then excurved, at vein 2 retracted to lower angle of cell, then oblique to inner margin; a series of small black spots just before termen; a fine fuscous terminal line; cilia whitish.

♀ much more suffused with fuscous; the antemedial line of fore wing on inner side and the postmedial line of both wings on outer side defined by ochreous.

*Hab.* BRAZIL, Lr. Amazons, Breves (*Austen*), 3 ♂, 3 ♀ type; Paraña de Buyassu, 1 ♂, 1 ♀. *Exp.*, ♂ 16, ♀ 20 mm.

(38 b.) *Piletocera albiciliialis*, sp. n.

♀. Head, thorax, and abdomen brown mixed with yellow; palpi brown, white below; pectus, legs, and ventral surface of abdomen whitish; fore tibiae with fuscous band at extremity. Fore wing yellowish almost wholly suffused with brown, leaving the medial part of costa yellow; an indistinct dark antemedial line, oblique from costa to median nervure, then erect; an indistinct dark discoidal annulus; two blackish semicircular marks on costa just beyond middle; postmedial line indistinct, dark slightly defined by yellowish on outer side, minutely dentate, erect from costa to vein 2, then retracted to lower angle of cell and slightly excurved at

vein 1 ; a terminal series of small black spots ; cilia yellow at base followed by a black line, the tips white slightly intersected with fuscous. Hind wing yellowish almost wholly suffused with brown ; a faint dark postmedial line slightly defined by whitish on outer side, nearly straight from costa to vein 2, then retracted to lower angle of cell and oblique to inner margin ; a fine black terminal line ; cilia yellow at base followed by a black line, the tips pure white.

*Hab.* BRAZIL, Lr. Amazons, Paraña de Buyassu (*Austen*), 1 ♀ type. *Exp.* 20 mm.

(38 c.) *Piletocera rufulalis*, sp. n.

Fore wing of male with no fovea in cell.

♂. Pale rufous ; fore tibiæ with black band at extremity ; tarsi whitish with fuscous bands ; abdomen with black dorsal line before anal tuft ; wings slightly irrorated with fuscous. Fore wing with subbasal blackish points on costa and in cell ; antemedial line blackish, oblique from costa to submedian fold ; a blackish spot in middle of cell and discoidal lunule ; three small black annuli on postmedial part of costa, the postmedial line arising from the outermost, excurved between veins 5 and 2 along which it is retracted, then again excurved ; a terminal series of small black spots ; cilia with series of slight fuscous spots at tips. Hind wing with small blackish discoidal spot ; postmedial line bent outwards between veins 5 and 2, then retracted to below end of cell and oblique to tornus ; a terminal series of small blackish spots ; cilia with series of slight fuscous spots at tips.

*Hab.* SIERRA LEONE (*Clements*), 2 ♂ type. *Exp.* 20 mm.

(38 d.) *Piletocera fulvalis*, sp. n.

♀. Head, thorax, and abdomen fulvous yellow ; palpi fuscous above, white below ; pectus, legs, and ventral surface of abdomen whitish, the fore tibiæ with fuscous band at extremity. Fore wing fulvous yellow ; the costal edge fuscous ; antemedial line indistinct, oblique, slightly angled just below median nervure ; a small rather ill-defined ocellus in middle of cell ; a discoidal lunule with yellow centre ; postmedial line expanding into a small black spot at costa, incurved to vein 5, then excurved to termen at vein 2, then almost obsolete and retracted to just below lower angle of cell and again distinct and slightly excurved ; a maculate terminal line from below apex to vein 2 ; cilia with a slight fuscous line at middle. Hind wing fulvous yellow ; a small

fuscous discoidal spot; postmedial line fuscous, excurved from vein 5 to termen at vein 2, then almost obsolete and retracted to just below lower angle of cell and again distinct and oblique to inner margin; a maculate blackish terminal line; cilia with a slight fuscous line at middle.

*Hab.* BR. GUIANA, Potaro R. (*Kaye*), 1 ♀ type. *Exp.* 18 mm.

#### Genus NEOGENESIS, nov.

Palpi porrect, triangularly scaled, downcurved at extremity and extending about twice the length of head; maxillary palpi with pointed tuft at extremity; frons flat and oblique; antennæ annulate; tibiæ with the spurs long and nearly even; abdomen very long and slender. Fore wing of male with the costa strongly arched and fringed with short hair, the apex rounded and truncate; a fringe of very long hair on inner area below; vein 3 from well before angle of cell; 4, 5 stalked; 7 straight and well separated from 8, with which 9, 10, 11 are coincident; female with vein 9 absent, 10, 11 stalked with 8. Hind wing with vein 3 from before angle of cell; 4, 5 stalked; 6, 7 stalked, 7 anastomosing with 8.

A development from *Clupeosoma*.

#### (1.) *Neogenesis flaviplagialis*, sp. n.

Pale rufous; palpi dark below; throat pure white; fore tibiæ banded with fuscous and white; abdomen ringed with white; wings semihyaline. Fore wing with indistinct dentate subterminal line defined by pale yellow on inner side, most strongly towards inner margin, towards which it is bent inwards, the area beyond it pink; termen yellow with series of black points. Hind wing suffused with pink except costal area; a dentate postmedial line with large yellow patch on its inner side between veins 6 and 2, the termen and cilia yellow with series of black points.

*Hab.* BR. N. GUINEA, Moroka (*An'hony*), 1 ♂, 1 ♀ type, Milne Bay (*Meek*), 1 ♂. *Exp.*, ♂ 24, ♀ 22 mm.

#### (4 a.) *Clupeosoma laniferalis*, sp. n.

♂. Fore wing with a fold the whole length of submedian interspace containing a fringe of long hair on upperside; a large patch on upperside beyond the cell clothed with rough hair directed towards the centre.

Head, thorax, and abdomen rufous; throat, greater part of tibiæ, the tarsi, and segmental rings on abdomen white. Fore wing rufous, the costal area towards apex and termen pink; the cilia yellow. Hind wing pale rufous; a pink patch in and below end of cell followed by a large yellow lunulate patch, the area beyond it black down to vein 2; cilia yellow.

*Hab.* LOUISIADÈS, St. Aignan (*Meek*). *Exp.* 14 mm. Type in Coll. Rothschild.

#### SCOPARIANÆ.

##### (3.) *Microglossa flavidalis*, sp. n.

♂. Head, thorax, and abdomen yellowish suffused with fuscous; third joint of palpi and basal joint of antennæ blackish; legs whitish, the fore tibiæ and the tarsi banded with blackish; abdomen with the anal tuft rufous. Fore wing yellowish irrorated with fuscous; a black subbasal line emitting short streaks below cell and on inner margin; two black antemedial spots on costa, a slight mark in cell and a band from cell to inner margin expanding into a patch below median nervure, a black point beyond it in cell; a rather quadrate black discoidal spot; two small black postmedial spots on costa, then a yellowish line defined on each side by blackish, excurved from below costa to vein 4, then incurved to below angle of cell and slightly waved to inner margin; terminal area rather more suffused with black, with diffused yellowish marks below apex and at middle; cilia yellowish intersected with fuscous at base, whitish at tips. Hind wing whitish slightly tinged with brown.

*Hab.* W. CHINA, Chang-Yang (*Pratt*), 1 ♂ type. *Exp.* 14 mm.

##### (3.) *Eclipsiodes cuprealis*, sp. n.

♂. Head and thorax dark cupreous brown; palpi whitish below at base; tarsi with slight whitish rings; abdomen cupreous brown with a greyish tinge, the anal tuft with some whitish hairs below. Fore wing dark cupreous brown with slight dark irroration; a faint diffused dark discoidal spot; traces of a dark postmedial line excurved from costa to vein 4, then oblique; a faint dark terminal line. Hind wing cupreous brown with a greyish tinge, the cilia whitish at tips.

*Hab.* VICTORIA, Gisborne (*Lyell*), 1 ♂ type. *Exp.* 24 mm.

(4.) *Eclipsiodes striatalis*, sp. n.

Head and thorax pale grey irrorated with fuscous; abdomen brownish, the basal segment dorsally orange. Fore wing grey-white strongly irrorated with fuscous; the veins streaked with black; a prominent black streak just below submedian fold with a whitish streak below it; a similar streak in cell from before middle to extremity with a more prominent white streak below it; a short streak beyond the cell connected by a diffused oblique streak with the apex; a series of dentate marks on termen. Hind wing tinged with brown, especially towards apex; cilia white with a brown line through them.

*Hab.* W. AUSTRALIA, Sherlock R. (*Clements*), 2 ♂ type. *Exp.* 24 mm.

(84 a.) *Scoparia rufitinctalis*, sp. n.

Head and thorax yellowish white; sides of palpi and shoulders pale rufous; fore legs tinged with rufous; pectus, mid and hind legs, and abdomen white. Fore wing yellowish white rather sparsely irrorated with rufous; a curved antemedial rufous band diffused on outer side and with slight dark streaks on it in and below cell; a diffused rufous patch from middle of costa to lower angle of cell with black discoidal point on it; an oblique rufous postmedial line, slightly excurved at middle and with darker point at costa, a broad band of rufous suffusion from just beyond it, constricted at middle; the termen suffused with rufous, expanding somewhat at discal fold and with obscure series of dark points on it; cilia yellowish white with a brown line near base. Hind wing white, faintly tinged with ochreous towards termen.

*Hab.* U.S.A., Washington Terr., 4 ♂, California, Shasta Co., Pit R. (*Walsingham*), 7 ♂, 3 ♀ type. *Exp.* 20 mm.

(88 a.) *Scoparia poliophæalis*, sp. n.

Head and thorax dark reddish brown mixed with some white scales; abdomen pale reddish brown; pectus, legs, and ventral surface of abdomen white, the fore tibiae and the tarsi banded with brown. Fore wing whitish thickly irrorated and suffused with reddish brown, the suffusion forming dark bands beyond the ante- and postmedial lines; an indistinct rather diffused whitish subbasal line; antemedial line diffused, white, oblique from costa to vein 1, where it is angled, then angled inwards above inner margin; a slight dark spot

beyond it in cell; a reniform discoidal stigma incompletely defined by diffused dark brown, and with some greyish suffusion beyond it before the postmedial line, which is white defined on inner side by a rather punctiform brown line, slightly angled inwards above vein 6, then excurved to vein 4, and oblique to inner margin; a diffused whitish subterminal line somewhat angled inwards at discal and submedian folds; a series of small dark brown spots just before termen; cilia whitish tinged with brown and with a series of brown striae near base. Hind wing greyish brown, the cilia white with a brown line near base; the underside greyer with traces of a curved postmedial line.

*Hab.* SYRIA, Lebanon (Pratt), 3 ♂, 1 ♀ type. *Exp.* 26-30 mm.

(90 a.) *Scoparia microdentalis*, sp. n.

Head and thorax mixed with fuscous and brown; palpi dark brown at sides, the base and the maxillary palpi at tips white; pectus and legs white, the fore tibiae and the tarsi banded with fuscous; abdomen grey tinged with brown, the ventral surface white. Fore wing white tinged with brown and irrorated with black; antemedial line indistinctly double filled in with white, oblique towards costa, angled outwards on median nervure and inwards in submedian fold, with short black streaks beyond it in cell and submedian fold; a slight dark patch on middle of costa; a rather x-shaped black discoidal spot; postmedial line double filled in with white and with some dark suffusion beyond it, minutely dentate, excurved from costa to vein 5, then oblique; a dark patch on middle of termen; a terminal series of small, somewhat dentate black spots with white striae between them; cilia chequered pale brown and white with a dark line near base. Hind wing white tinged with brown.

*Hab.* JAPAN, Hakodate (Andrews), 1 ♂, 1 ♀, Kiushiu, 1 ♀, Yokohama (Jonas), 1 ♂ type. *Exp.* 16-22 mm.

(105 a.) *Scoparia isochroalis*, sp. n.

♀. Head, thorax, and abdomen pale reddish brown, the ventral surface paler; fore tibiae and tarsi banded fuscous and white. Fore wing whitish almost wholly suffused with red-brown and irrorated with fuscous; slight subbasal dark spots in cell and above inner margin; antemedial line defined by whitish on inner side, oblique towards costa, slightly angled inwards in submedian fold, then excurved, a short

black streak beyond it in submedian fold; some whitish in end of cell followed by two black discoidal bars with a black point beyond them; postmedial line indistinct, defined by whitish on outer side, oblique towards costa, excurved to vein 4, then inwardly oblique and minutely dentate, some darker brown suffusion beyond it on costal area; a series of short black streaks in interspaces of terminal area, the streak above vein 4 extending to postmedial line; cilia whitish with a dark line near base. Hind wing whitish suffused with pale red-brown; cilia ochreous white with a fine dark line near base.

*Hab.* JAPAN, Hakodate (*Andrews*), 1 ♀ type. *Exp.* 18 mm.

(107 a.) *Scoparia metaleucalis*, sp. n.

♂. Head and thorax grey tinged with brown and fuscous, the palpi at base and tips of maxillary palpi white; pectus and legs whitish, the tarsi ringed with fuscous; abdomen ochreous white. Fore wing white slightly tinged with ochreous and irrorated with dark brown; short dark streaks from base in cell and above inner margin; a diffused dark curved antemedial line with dark spot beyond it in cell and suffusion from median nervure to inner margin; a large diffused dark brown rounded discoidal patch with some dark suffusion above it on costa; postmedial line whitish defined on inner side by a brown patch on costa, then by short streaks, and with brown suffusion beyond it on costal area and from vein 3 to inner margin, excurved from below costa to vein 4, then incurved; the termen dark with a diffused patch at middle; cilia white with a dark line near base. Hind wing pure white.

*Hab.* W. CHINA, Pu-tsu-fang, 1 ♂ type. *Exp.* 18 mm.

(109 a.) *Scoparia luteusalis*, sp. n.

♀. Head and thorax ochreous yellow mixed with rufous; abdomen ochreous white. Fore wing ochreous yellow; a diffused reddish-brown streak below base of cell with some blackish scales on it and a slight streak above base of inner margin; a diffused brown antemedial band, oblique from costa to submedian fold with a blackish streak from it in cell and two shorter streaks below the cell; a diffused brown postmedial band with some blackish scales on it, oblique from costa to submedian fold, where it is angled inwards, and expanding into a discoidal spot; a diffused reddish-brown subterminal band, bent outwards to apex and with slight

dark streaks on it in the interspaces; the termen tinged with reddish brown with a series of black points. Hind wing semihyaline white faintly tinged with brown; a slight brown terminal line and slight line through the cilia.

*Hab.* AZORES (*J. J. Walker*), 1 ♀ type. *Exp.* 22 mm.

(111 a.) *Scoparia melanographa*, sp. n.

*Scoparia stenota*, Warr. Nov. Zool. xii. p. 447, nec Wlstr.

♂. Head and thorax black mixed with some grey-white; palpi white below at base; pectus whitish; legs whitish banded with fuscous; abdomen black with white segmental lines, the ventral surface white with fuscous bands. Fore wing narrow, white irrorated with black; the base suffused with black, followed by a band formed of short diffused black streaks; a diffused black antemedial line, rather angled inwards below cell, connected with an obscure diffused annulus from just below costa to median nervure and with a patch of blackish suffusion beyond it on inner area; a black streak on middle of costa connected by a bar with the rather x-shaped black discoidal spot, with a slight line from it to the black patch on tornal area; postmedial line black, strongest at costa, angled inwards at discal fold, then outwards at vein 4 and oblique to the patch on tornal area; a black patch from costa before apex to the triangular patch on middle of termen; a black terminal line; cilia grey with a black line near base. Hind wing narrow, whitish tinged with fuscous especially towards termen; a black terminal line; cilia whitish with a fine dark line near base.

*Hab.* AZORES, S. Jorge, 1200' (*O.-Grant*), 1 ♂, Terceira, 2200' (*O.-Grant*), 1 ♂ type. *Exp.* 14 mm.

(124 a.) *Scoparia albifusalis*, sp. n.

♀. Head, thorax, and abdomen fuscous; palpi white at base; pectus and ventral surface of abdomen white; legs white and fuscous. Fore wing fuscous sparsely irrorated with white; antemedial line white, oblique from costa to submedian fold; an ill-defined dark discoidal spot; postmedial line white, obtusely angled at vein 6; large white patches on termen at apex, discal and submedian folds connected by the white terminal line. Hind wing greyish fuscous with a fine pale line at base of cilia.

*Hab.* CEYLON, Bogowantalawa, Maskeliya (*Pole*), 3 ♀ type. *Exp.* 16 mm.

II.—On some new Species of Blattidæ in the Oxford and Paris Museums. By R. SHELFORD, M.A., F.L.S.

Subfam. *ECTOBINÆ*.

Genus *ANAPLECTOIDEA*, Shelf.

*Anaplectoidea Dohertyi*, sp. n.

♀. Clear testaceous, nitid. Head rufo-testaceous, antennæ testaceous. Pronotum posteriorly truncated, exposing the scutellum, testaceous, lateral margins hyaline. Tegmina with fifteen costal veins; anterior ulnar with six branches, some of which are oblique, posterior ulnar simple; anal vein strongly curved, well marked; four axillary veins; the part of the right tegmen overlapped by the left reticulated. Wings hyaline, suffused with a pale flavid tint, with ten costal veins incrassated at the apex; medio-discal field crossed by eleven transverse veinlets; ulnar vein curved upwards, with five branches, the medio-ulnar field only one third the breadth of the medio-discal field, first anal vein quadrimorse; apical area small, barely one fifth of total wing-length, its basal margin obtusely angled, its apex slightly emarginate, divided almost equally by a longitudinal vein. Supra-anal lamina produced, its apical margin straight; subgenital lamina ample, semiorbicular; cerci elongate, nine-jointed.

Length of body 7 mm.; length of tegmina 6 mm.

Sangir (*IV. Doherty*); one example (Oxford Mus.).

Genus *HOLOLAMPRA*, Sauss.

*Hololampra minuta*, sp. n.

♀. Head rufo-castaneous, antennæ fuscous with exception of first two basal joints, which are testaceous. Pronotum covering vertex of head, trapezoidal, the angles rounded, sides deflexed, posterior margin nearly straight; all the margins testaceous, most broadly at posterior angles; disk rufo-castaneous, with a posterior transverse castaneous vitta which is notched anteriorly. Tegmina ovate, smooth, shining, hyaline-testaceous, extending as far as middle of fourth abdominal tergite, the veins testaceous; eight costal veins, the last three ramose, discoidal sectors oblique and few in number, anal vein not impressed. Wings scale-like. Abdomen testaceous above, banded with black, beneath black margined with

testaceous, last segment and subgenital lamina rufo-castaneous; supra-anal lamina short, trigonal, with a median impressed line; subgenital lamina ample, semiorbicular, projecting beyond the supra-anal lamina; cerci moderate, black. Legs rufo-testaceous; femora very sparsely armed, not more than two spines on the anterior and posterior margins of each.

Total length 6 mm.; length of tegmina 4 mm.

Andrahomana, South Madagascar (*Ch. Alluaud*, 1901); two examples (Paris Museum).

One of the smallest species of the genus.

Subfam. *PHYLLODROMINÆ*.

Genus *ISCHNOPTERA*, Burm.

*Ischnoptera Ridleyi*, sp. n.

♂. Head ferruginous, a V-shaped darker mark between the antennal sockets; antennæ ferruginous, longer than the body. Pronotum rounded, posteriorly truncate, sides slightly deflexed, not covering vertex of head; disk rufous, with two broad vittæ, black in colour, not reaching the posterior margin, their outer margins sinuate, their inner margins straight. Tegmina ferruginous; radial vein bifurcated at the middle; sixteen costal veins; discoidal area with eleven longitudinal sectors; seven axillary veins. Wings hyaline, veins fuscous, the marginal field suffused with flavid; radial vein bifurcated at the middle, mediastinal vein with five branches; fourteen costal veins; median vein sinuate; ulnar vein with fourteen branches, six of which go to the apex of the wing. Abdomen infuscated above, ferruginous below; the seventh tergite notched in the middle of its posterior margin, the eighth very narrow; the eighth sternite reduced to a pair of lateral lappets; the supra-anal lamina quadrate, its posterior margin notched and produced on each side of the notch into two curved and slender processes; the subgenital lamina subquadrate, its posterior margin much thickened, forming two asymmetrical swellings which are grooved and furnished with numerous minute denticles; styles absent. Front femora with the anterior border beneath armed throughout its length with long stout spines.

Length of body 22 mm.; length of tegmina 20 mm.

Singapore (*H. N. Ridley*, March to May, 1906); one example (Oxford Museum).

This species, like so many of its Oriental congeners, presents unusual modifications of those external parts which are

related to reproduction. The form of the subgenital lamina in *I. Ridleyi* recalls that of *Hemithyrsocera histrio*, Burm.

*Ischnoptera perpulchra*, sp. n.

♀. Head testaceous, antennæ (mutilated) testaceous at base. Pronotum trapezoidal, posterior margin slightly produced; disk flavo-testaceous, encircled by a broad penannular ring of black, open on the anterior margin, lateral and posterior margins testaceous. Tegmina castaneous, margin testaceous; eighteen costal veins; radial vein bifurcated beyond the middle, the lower branch sending ramifications to the apex of the wing; discoidal field with nine longitudinal sectors, the most internal of which are angled. Wings hyaline, veins fuscous, marginal field bordered with testaceous; mediastinal vein with six branches, ten to twelve costal veins, radial vein bifurcated beyond the middle; ulnar vein with seven branches, three of which run towards the dividing vein. Abdomen flavo-testaceous above, except at the apex, which is fuscous, testaceous below; supra-anal lamina produced triangular, subgenital lamina ample. Legs testaceous; front femora armed on the anterior margin beneath with strong spines throughout its length, the most basal the longest; formula of apical spines  $\frac{3}{1}$ ,  $\frac{1}{1}$ ,  $\frac{1}{1}$ ; front femora without a genicular spine, unless the most anterior apical spine is to be regarded as such.

Length of body 12 mm.; length of tegmina 14 mm.

Macassar, Celebes (*W. Doherty*, 1896); one example (Oxford Museum).

This species is rather a puzzling one; the angulation of some of the discoidal sectors of the tegmina suggests the genera *Pseudomops* and *Pseudothyrsocera*, but this is a character that also crops up in *Phyllodromia*, and, taken by itself, is not of the greatest importance; it is on account of the branching of the vena ulnaris alarum, so characteristic of *Ischnoptera*, that I have referred this species to that generic position.

*Ischnoptera cavernicola*, sp. n.

♂. Head castaneous, mouth-parts testaceous; antennæ testaceous, one and a half times longer than the body. Pronotum rufo-castaneous, with lateral and posterior margins narrowly castaneous. Tegmina clear testaceous, radial vein bifurcated, twelve costal veins, six discoidal sectors. Wings hyaline, mediastinal vein with three branches, seven costal

veins, radial vein not bifurcated, ulnar vein sending three branches to the dividing vein and three to the apex of the wing. Abdomen rufo-testaceous, supra-anal lamina slightly produced, rounded; subgenital lamina produced, narrow, with two stout styles; cerci elongate. Legs rufo-testaceous; front femora with anterior margin beneath armed throughout its length with a series of short spines, the most distal the shortest; apical spines  $\frac{1}{2}$ ,  $\frac{1}{2}$ ,  $\frac{1}{2}$ ; genicular spines 1, 1, 1.

Length of body 10 mm.; length of tegmina 9.5 mm.

In cave at Bidi, Sarawak, Borneo (*R. Shelford*); one example (Oxford Museum). [No. 22.]

The species, which can be readily recognized by the pale pronotum with dark margins, was found in some numbers in a large and quite dark cave in the limestone formation at Bidi, Sarawak; it is somewhat remarkable that this cockroach, a Stenopelmatid (? *Dolichopoda*), and a species of crab (*Potamon bidiense*, Lanch.), which were all found in considerable numbers in the darkest part of the cave, show no reduction in size of the eyes; one can only suppose that the caves have been peopled within quite recent times by these Arthropoda. The antennæ of the Stenopelmatid are of great length, but this is not the case in *Ischnoptera cavernicola*.

#### Genus ELLIPSIDIUM, Sauss.

##### *Ellipsidium castaneum*, sp. n.

♀. Head dark rufous, with a black spot between the antennal sockets; antennæ with the basal half strongly incrassated, black, the two basal joints rufous, apical half with a testaceous band occupying ten lower joints, the remaining joints fuscous. Disk of the pronotum rufo-testaceous, with a symmetrical black design, anterior and posterior margins pale testaceous, lateral margins hyaline. Tegmina castaneous, with the densely reticulated veins pale testaceous, the mediastinal field hyaline. Wings infuscated, veins flavid. Abdomen black beneath, sternites with white margins; subgenital lamina with the apex slightly cleft; cerci black, with castaneous legs. Legs castaneous, the coxæ black, with white borders, the tarsi black.

Total length 14 mm.; length of tegmina 12.5 mm.; pronotum 4 × 6 mm.

Humboldt Bay, New Guinea (*W. Doherty*, 1896); one example (Oxford Museum).

This well-marked species somewhat extends the range of the genus, hitherto known only from Australia.

Genus PIROBLATTA, NOV.

Differs from *Chrastoblatta*, Sauss. & Zehnt., by the less prominent vertex, by the shape of the pronotum, by the greater breadth of the tegmina, and by the presence of a prominent triangular apical area in the wings.

Head almost covered by the pronotum; pronotum trapezoidal, anterior margin truncate, sides deflexed, posterior margin slightly arcuate; scutellum exposed; tegmina longer than the body, discoidal sectors oblique. Wings with a large apical triangle, projecting beyond the anterior part of the wing; ulnar vein bifurcate and sending also two to three branches to the dividing vein. Front femora unarmed beneath, mid and hind femora very sparsely armed on both borders beneath; genicular spines present on all the femora. Supra-anal lamina in the male somewhat quadrately produced, in the female triangularly produced.

On a re-examination of the species described by me as *Theganopteryx Bouvieri* (Trans. Ent. Soc. 1906, p. 236) I have come to the conclusion that a new genus must be established for this and for the species described below. In general appearance both species are very like *Theganopteryx*, but the branching of the ulnar vein of the wings is sufficient to place them close to the genus *Chrastoblatta*, from which, however, they may be distinguished by the points enumerated above. Both species are testaceous in colour and quite unlike the conspicuous *Chrastoblatta dimidiata*, Sauss. & Zehnt., and *C. tricolor*, Sauss. & Zehnt. The females are shorter and a little broader than the males.

*Pirolatta Alluaudi*, sp. n.

♂. Head rufo-castaneous; maxillary palpi and antennæ testaceous, the latter longer than the body; pronotum rufo-testaceous, the lateral margins hyaline. Tegmina testaceous hyaline; fifteen to sixteen costal veins, eight oblique discoidal sectors. Wings hyaline; veins fuscous, marginal field flavid; fourteen to fifteen costal veins, their apices very slightly incrassated; ulnar vein bifurcated and sending three branches to the dividing vein; first axillary vein quadriramous, triangular apical field large. Legs and cerci rufo-testaceous. Abdomen piceous; supra-anal lamina trigonal, subgenital lamina semiorbicular; the left style stout and curved, the right style minute.

♀. Similar to the male, but shorter; supra-anal lamina triangular; subgenital lamina ample.

♂. Length of body 7 mm.; length of tegmina 8 mm.

♀. Length of body 7 mm.; length of tegmina 7.5 mm.

Diego Suarez, Madagascar (*Alluand*, April 1896); eight examples (Paris Museum).

*Pirolatta Bouvieri*, Shelf.

*Theganopteryx Bouvieri*, Shelford, Trans. Ent. Soc. London, 1906, p. 236.

The female has the pronotum less strongly marked with testaceous than the male; the supra-anal lamina is trigonal, the subgenital lamina ample and semiorbicular; the tegmina measure 8 mm., as against 10.8 mm. in the male, the body 8 mm., as against 9.5 mm. in the male.

Genus PHYLLODROMIA, Serv.

*Phyllodromia picturata*, sp. n.

♂. Head testaceous, with castaneous markings, forming a symmetrical design. Pronotum transversely elliptical, lateral margins hyaline; disk of the pronotum pale testaceous, with castaneous markings composed of irregular spots and two central longitudinal lines; a few minute castaneous points in the hyaline margins. Tegmina hyaline testaceous, with castaneous spots disposed along the veins, denser at two points in the marginal field, forming two indistinct maculae; an oblique castaneous fascia on the right tegmen extending from the middle of the anal field to the apical third of the radial vein; mediastinal vein with two branches, radial vein not bifurcated, twelve costal veins; anterior ulnar vein sending several branches to the sutural margin, posterior ulnar vein simple; anal vein somewhat sinuate, its apex suddenly bent inwards. Wings hyaline; nine costal veins, the six basal clavately incrassated, the apical three ramose; ulnar vein with five branches. Abdomen infuscated above, testaceous, marbled with fuscous below; supra-anal lamina short, transverse; subgenital lamina ample, somewhat irregular, the left style larger than the right and curved (cerci mutilated). Legs testaceous; tibiae banded with castaneous; tarsi fuscous except the basal two thirds of the first joint; front femora not armed beneath; mid and hind femora sparsely spined; apical spines  $\frac{1}{6}$ ,  $\frac{1}{4}$ ,  $\frac{1}{4}$ ; no genicular spine on front femora.

Length of body 9 mm. ; length of tegmina 10 mm. ; pronotum  $2.2 \times 4.5$  mm.

Singapore, Botanic Gardens (*H. N. Ridley*) ; one example (Oxford Museum).

The species in the characters presented by the femora and supra-anal lamina resembles the *Ectobinae*, but the wing-structure is typically *Phyllodromine*.

*Phyllodromia albovariegata*, sp. n.

♀. Head dark castaneous, with two diverging testaceous lines running from the vertex to the sides of the clypeus ; clypeus rufo-testaceous ; palpi fusco-testaceous ; antennae testaceous at base, the rest fuscous. Pronotum trapezoidal, dark castaneous, with a narrow central line testaceous, lateral margins hyaline. Tegmina dark castaneous, paler towards the apex, mediastinal field and base of marginal field hyaline ; a transverse white fascia extending from the marginal field to the apex of the anal field, not meeting its fellow of the opposite side ; twelve costal veins, the apical four branched, discoidal sectors oblique. Wings infuscated, costal margin very narrowly flavid ; eleven costal veins, their apices incrassated ; ulnar vein 5-ramose, the branches joined by transverse venulae ; a prominent apical triangle. Abdomen fuscous, with a fulvous patch on the disk below ; supra-anal lamina short, transverse ; subgenital lamina large, produced, its apex cleft ; cerci long, testaceous. Legs testaceous, front femora armed with several spines on the anterior margin beneath, the more distal being the shortest of the series ; mid femora strongly spined ; hind femora sparsely spined, apical spines  $\frac{2}{1}$ ,  $\frac{1}{1}$ ,  $\frac{1}{1}$  ; no genicular spine on front femora.

Length of body 6.2 mm. ; length of tegmina 7 mm.

Fernando Po (*L. Conradt*, 1901) ; one example (Paris Museum).

*Phyllodromia nimbata*, sp. n.

♂. Testaceous. Head with a rufous band between the eyes and sometimes with a narrower band between the antennal sockets. Pronotum trapezoidal ; lateral margins hyaline ; disk testaceous, with rufous markings symmetrically disposed. Tegmina clear testaceous ; ten costal veins, five longitudinal discoidal sectors. Wings hyaline ; mediastinal vein with two branches ; eight to nine costal veins, their apices clavately incrassated ; ulnar vein with four branches. Abdomen infuscated above, testaceous below, with

fuscous margins; supra-anal lamina trigonal, slightly emarginate; subgenital lamina triangularly produced, with two styles; cerci elongate, testaceous. Legs testaceous; front femora armed on anterior margin beneath with a series of spines, the most distal short and serried; apical spines  $\frac{1}{2}$ ,  $\frac{1}{2}$ ,  $\frac{1}{2}$ ; all the femora with genicular spines.

♀. Head entirely rufo-testaceous; supra-anal lamina transverse; subgenital lamina ample, semiorbicular, posterior margin slightly but widely emarginate.

	♂.	♀.
Length of body . . . . .	11 mm.	8.1 mm.
Length of tegmina . . . . .	10 mm.	9.8 mm.

Kuching, Sarawak, Borneo; five examples (Oxford Museum). [No. 29.]

The species is undoubtedly closely allied to *Phyllodromia liturifera*, Stål, the type of which is now before me, but differs in the following points:—It is smaller; the head is not marked with three castaneous bands; the coloration of the tegmina is different; the wings are clear hyaline and their veins pale testaceous; the costal veins are more numerous; the supra-anal lamina is slightly more produced and its apex is emarginate; the subgenital lamina is narrower. It is quite evident that de Saussure correctly identified *P. liturifera*, Stål (Mél. Orthopt. ii. p. 56, 1869), and his detailed description of the species is perfectly accurate in every point.

#### *Phyllodromia nebulosa*, sp. n.

♂. Head testaceous; four longitudinal lines on the vertex, three indistinct transverse bands on the face, castaneous. Pronotum trapezoidal, lateral margins hyaline, disk marbled with castaneous and testaceous. Tegmina clear testaceous, with numerous irregular castaneous markings occurring between the veins; ten to eleven costal veins, five longitudinal discoidal sectors. Wings hyaline; veins testaceous, mediastinal vein with two branches; eight costal veins, their apices clavately incrassated; ulnar vein with four branches. Abdomen infuscated; supra-anal lamina triangular; subgenital lamina ample, semiorbicular, with two styles, the margin of the lamina emarginate at their points of insertion; cerci long, testaceous, base and apex fuscous. Legs testaceous, the tibiae banded with fuscous; armature of femora as in the preceding species.

♀. All the castaneous markings on the head more distinct;

supra-anal lamina transverse, slightly emarginate; subgenital lamina very large, its posterior margin slightly and asymmetrically emarginate.

	♂.	♀.
Total length . . . . .	10 mm.	11 mm.
Length of tegmina . . . . .	9 mm.	8 mm.

Kuching, Sarawak, Borneo; three examples (Oxford Museum). [No. 30.]

The small size of the species and the marbling of the tegmina with darker markings serve to distinguish it from any of the described Oriental forms; its nearest ally appears to be *P. ignobilis*, Wlk., from Sula Islands.

*Phyllodromia Hewitti*, sp. n.

♂. Fulvo-castaneous. Antennæ equal to total length of body, fuscous except at base. Pronotum trapezoidal, smooth, shining, sides deflexed, not covering vertex of head, with obscure darker markings, posterior margin slightly produced. Tegmina with radial vein bifurcated, twenty-one costal veins, discoidal area with nine longitudinal sectors. Wings with marginal area somewhat coriaceous; mediastinal vein with five branches, radial vein bifurcated from near base; twelve costals; ulnar vein with three branches; a prominent triangular apical area. Front femora with eleven long spines on anterior margin beneath, the more distal closely set together; formula of apical spines  $\frac{2}{1}, \frac{1}{1}, \frac{1}{1}$ ; no genicular spine on front femora. Supra-anal lamina triangular; subgenital lamina produced, highly irregular in appearance; no styles.

Total length 21 mm.; length of body 18 mm.; length of tegmina 18 mm.

Kuching, Sarawak. [No. 27.]

This species, which I have pleasure in naming after Mr. J. Hewitt, Curator of the Sarawak Museum, has all the appearance of an *Ichnoptera*, but the wing-venation is that of a typical *Phyllodromia*; it is, perhaps, most nearly allied to *P. ferruginea*, Br.

*Phyllodromia* (?) *japonica*, sp. n.

♀. Rufo-castaneous, nitid, broad, short. Head with a darker mark between the eyes; antennæ longer than the body, fuscous except at base. Pronotum trapezoidal, sides deflexed, not quite covering vertex of head, posterior margin

very slightly angled; a short black line on each side in front. Tegmina not longer than abdomen; radial vein bifurcate; eleven costals; seven axillaries; discoidal sectors oblique. Wings suffused with rufo-testaceous; mediastinal vein with three branches, radial vein bifurcated; eight costals; ulnar vein with three rami reaching apex of wing and two irregular and anastomosing rami which are directed towards the apex of wing but do not reach it; no apical triangle. Abdomen dark castaneous above and beneath, margined with paler; supra-anal lamina triangular; cerci moderate; subgenital lamina ample. Legs rufo-testaceous, all the femora strongly armed; no genicular spine on front femora; formula of apical spines  $\frac{2}{1}, \frac{1}{1}, \frac{1}{1}$ .

Total length 15.2 mm.; length of tegmina 12 mm.; pronotum  $5.5 \times 7.9$  mm.

Riou-Kiou, Oshima, Japan; three examples (Paris Museum).

This is a very puzzling species, and I include it in the genus *Phyllodromia* with considerable doubt; in general appearance it approaches the Madagascar species of *Allacta*, but it certainly does not belong to that genus. The wing-venation is suggestive of the genus *Ischnoptera*, but does not strictly conform to that type nor to the wing-venation of *Phyllodromia*.

#### GENUS PSEUDOPHYLLODROMIA, Br.

##### *Pseudophyllodromia elegans*, Shelf.

♀. Head flavo-testaceous; a rufous band on the vertex and between the eyes; antennæ fuscous except three basal joints, which are testaceous; second and third joints of maxillary palpi black. Pronotum transversely elliptical, anteriorly truncate, posteriorly very slightly angulate; lateral margins broadly, posterior margin narrowly hyaline testaceous; disk dark castaneous, with four testaceous markings; an anterior median line, stopping short before the middle of the disk; two dots on each side of the middle line in the centre of the disk, a median posterior dot, in addition a rufescent marking on each side of the disk in front. Tegmina fusco-castaneous, marginal area and area between radial and anal vein testaceous hyaline; twelve to thirteen costal veins, five discoidal sectors, five axillary veins. Abdomen fusco-castaneous above; supra-anal lamina short, trigonal; abdomen beneath and legs flavo-testaceous; subgenital lamina ample, tipped with fuscous, its posterior margin cleft in the middle; cerci moderate, tipped, testaceous.

Total length 11.5 mm. ; length of body 9 mm. ; length of tegmina 9.2 mm.

Maroni, French Guiana (*F. Geay*, 1903) ; one example (Paris Museum).

*P. histrio*, Sauss., appears to be the nearest ally of this species, which is well marked by the dark tegmina with one hyaline band.

#### GENUS PSEUDECTOBIA, SAUSS.

##### *Pseudectobia Alluaudi*, sp. n.

♀. Rufo-testaceous. Antennæ and mouth-parts testaceous. Pronotum covering vertex of head, trapezoidal ; anterior margin truncate, posterior margin obtusely angled, lateral margins pellucid, with an opaque testaceous submarginal band bordered inwardly by a rufous suffusion. Tegmina convex, nitid, venation of anal and discoidal fields obsolete ; anal vein deeply impressed, arcuate, reaching sutural margin at a point on one half of its length ; fifteen costals. Wings small, hyaline ; radial vein bifurcated near its apex ; twelve costal veins ; ulnar vein triramose ; apical triangle well defined, projecting beyond the anterior margin. Abdomen broad ; supra-anal lamina triangular ; subgenital lamina semiorbicular, projecting slightly beyond the supra-anal lamina. Front femora with eleven spines along the anterior margin beneath ; hind femora with four pairs of spines ; genicular spines and a pair of apical spines on each femur.

Total length 10 mm. ; length of tegmina 7 mm. ; pronotum 3 × 5 mm.

Diego Suarez, Madagascar (*Alluaud*, April 1896) ; one example (Paris Museum).

De Saussure created this genus or subgenus for the reception of the species *Luneli*, Sauss., *liturifera*, Stål, *insularis*, Sauss., regarding the apical triangle and branched ulnar vein of the wings of prime importance. As I have shown (*Trans. Ent. Soc. London*, p. 231, 1906), the presence of an apical triangle in the wings is a feature that appears in so many subfamilies of Blattidæ, that, taken by itself, it is of small value for purposes of generic distinction. I do not believe that *liturifera*, Stål, and *insularis*, Sauss., are congeneric, and I have seen the types of both species ; *Luneli*, Sauss., is congeneric with *liturifera*, Stål, and I do not see how either species can be separated from the genus *Phyllo-*  
*dromia* ; *insularis*, Sauss., is a broad convex insect, very

different from the other two species, and may well be selected as the type of the genus, which can be distinguished by the following characters:—

Broad, convex insects; the tegmina not projecting much beyond the tip of the abdomen, their venation sometimes obsolete in the anal and discoidal fields. Wings with an apical triangle, the ulnar vein ramose. Femora generally strongly armed. Supra-anal lamina variable, but usually produced.

Type of the genus *P. insularis*, Sauss.

The other species of the genus are *P. bipunctata*, Wlk., *P. adimonialis*, Wlk. (= *Lupparia adimonialis*), possibly *P. latipennis*, Br. (= *Phyllodromia latipennis*), and the new species described above. Of the species previously included in the genus, *P. pallidula*, Bol., and *P. woltzkowiana*, Sauss. & Zehnt., have the supra-anal lamina produced, the abdomen is missing in *P. Luneli*, Sauss., and in *P. intermedia*, Sauss. & Zehnt.; it is probable that the shape of this tergite is as variable as in the genus *Phyllodromia*, and too much reliance should not be placed on its transverse form in *P. subpectinata*, Sauss. & Zehnt., and *P. antiguensis*, Sauss. & Zehnt. In all these species the armature of the femora is most variable. They cannot be placed in the genus *Theganopteryx* on account of the ramose character of the *vena ulnaris alarum* (cf. Trans. Ent. Soc. p. 232, 1906), but the presence of a triangular apical area in the wings does not forbid their entry in the genus *Phyllodromia*, seeing that this character does occur in several well-marked and well-recognized species of that genus. *P. punctulata*, Sauss. & Zehnt., must be referred to the genus *Theganopteryx*.

#### Subfam. NYCTIBORINÆ.

##### *Nyctibora bicolor*, sp. n.

♀. Head entirely black, with a scanty erect pubescence on the front; ocelli minute, testaceous; antennæ incrassated, black, apical joints rufescent, densely pubescent. Pronotum transversely elliptical, anterior border not nearly covering vertex of head; posterior border more arcuate than anterior, covering the scutellum; disk with two converging impressions, flavo-testaceous, with a shield-shaped black mark on the disk, posterior margin with a fine black line. Tegmina coriaceous, serio-punctate and reticulate between the raised veins, not pubescent; the basal three fifths flavo-testaceous, the apical two fifths dark castaneous; radial vein black throughout its

length, sutural margins black, anal vein deeply impressed, mediastinal vein sending several branches to the margin, costals numerous. Wings dark castaneous, ulnar vein with nine branches. Abdomen entirely black, except apical half of subgenital lamina, which is flavo-testaceous; supra-anal lamina triangular, produced; subgenital lamina ample, its lateral margins shortly produced; cerci black (mutilated). Legs black; front femora unarmed, mid femora with four spines on posterior margin, none on anterior margin; hind femora with two spines on posterior margin, none on anterior margin; genicular spines on second and third femora; formula of apical spines  $\frac{2}{1}, \frac{1}{1}, \frac{1}{1}$ .

Total length 26.8 mm.; length of body 17 mm.; length of tegmina 23.8 mm.; pronotum 6 mm.  $\times$  8.5 mm.

Yarimaguas, Peru (*Sallé*, 1886); one example (Paris Museum).

This species, that described below, and *N. crassicornis*, Burm., should probably be included in a new genus, characterized by the incrassated antennæ, shape of the pronotum, and sparse armature of the femora.

*Nyctibora nigrocincta*, sp. n.

♂. Head entirely black; antennæ black, except apical joint, which is castaneous, incrassated, pubescent. Pronotum as in the preceding species, but with the lateral and posterior margins slightly reflected and with a very scanty recumbent pubescence, yellow, with a shield-shaped black mark on the disk. Tegmina long, coriaceous at base and reticulate, not pubescent; four branches to the mediastinal vein, costals numerous; colour yellow, radial vein at base, a broad streak on sutural margin of anal field, a broad band from near the costal margin to the sutural margin in the apical third, black; apex castaneous. Wings fusco-castaneous; a broad pre-apical yellow band; costals irregular, six branches to the ulnar vein. Abdomen black above and below; supra-anal lamina triangular; subgenital lamina produced, very convex, with two styles; cerci black. Legs black; front femora with no spines beneath; mid femora with three to four spines on posterior margin, none on anterior margin; hind femora with five spines on posterior margin, none on anterior margin; genicular spines on the mid and hind femora; formula of apical spines  $\frac{2}{1}, \frac{1}{1}, \frac{1}{1}$ .

♀. Similar to ♂, but rather larger, the black band extending right across the tegmina, castaneous apex of tegmina more extended, subgenital lamina as in *N. bicolor*, mihi

♂. Total length 24 mm.; length of body 17.5 mm.; length of tegmina 20 mm.; pronotum 4.2 mm. × 6 mm.

♀. Total length 27 mm.; length of body 20.2 mm.; length of tegmina 21 mm.; pronotum 5 mm. × 8 mm.

Colombia; four examples (Oxford Museum).

Subfam. *EPILAMPRIÆ*.

Genus *NOTOLAMPRA*, SAUSS.

*Notolampra antillarum*, sp. n.

♂. Castaneous. Head and antennæ testaceous, the former with a few scattered castaneous punctures. Pronotum not punctate, castaneous, the lateral borders broadly, the anterior margin narrowly, testaceous, semiopaque, with a few scattered fuscous or castaneous dots. Tegmina castaneous, the lateral borders testaceous, semiopaque with scattered castaneous dots, these borders are continuous with the pronotal testaceous borders and are broadest at the base, narrowing to the apex; radial vein marked at its base by a dark line, no other veins visible; surface of tegmina seriopunctate. Wings rufo-testaceous; intercalated apical triangle small. Abdomen rufo-testaceous; supra-anal lamina triangular, slightly notched; subgenital lamina trigonal, somewhat asymmetrical with two styles; cerci short. Legs testaceous spotted with castaneous; front femora with two spines only at base of anterior margin beneath, rest of anterior margin occupied by piliform setæ, one spine on posterior margin; mid and hind femora with two spines on anterior margin, four on posterior margin; formula of apical spines  $\frac{2}{1}$ ,  $\frac{1}{1}$ ,  $\frac{1}{0}$ ; no genicular spine on front femora.

Total length 19 mm.; length of tegmina 14 mm.; pronotum 6 mm. × 7.5 mm.

Trinité, Martinique (*A. Bourgouin*, 1901); one example (Paris Museum).

The species is most closely allied to *Notolampra punctata*, Sauss., from Brazil, but differs in the testaceous borders of the tegmina and in its proportions.

Genus *APSIDOPIS*, SAUSS.

*Apsidopis Wallacei*, sp. n.

♀. Pale testaceous. Frons concave and transversely striated; a chevron-shaped depression at base of clypeus and two marks between the eyes castaneous; antennæ fuscous

except basal joint; eyes  $1\frac{1}{2}$  mm. apart. Pronotum cucullate, of the form characteristic of the genus, punctate and with numerous minute fuscous or castaneous macule. Tegmina semicoriaceous, densely serio-punctate between the veins in the basal two thirds, in the apical third the punctures merge into quadrangular interspaces between numerous reticulated interstitial veins, a few minute fuscous dots are scattered over the tegmina; mediastinal vein with ten branches; seven ramose costal veins; nine anal veins, the first ramose. Wings angulated at the apex as in the genus *Derocardia*, Sauss.; marginal area testaceous with fuscous spotting at apex, the apex semicoriaceous; mediastinal vein multiramose; costal veins irregular, the interspaces filled by reticulated interstitial veins; ulnar vein with nineteen branches. Supra-anal lamina ample, prominent, bilobed; subgenital lamina semiorbicular; cerci slender and short. Front femora with five spines on middle of anterior margin beneath, piliform setæ extending from them to apex, two spines on posterior margin; mid and hind femora with three to four spines on each lower margin; formula of apical spines  $\frac{1}{1}, \frac{1}{1}, \frac{1}{0}$ ; minute genicular spines on mid and hind femora, none on front femora; posterior metatarsus shorter than remaining joints, its pulvillus produced proximally.

Length of body 30 mm.; length of tegmina 35 mm.; pronotum 11 mm.  $\times$  12.5 mm.

Sarawak (*Wallace*; Wilson Saunders collection, Oxford Museum).

The species is close to *A. oxyptera*, Wlk., also from Borneo, which exhibits the same characters of punctuation of the tegmina; but *A. oxyptera* is smaller, more rufous in colour, the proportions of the pronotum are different and the pronotum is less closely punctate, but more densely covered with castaneous dots. Both species can be distinguished from *A. acutipennis*, Sauss., by their larger size.

#### Subfam. BLATTINÆ.

#### Genus BLATTA, L.

#### *Blatta Rothschildi*, sp. n.

♂. Rufo-castaneous. Head with four darker markings between the eyes; ocelli and clypeus testaceous; antennæ much longer than the body, first two joints and apical third rufo-castaneous, remainder fuscous. Pronotum trapezoidal; anterior and posterior borders truncate, flavo-testaceous, a

castaneous marking like an inverted **W** on the disk, a central testaceous line. Tegmina abbreviated, not extending much beyond the second abdominal tergite, surface reticulate, anal vein reaching internal posterior angle of tegmina. Wings rudimentary. The first and second abdominal tergites flavo-testaceous, third to fifth flavo-testaceous with castaneous lateral and posterior borders; sixth rufo-castaneous, enlarged; seventh flavo-testaceous with central castaneous macula, narrow, posterior margin sinuate and slightly emarginate in the middle; supra-anal lamina quadrate, broadly emarginate, rufo-castaneous with a testaceous macula at the postero-lateral angles. Cerci black, apices rufo-castaneous. Abdomen beneath rufo-castaneous, lateral margins castaneous and a castaneous stigma on second to fourth sternites; subgenital lamina notched on each side, the long slender styles springing from the notches. Legs rufo-castaneous. Metatarsus scarcely equal to remaining joints, spined beneath, its pulvillus minute.

♀. Head black; ocelli, clypeus, genæ, vertex flavo-testaceous; antennæ rufo-castaneous. Pronotum as in ♂, but the discal black marking much enlarged, so that it occupies all the disk, leaving only a narrow sinuate flavo-testaceous margin, no central testaceous line. Tegmina squamiform, not extending beyond metanotum, black, with a yellow line at base; mesonotum, metanotum, and first five abdominal tergites black, with a broad central transverse flavo-testaceous band; sixth tergite enlarged, concavely depressed, black with flavo-testaceous lateral and posterior margins; seventh tergite somewhat triangularly produced, black, apex slightly emarginate, flavo-testaceous; supra-anal lamina produced, narrower than in ♂, broadly emarginate. Abdomen beneath and legs black, disk of abdomen rufo-castaneous; coxæ margined outwardly with flavo-testaceous, tibial spines and tarsi castaneous.

♂. Total length 21 mm.; length of tegmina 10 mm.; pronotum 5·8 mm. × 7·2 mm.

♀. Total length 26 mm.; length of tegmina 4 mm.; pronotum 8 mm. × 10 mm.

South of Lake Rudolph, Brit. E. Africa (*Maurice de Rothschild*, 1905); five examples (Paris Museum).

The nearest ally of the species appears to be *B. manca*, Gerst., from W. Africa.

## Subfam. OXYHALOINÆ.

## Genus OXYHALOA, Br.

*Oxyhaloa variabilis*, sp. n.

♀. Rufo-castaneous. Vertex of head rufo-castaneous, a clear testaceous band between the antennæ, genæ testaceous; frons, clypeus, labrum, palpi, and antennæ shining black. Pronotum with two oblique impressions anteriorly, with a few minute punctures from which spring short slender hairs. Tegmina with the veins fuscous, sparsely pubescent, very variable in length, in some examples reaching tip of abdomen, in others lanceolate and extending no further than the third tergite; thirteen costals; discoidal field reticulate. Wings as variable in length as the tegmina, flavid at base, the rest infuscated; veins fuscous, ulnar vein with eight to nine rami, the basal ones transverse. Abdomen broad, black above, the margins of the segments narrowly rufous, beneath rufo-castaneous; supra-anal lamina short with rounded posterior angles, not emarginate; subgenital plate projecting beyond the supra-anal lamina, fuscous, ample, its margin sinuated; cerci short, fuscous, tipped with rufous. Legs black, apices of coxæ and femora rufous, tibial spines rufous.

Total length from 16 mm. to 13·5 mm.; length of body from 16 mm. to 12·5 mm.; length of tegmina from 11 mm. to 8 mm.; breadth of pronotum from 6·2 mm. to 5 mm.; length of pronotum from 4·5 to 4 mm.

Interior of Djibouti (*Hermann*); one example (Paris Museum).

This is the smallest species of the genus, and is remarkable on account of the variation in size of the wings and tegmina; apparently this variation bears no relation to the variation in size of the individual, for one of the smallest specimens has long tegmina and one of the largest has these organs much reduced.

## Genus PARAPLECTA, nom. nov.

(= *Cirphis*, Stål.)

The name *Cirphis*, created by Stål in 1876 (*Ent. Vet.-Akad. Förh.* xxxiii. p. 74) for a cockroach (*C. pallipes*) from Damara Land, is preoccupied, having been applied by Walker in 1865 to a genus of Noctuid moths.

*Paraplecta aethiopica*, sp. n.

♂. Castaneous, smooth, nitid; vertex of head not covered by pronotum; ocelli, apex of clypeus, mouth-parts, and antennæ testaceous; minutely punctured. Pronotum trapezoidal, with rounded posterior angles, minutely punctured; posterior margin truncate, exposing the scutellum. Tegmina semicoriaceous, barely reaching apex of abdomen; eleven or twelve costals; discoidal field reticulate, anal vein impressed; eight axillaries. Wings with a large apical reflected area, two fifths of total wing-length, its basal margin obtusely angled; costals highly irregular and obsolescent; median vein consisting of two parallel branches, with one or two transverse venulæ connecting them; ulnar vein with seven branches. Abdomen castaneous above, supra-anal lamina produced; abdomen rufo-castaneous below, subgenital lamina asymmetrical with one style (the left); cerci short, acuminate, 4-jointed. Legs testaceous; femora spineless, tarsal claws without arolia.

♀. Similar to ♂, but larger, tegmina and wings (when folded) not extending beyond the sixth abdominal tergite; supra-anal lamina produced quadrately; subgenital lamina ample, produced, narrowed posteriorly.

♂. Total length 9 mm.; length of tegmina 8 mm.; pronotum 3 mm. × 3.2 mm.

♀. Total length 11 mm.; length of tegmina 7 mm.; pronotum 3.5 mm. × 3.8 mm.

Fernando Po (*L. Conradt*, 1901); six examples (Paris Museum).

The species can readily be distinguished from *P. pallipes*, Stål, by the wing-structure: in Stål's species there is a conspicuous triangular apical area which in *P. aethiopica* has become extended to form an apical reflected area; the venation is very similar in both species, but in *pallipes* the costals are better marked and the rami of the ulnar vein are more numerous, the double median vein is common to both species.

## GENUS CHORISTIMA, Tepper.

*Choristima*, Tepper, Trans. Roy. Soc. S. Austral. xix. p. 165 (1895).

*Aphlebidea*, Brancsik, Jahresh. Ver. Trensin. Com. xix. & xx. p. 56 (1897).

Kirby in his 'Synonymic Catalogue of Orthoptera' (1904), following Brancsik, places *Aphlebidea* in the Ectobinæ; but as the femora are unarmed beneath and a triangular apical field is present in the wings, the genus falls naturally into the

subfamily Oxyhaloinæ (= Plectopterinae). *Aphlebidea* is undoubtedly the same as Tepper's genus *Choristima*, described two years previously, and *A. Brunneri*, Brancs., if not identical with *Choristima galerucoides*, Wlk., is most closely allied. *Blatta apicifera*, Wlk. (Cat. Blatt. B. M. p. 110, 1868), is the male of *C. galerucoides*, Wlk.: the type, which is in the British Museum, is in extremely poor condition, the abdomen and antennæ being missing; it is smaller than the female, the tegmina and wings are relatively longer and would, I imagine, extend beyond the tip of the abdomen. Tepper's diagnosis of the genus is extremely brief, but Brancsik's description of *Aphlebidea* is detailed enough to render it readily recognizable. The species included in the genus may be distinguished as follows:—

- a. Subgenital lamina in ♀ somewhat cucullate.
  - b. Rufous ..... *C. Brunneri*, Brancs.
  - bb. Testaceous ..... *C. Kershawi*, Tepp.
- aa. Subgenital lamina in ♀ not cucullate.
  - b. Piceous above ..... *C. hydrophoroides*, Wlk.
  - bb. Rufous ..... *C. galerucoides*, Wlk.  
(syn. *C. loftyensis*, Tepp.;  
*C. apicifera*, Wlk.).

*Chorisonera pectinata*, Sauss. (Mél. Orthoptér. iv. p. 131, 1872), may be referred to a new genus, on account of the fusion of the radial and ulnar veins of the tegmina—a condition which obtains also in *Ectobia*, Westw., but not in the genera *Chorisonera*, Br., or *Choristima*, Tepp., to which it is most nearly allied.

GENUS ECTONEURA, NOV.

Allied to *Choristima*, Tepper, but the radial and ulnar veins of tegmina fused and emitting oblique veins to both margins. Tegmina and wings somewhat reduced in the female, but not to so great an extent as in *Choristima*; triangular apical area large and conspicuous. Supra-anal lamina transverse or slightly produced; subgenital lamina of the male narrow, triangular, of the female large and subquadrate. Femora spineless beneath, except for apical spines, the formula of which is  $\frac{1}{0}, \frac{1}{1}, \frac{1}{1}$ .

Type, *E. pectinata*, Sauss.

*Ectoneura figurata*, sp. n.

♂. Head fusco-castaneous with a pale testaceous band

between the eyes; antennæ testaceous. Prothorax transversely elliptical, margins hyaline; disk fusco-castaneous with the centre testaceous, on which are some fuscous markings. Tegmina hyaline with pale fuscous spots along the veins; twelve costal veins, nine discoidal rami. Wings hyaline, veins fuscous; nine costal veins; medio-discal area twice as broad as medio-ulnar, crossed by several irregular transverse bars; ulnar vein simple; first axillary vein biramose, upper branch irregularly bifurcate. Abdomen fuscous, with testaceous markings; cerci long, fuscous, with a broad testaceous band. Legs testaceous.

Total length 8 mm.; length of tegmina 6.5 mm.

Five males without locality (Oxford Museum).

It is possible that this is the *Blatta marcida* of Erichson, a species placed by Brunner with some doubt in the genus *Ectobia*, Westw.

#### Genus CHORISONEURA, Br.

##### *Chorisonaura Brunneri*, sp. n.

♀. Head fuscous, vertex rufo-castaneous; antennæ fuscous at base, the remainder testaceous. Prothorax transversely elliptic, disk fuscous, margins hyaline. Tegmina castaneous with hyaline costal margin and with fuscous humeral vitta, veins white; sixteen costal veins, very irregular; median vein distinct, longitudinal, discoidal vein with four irregular branches; the whole surface of the tegmina is much reticulated, and the veins are rather obscured thereby; the part of the right tegmen covered by the left is infuscated. Wings fuscous, the edge of the marginal field yellowish; eleven costal veins, their ends swollen, joined by transverse bars; medio-discal field crossed by several transverse bars; ulnar vein arcuate, simple; apical triangle unevenly divided, its base acutely angled, its apex subtruncate. Abdomen fulvous, legs testaceous. Cerci long, testaceous.

Total length 8.5 mm.; length of tegmina 7.5 mm.

Rio Grande do Sul. Two examples labelled in Brunner v. Wattenwyl's handwriting "*Chorisonaura*, sp. n." (Oxford Museum).

The species appears to be distinct from anything described; perhaps it shows most affinity with *C. anomala*, Sauss. & Zehnt.

##### *Chorisonaura morosa*, sp. n.

♂. Head rufo-fuscous, with a pale narrow transverse line between the eyes; antennæ (mutilated) testaceous;

pronotum with the disk fuscous, margins hyaline. Tegmina pale fulvous, surface not reticulated, veins prominent and white, a fuscous humeral vitta; twelve costal veins, the last two biramose; the humeral vein also giving off four rami to the sutural margin, the discoidal vein giving off only three; ulnar vein triramose. Wings infuscated, edge of marginal field yellow; fourteen costal veins, medio-discal field crossed by numerous transverse bars; ulnar vein forked at apex, axillary vein triramose; apical area unequally divided, acutely angled at base, its apex subtruncate. Body and legs testaceous beneath.

Total length 9 mm.; length of tegmina 7 mm.

Cachabi, Ecuador (W. F. H. Rosenberg coll., Dec. 1896); one example (Oxford Museum).

The species is evidently allied to *C. translucida*, Sauss., from Mexico.

Subfam. *PANCHLORINÆ*.

Genus *ZETOBORA*, Burm.

*Zetobora lata*, sp. n.

♂. Head black; labrum golden; antennæ at base black, nitid, the rest fuscous, villose. Pronotum with anterior margin strongly rounded in the middle, less so laterally, the margin slightly reflected, the posterior margin only slightly curved, the postero-lateral angles slightly notched; disk with a humeral carina on each side, the "hood" with a few tubercles, nitid, the sides with numerous tubercles of various sizes, a few granules on the front; castaneous except for a testaceous hyaline patch, semicircular in shape, in front; scutellum with central carina and a few punctures. Tegmina broad, scarcely exceeding the abdomen in length, testaceous-hyaline, anal field and humeral vein castaneous; marginal field very broad, its outer border slightly thickened and margined; mediastinal area with large shallow punctures; anal field reticulate-punctate; discoidal field reticulate; apex broadly rounded. Supra-anal lamina quadrate, notched; subgenital lamina produced, rather asymmetrical, with one style (the right). Abdomen castaneous; the dorsal tergites with their posterior angles strongly produced backwards and projecting considerably beyond the sternites, very much as in the genus *Capucina*, Sauss.

Total length 22 mm. ; length of tegmina 25 mm. ; breadth of tegmen 13 mm. ; pronotum 10 mm.  $\times$  16.2 mm.

The species is characterized by its great breadth in proportion to its length ; the notched postero-lateral angles of the pronotum are also distinctive.

Subfam. *CORYDINÆ*.

GENUS *EUTHYRRAPHA*.

*Euthyrrapha bigeminata*, sp. n.

♀. Very similar to *E. pacifica*, Coq., but the pronotum entirely fuscous, a round pale testaceous spot on each tegmen beyond the middle ; the abdomen beneath is orange with the apex fuscous. The tegmina at base are slightly rugose, minutely punctate, and furnished with an erect pubescence ; the apex of the tegmina appears velvety. Legs fuscous, coxal joints and tibial spines castaneous. Subgenital lamina strongly carinate.

Total length 7.5 mm. ; length of body 5 mm. ; length of tegmina 6 mm.

Ivory Coast, W. Africa (*G. Thoiré*, 1901) ; one example (Paris Museum).

Subfam. *FERISPHERINÆ*.

GENUS *PARANAUPHÆTA*, Br.

*Paranauphæta Brunneri*, sp. n.

♀. Closely allied to *P. rufipes*, Haan, but smaller. Head with three maculæ on the vertex ; the ocelli, genæ, clypeus, and basal joints of the palpi testaceous ; apical joints of antennæ not testaceous. Pronotum with the testaceous margins much narrower than in *P. rufipes*. Tegmina and wings as in *P. rufipes*. Abdomen above less strongly marked with testaceous ; subgenital lamina ample, produced, emarginate. Coxæ testaceous, castaneous at base ; femora testaceous at base, remainder castaneous ; tibiæ and tarsi rufo-castaneous.

Total length 20 mm. ; length of body 18 mm. ; length of tegmina 17.1 mm.

Kuching, Sarawak (*Shelford*, 1900) ; one example (Oxford Museum).

## Genus EUSTEGASTA, Gerst.

*Eustegasta agrilidina*, sp. n.

♂. Black, nitid, with dark green metallic reflections. Head entirely of this colour except the labrum, which is testaceous; antennæ with five basal joints, black, nitid, remainder fuscous. Pronotum of typical form, broadly bordered laterally with orange. Tegmina with an orange spot at base of discoidal area, another in apical third of marginal area. Abdomen above fuscous, broadly margined with orange, beneath orange; supra-anal lamina short, trigonal, fuscous; subgenital lamina small, asymmetrical, without styles, black; cerci pale testaceous. Front legs orange; mid and hind coxæ black, outwardly bordered with white, femora and tibiæ orange, all the tarsi fuscous; front femora with two spines on anterior margin beneath; mid femora with one spine on anterior margin, none on posterior margin; hind femora with one spine on anterior margin, three on posterior margin; formula of apical spines  $\frac{1}{0}$ ,  $\frac{1}{1}$ ,  $\frac{1}{0}$ ; no genicular spine on front femora.

Total length 12.5 mm.; length of body 10 mm.; length of tegmina 10.1 mm.

N<sup>o</sup> Kogo, French Congo (*H. Bonnet*, 1903); one example (Paris Museum).

The nearest ally of the species is *E. metallica*, Sauss.

*Eustegasta variegata*, sp. n.

♂. Head testaceous; occiput, a cordate patch on the frons, the genæ, two spots on the clypeus, and the palpi castaneous or black; antennæ black, the six basal joints nitid. Pronotum testaceous, the disk rufo-castaneous, with two black longitudinal vittæ of irregular shape. Tegmina rufo-castaneous; mediastinal area and two thirds of marginal area clear testaceous, the stripe at its termination expanding into a spot that extends on to the outer part of discoidal field; a humeral stripe; the anal vein and a longitudinal stripe in the anal field black, faint indications of a testaceous spot at base of discoidal field. Wings flavo-hyaline; median vein bifurcate; ulnar vein with ten rami, four of which reach the apex of the wing. Abdomen orange above and beneath; supra-anal lamina quadrate, posterior angles acute, not emarginate; subgenital lamina asymmetrical, with one style, the right; cerci orange. Coxæ black, outwardly bordered with testaceous; front femora castaneous, the other femora

and all the tibiæ flavo-testaceous; tibial spines rufo-castaneous, apical joints of tarsi fuscous; femoral spines as in preceding species, except that the mid femora have no spines beneath.

Total length 13·8 mm.; length of body 10 mm.; length of tegmina 10·8 mm.

Congo (*Dybwski*, 1896); two examples (Paris Museum).  
Nearest to *E. Lucci*, Dom.

#### Genus ELLIPSICA, Sauss. & Zehnt.

##### *Ellipsica rugosa*, sp. n.

♀. Black, narrowly elliptical, convex. Head punctate; clypeus, mouth-parts, and antennæ flavo-testaceous. Sides of the thoracic tergites strongly deflexed, their posterior angles acute and produced backwards, their surface beset with tubercles, between which are numerous punctures; on the meso- and metanotum the tubercles are in a double row, on the pronotum they are less regularly placed. Abdominal tergites transversely divided by a sulcus into two unequal portions; the anterior narrow portion is impunctate and smooth, the posterior portion is marked by a double row of punctures followed by a double row of tubercles; the transverse sulci are laterally very deep, especially in the posterior segments, and one row of punctures lies in these sulci; on the seventh tergite the tubercles are larger and less regularly arranged than in the preceding segments. Supra-anal lamina quadrate, margined, tuberculate. Abdominal sternites transversely divided by sulci like the tergites, punctate but not tuberculate; subgenital lamina ample, punctate. Legs black, tarsi flavo-testaceous, arolia large.

Total length 15 mm.; pronotum 5 mm. × 7 mm.

West coast of Madagascar (*Lantz*, 1882); two examples (Paris Museum).

The species is quite unlike any other of the genus in its tuberculate characters.

#### Genus PSEUDOGLOMERIS, Br.

##### *Pseudoglomeris magnifica*, sp. n.

♀. Brilliant metallic green or blue-green. Head punctate; eyes 1 mm. apart; base of antennæ and palpi flavid, apical half of antennæ fuscous, middle section castaneous. Pronotum semiorbicular, posterior angles backwardly produced; anterior border margined and slightly

reflected, densely punctate; anteriorly the punctures are irregular, producing a reticulate appearance; a few irregular smooth spaces on all the thoracic tergites; thorax beneath black, shining. Abdomen with large shallow punctures above; lateral margins of fifth and sixth segments slightly sinuate, four or five punctures in the sulci of third to sixth segments; supra-anal lamina quadrate, slightly concave, angles rounded; abdomen beneath æneous, densely punctate, lateral smooth stigmata on each segment; subgenital lamina ample, sinuate, striato-punctate. Cerei rufous. Coxæ, apices of femora, tibiæ, and tarsi rufo-testaceous; femora castaneous.

Total length 23 mm.; pronotum 7·8 mm. × 14 mm.

Tuyen-Quan, Central Tonkin (*A. Weiss*, 1901); a long series of specimens in all stages of growth (Paris Museum).

This is one of the most brilliantly-coloured cockroaches known to science; its colour is reminiscent of the gorgeous metallic-green Cetoniid beetles of the Eastern Tropics.

### III.—*New Eastern, Australian, and African Heterocera*.

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

#### Family Bombycidæ.

##### *Andraca apodecta*, nov.

♂ ♀. Of a uniform ochreous-fawn colour, the male slightly suffused with brownish and darker than the females; shafts of the antennæ dark brown above, white at the sides, pectinations of the male brown; some whitish suffusion along the outer portions of the costa in the male, not present in the females: fore wings with three transverse indistinct grey lines or thin bands—antemedial, medial, and discal, the two former sinuous, the latter deeply angled outwardly below the costa: hind wings with two medial lines and with the ground-colour of the wings paling towards the costa: the hairs on the abdominal margin dark brown, this margin curved inwards but without any excision. Underside paler, lines as above.

Expanse of wings, ♂  $1\frac{8}{10}$ , ♀  $2\frac{4}{10}$  inches.

Padang, W. Sumatra; one male, two females.

The fore wings are not so produced as in the type species of the genus, *bipunctata*, Walker, from India, and it is without the excision of the abdominal margin of the hind wing as in that species, but it has every other character of the genus.

## Family Aganiidæ.

*Asota philippinensis*, nov.

♂. Palpi black, first and second joints with white stripes; frons white, with a black central spot; head and body deep chrome-yellow; a black spot at the base of each antenna; a black and white collar, a black thin band behind it; a black spot on each shoulder, another on the thorax near the base of the abdomen, a black stripe on the thorax at the base of the fore wings, black dorsal spots on the first five segments of the abdomen, and a double row on each segment below: fore wings dark purplish grey, as in *A. paphos*, with a deep chrome-yellow subbasal patch, which does not touch the costa, which is there black intersected by white, making four square marks; the immediate base is white, with a black spot, followed by another on the inner edge of the chrome patch; an elongated spot on the lower side of the patch, an angled spot on the middle of the outer side and a round spot above it; veins whitish, most prominently on the outer portions of the wing: hind wings black, whitish above the cell; some whitish longitudinal short streaks in the disk; a long streak in the abdominal marginal space and an outwardly recurved whitish discal line or thin band, which ends near the extremity of the long streak. On the underside the wings are slaty grey for two thirds, slaty black with whitish veins on the outer third; a large patch or spot at the end of each cell; a small spot near the base on the fore wings and one in the middle of the cell on the hind wings; the veins are marked with slaty black on both wings; the discal recurved band is clear on the hind wings, and indications of a somewhat similar band on the fore wings; cilia white above and below.

Expanse of wings  $2\frac{7}{8}$  inches.

Cagayancillo, Philippines, Jan. 6, 1903 (type in B. M.).

A handsome insect, belonging to the *paphos* group.

*Digama costimacula*, nov.

♂. Antennæ simple; palpi white, with black spots at the tips of each joint; frons, head, thorax, and fore wings dark slaty grey, frons and head with white and black spots at the sides; abdomen pale dull pink, with dorsal grey dots: fore wings with three prominent subcostal white spots very close to the costal line, the spots more or less square, the middle one the largest, the first smooth, one fifth from the base, the last at one fourth from the apex: hind wings yellow, with

blackish-brown outer marginal border, terminating abruptly one third from the anal angle. Underside: body and wings yellow; fore wings with a black cell-spot; the outer third of the wing dark slaty grey, the middle portion of its inner margin extending in an angle into the wing.

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

Gold Coast (*W. H. Johnston*) (type in B. M.).

Belongs to the *Hearseyana* group.

*Digama lithosioides*, nov.

♂. Palpi white, with black bands at the ends of the last two joints; antennæ simple; frons and head white, two black spots in front of the antennæ, one between them, two on the collar; thorax and fore wings dull ochreous grey, veins grey and rather prominent; hind wings and abdomen dark ochreous; the wings are rather longer than usual, and the example looks like a Lithosid; there are no markings above or below, except a small black dot at the end of cell of the fore wings below.

Expanse of wings 2 inches.

One male, Hills of Terta, Kilimanjaro, E. Africa (type in B. M.).

*Digama meridionalis*, nov.

♂. Antennæ ciliated; palpi grey, with blackish bands at the ends of the last two joints; head, thorax, and fore wings dark grey, much as in the common Indian form *Hearseyana*, Moore; two black spots in front of the antennæ, one immediately behind, two on the collar, and two on the thorax in front: fore wings with black spots on the costa, three inside the cell, one at the base, and two beyond it below the cell; discal and medial transverse, brown, erect bands below the cell and an outwardly curved, very highly dentated, discal, brown band and similar but smaller dentations on the outer margin; abdomen and hind wings yellow, the latter without markings; the abdomen is more ochreous and darker in colour than the hind wings and has black dorsal spots: the wings are long; fore wing narrow, with the hinder margin curved outwards before the middle. The underside is uniform pale yellow; wings without markings, except a black dot at the end of the cell of the fore wings; abdomen with lateral black spots.

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

Johannesburg (*A. T. Cooke*); one male.

*Digama africana*, nov.

♂ ♀. Antennæ of male bipectinate; palpi grey, with black bands at the tips of the last two joints; frons and head white, thorax greyish white; two black dots on the collar, four in a transverse row on the fore part of the thorax; abdomen ochreous, with dorsal black segmental dots: fore wings dark ochreous grey, with a purplish tinge, one fifth at base white, divided by a grey transverse line, containing a black spot in the cell and one near hinder angle; a white medial band, consisting of a large white square patch containing a black spot on the costa and a much smaller patch on the hinder angle; another white patch on the costa at two thirds, with a thin white band running down from it to the hinder angle, angled outwards in its middle, with a curious incomplete white circular mark near the inner side of the angle.

The above is a description of a female from Tonga; the other female and the male from Samburu have all the white bands more or less traceable, but very obscure from greyish suffusion; the hind wings are dark ochreous yellow, with a narrow band at the apex, not continued on the costa or outer margin. On the underside all three examples are identical, being entirely yellow, the fore wings having some traces of the upperside markings and the costal spot rather prominent.

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

Samburu, British East Africa (*Betton*); one male. Tonga, British East Africa; two females. Types in B. M.

*Digama elongata*, nov.

♂. Antennæ with the shafts white, pectinations black; palpi black, white beneath; frons, head, body, and wings white; frons with a large black spot, a small one on the top of the head, three on the thorax down the middle, and three on each side; abdomen with a dorsal row: fore wings with pale blackish broad bands, first basal, for one fifth with a white mark at the base, its outer margin with an outward dentation above the middle and extends in a streak along the hinder margin, joined on the costa to the second band, which has irregular margins on each side and runs obliquely from the middle of the costa to the hinder margin one third from the angle; the third band is discal and runs down only a short distance from the costa, and narrows down to two little spots; the fourth band is composed of elongated spots on the

outer margin: hind wings dull white, with a rather broad, grey, marginal band.

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

Eb Urru, British East Africa (*Betton*) (type in B. M.).

The fore wings longer than usual in the genus.

### Family Acontiidæ.

#### *Eublemma acarodes*, nov.

♂. Palpi, frons, head, and fore part of the thorax pure white, rest of the thorax, abdomen, and wings pale greyish, veins on both wings darker grey: fore wings with the costal line dark grey; a very broad, dark pink, oblique band, occupying more than half the outer portion of the wing, its inner margin dark grey and well defined, its outer margin suffused with the dark grey colour of the outer margin of the wing: hind wings without markings. Underside: body, legs, and wings white: fore wings suffused with grey except for a broad subcostal ochreous streak from the base for more than half the length of the wing.

Expanse of wings  $\frac{7}{10}$  inch.

Bihé, W. Africa; one example.

Somewhat resembling *E. derogata*, Walker, from India.

#### *Tarache amydra*, nov.

♂. Palpi white, with grey bands on the last two joints; head, body, and fore wings dark iron-grey; frons white, with two grey spots; abdomen with white segmental lines: fore wings with the orbicular and reniform whitish, the former containing one, the latter two dark grey spots; the entire wing picked out with many whitish marks, transverse, sinuous, ante- and postmedial, and submarginal lines, and some whitish dots on the costa: hind wings uniform greyish white; cilia of both wings grey, with a whitish interline. Underside: fore wings uniform pale grey, with some blackish and ochreous spots on the outer half of the costa; hind wings pale, with a discal curved grey line; body and legs whitish, the latter with blackish bands.

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

Bihé, W. Africa; one example.

#### *Tarache apatelia*, nov.

♀. White, palpi with last joints black; the frons projection with two black spots touching each other; thorax with

black spots; abdomen suffused with grey, with black segmental bands: fore wings almost entirely covered with dislocated blackish bands, subbasal, ante- and postmedial, and marginal, the last the broadest, only extending two thirds upwards, with a black spot on the costa: hind wings white, with grey marginal borders and a grey dot at the end of the cell. Underside paler, slightly ochreous tinged, markings showing through: hind wings with an additional large grey spot on the costa beyond the middle: body white; legs white, with grey bands.

Expanse of wings 1 inch.

Bihé, W. Africa; one example.

There are several unnamed examples from British East Africa in the B. M. Trifid Drawer 195 which are identical with my specimen.

#### Family Pyraustidæ.

##### *Isocentris charopalis*, nov.

♂. Above clear ochreous-yellow; palpi dark brown at the base: fore wings with a black subcostal spot near the base; transverse lines brown, antemedial nearly erect, medial descending to the hinder margin from a lunular line at the end of the cell, and postmedial from costa to vein 2; a sub-marginal line, followed by a silvery line, and a marginal chocolate thin band, all close together; cilia white, thickly interlined with chocolate-brown: hind wings with a discal line, curving deeply inwards at vein 4, the marginal marks as in the fore wings. Underside: pectus and body white; legs yellow above, white beneath; tarsi with blackish-brown bands; wings pale yellowish; fore wings with some of the interior lines visible; hind wings without markings.

Expanse of wings  $\frac{8}{10}$  inch.

Queensland; one example.

##### *Blepharomastix hedychroalis*, nov.

♂. Bright ochreous yellow, transverse lines brown: fore wings with a short line on the lower half very near the base; an antemedial, outwardly curved, even line; a lunular line at the end of the cell; a somewhat irregular and crenulated discal line, which bends outwards below the costa, then curves deeply inwards to the lower end of the cell, then again bends outwards near the hinder margin, to which it then runs down straight; a row of brown points near outer margin: hind

wings whitish in the cell and costal space, with a discal, irregular, recurved line; cilia of both wings yellow. Underside paler than above; fore tarsi with narrow blackish-brown bands.

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

Port Blair, Andaman Islands; one example.

*Calamochrous homochroalis*, nov.

♀. Pale greyish ochreous; upper side of palpi, frons, and top of head chocolate-brown; lines brown, thin and crenulated: fore wings with an antemedial line, not reaching the costa; a lunular line at the end of the cell; a discal line fairly erect from costa to vein 2, where it bends inwards and then downwards to the hinder margin: hind wings with a discal recurved line. Underside with the face and body white; legs and wings pale whitish yellow, without markings.

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

Port Blair, Andaman Islands; one example.

*Nacoleia dairalis*.

*Botys dairalis*, Walker, xviii. 698 (1859).

*Nacoleia dairalis*, Hmps. P. Z. S. 1898, p. 697.

*Merotoma dairalis*, Swinhoe, Cat. Het. Mus. Oxon. ii. p. 483 (1900).

Sarawak, Borneo.

Type (female), Sarawak, in B. M., and four others (all females) from the same locality. I have received a pair lately from Sarawak the male of which has bipectinate antennæ and has not the characters ascribed to the genus *Merotoma*, Meyrick; it will come into a fresh section of Hampson's genus *Nacoleia*.

*Merotoma Meyricki*, nom. nov.

*Merotoma dairalis*, Meyrick (nec Walker), Trans. Ent. Soc. 1894, p. 460.

Pulo Laut, Celebes.

A pair received from Mr. Meyrick from Pulo Laut are in the B. M. with *dairalis*, Walker.

*Tyrausta plinthinalis*, nov.

♂. Pale primrose-yellow; palpi above, frons, head, and thorax dark yellowish brown; palpi below white; abdomen

white, with a brown dorsal stripe: fore wings with the costa broadly suffused with ochreous brown, the basal portion of the suffusion very dark; a prominent, almost square, blackish-brown spot fills the end of the cell; lines thin, pale, ante- and postmedial, the latter with an outward curve in the middle; an outward marginal line, much thickened and dark brown towards the apex; cilia dark greyish ochreous: hind wings nearly white; a brown spot at the end of the cell; a discal line with an outward bend in its middle, and an outer marginal line as in the fore wings; cilia white. Underside white; fore wings with a brown dot in the middle of the cell, the spot at the end and some of the other markings showing through the wing; hind wings with only a small brown mark at the apex; body and legs white without markings.

Expanse of wings  $\frac{7}{8}$  inch.

Padang, W. Sumatra; one example.

IV.—*Descriptions of Six new Species of Coleoptera from New Zealand.* By Major T. BROUN, F.E.S.

Group Pogonidæ.

*Oöpterus pygmeatus*, sp. n.

*Suborate*, slightly convex, nitid, picco-fuscous, sometimes more rufescent; legs and antennæ fusco-testaceous or reddish.

*Head* narrower than thorax, interocular furrows well marked. *Eyes* large, moderately prominent. *Thorax* cordiform, about one-third broader than long, distinctly rounded and marginated laterally, much narrowed but not sinuated behind the middle, posterior angles rectangular; its surface with fine indistinct transverse rugæ, discoidal groove entire and rather feebly impressed, basal foveæ moderately large. *Elytra* ovate-oblong, large, marginal channels well developed, posterior carinæ distinct; they are more or less finely punctate-striate, sometimes irregularly or indistinctly, but, excepting the sutural striæ, they are without sculpture near the apices; the third interstices have three small punctures and fine setæ.

*Underside* shining, pitchy or reddish; fourth ventral segment with four setigerous punctures at the extremity, the

other segments with one on each side of the middle in the female, in the male there are only two at the apex of the fourth segment.

*Tibiæ* straight, the intermediate pair and the tarsi distinctly setose. The other characters agree with those defined by me on page 609, vol. xi. 1903, of the Ann. & Mag. Nat. Hist.

When compared with *O. parvulus*, this new species may be at once distinguished by the more ample and oblong, but evidently less convex, hind body, which, moreover, does not possess the rather coarse sculpture so apparent in the former species. In two or three examples I notice an additional seta at the thoracic hind angles.

Length  $1\frac{1}{2}$ ; breadth  $\frac{3}{4}$  lines.

Found under stones near a stream on the Carrick Range, near Obelisk Peak, at an elevation of 4100 feet, by Mr. J. H. Lewis.

### Group *Oxytelinæ*.

#### *Phlæonæus cordicollis*, sp. n.

*Elongate*, subdepressed, slightly shining, rufo-testaceous, elytra paler, finely pubescent.

*Head* shining, with an indistinct transverse impression behind the eyes, behind this it is so minutely sculptured as to appear smooth; in front, near the eyes, it is punctate, and seems there a little asperate and hairy; the antennal tubercles are prominent. *Eyes* rather flat, distinctly faceted, quite lateral. *Mandibles* curvate, inwardly bidentate. *Antennæ* finely pubescent, basal articulation elongate and gradually incrassate; the terminal three joints nearly twice as broad as the intermediate ones. *Thorax* about as long as it is broad, truncate and widest in front, gradually curvedly narrowed towards the rounded base, and without perceptible hind angles; its punctuation is moderate and rather shallow, it is almost smooth along the middle, and the greyish pubescence is disposed transversely. *Elytra* pallid, short, broader than long, subtruncate behind, posterior angles oblique or rounded; their surface is not definitely sculptured, but bears evident greyish hairs. *Hind-body* elongate, parallel, marginated, its five exposed segments are nearly equal and distinctly pubescent, the sculpture is ill-defined; the terminal segment is short and retracted and is trituberculate at the extremity.

*Legs* of moderate length, rather slender; *tibiæ* minutely spinose externally, the anterior outwardly curved, with small terminal spurs. *Tarsi* slender, the basal two joints, taken

together, are shorter than the apical one. *Palpi* with subulate terminal joints.

This may be readily identified by its simple cordiform thorax. M. Fauvel's *P. punctiventris* has a shorter bisulcate thorax and longer wing-cases.

Length  $1\frac{1}{2}$ ; breadth  $\frac{3}{8}$  lines.

Collected by Mr. J. H. Lewis at Ocean Beach near Dunedin.

### Group *Byrrhidæ*.

#### *Pedilophorus Lewisi*, sp. n.

*Orate*, moderately convex, æneo-niger; tibiæ pitchy red; tarsi and antennæ rufescent, the basal joint of these latter, however, piceous. Body apparently nude, but really bearing some minute greyish setæ.

*Head* closely and distinctly punctured, narrowed anteriorly, the forehead subtruncate or obtusely rounded, but not sharply defined in front, the short vertical frontal portion nearly smooth. *Labrum* punctate-rugose, more or less pilose, lateral grooves deep. *Eyes* large, evidently faceted, most prominent in front. *Thorax* twice as broad as it is long, narrowed anteriorly, lateral margins well-defined, front angles rectangular and slightly projecting; its surface closely and distinctly punctured, more coarsely towards the sides. *Scutellum* almost cordiform, distantly punctate. *Elytra* large, moderately narrowed posteriorly, not so closely sculptured as the thorax, much more distantly and finely, almost obsoletely, punctured towards the apices. The *female* with six or seven more or less obvious striæ on each elytron, the sutural most distinct. The *male* with two or three short ill-defined striæ, and with series of coarse punctures on each elytron.

*Tibiæ* finely pilose, with short terminal spines, the anterior pair grooved along the lateral portion of the frontal face for the reception of the tarsi, the external edges of all minutely setose. *Tarsi* elongate, pilose underneath; fourth joint small, third prolonged below.

♂. *Antennæ* elongate, finely pubescent, very gradually dilated from the fifth joint onwards; basal joint stout, subcylindric, and finely sculptured; second much shorter and narrower than the first, tapering apically; third nearly as long as the first, but slender; fourth shorter than the contiguous ones; sixth and seventh longer than broad; joints

eight to ten subquadrate; eleventh elongate-oval; the basal three articulations are less pubescent than the following ones. My female specimen, owing to malformation, differs considerably in antennal structure.

*Underside*, including the femora, shining pitchy-black, moderately closely punctured, the metasternum most coarsely. Flanks of prosternum smooth, the intercoxal process broad, but not prolonged and fitting into the deep angular meso-sternal cavity. The posterior femora are accommodated in rather large deep cavities. The abdominal sutures are nearly straight, the fourth only being somewhat incurved.

Length  $3\frac{1}{4}$ – $3\frac{3}{4}$ ; breadth  $2$ – $2\frac{1}{4}$  lines.

Named in honour of Mr. J. H. Lewis, who found this fine species under stones near a stream on the Old Man Range, Otago, at an elevation of 4100 feet. It may be easily recognized by its rather large size and more or less obvious elytral striæ.

### Group Melolonthidæ.

#### *Scythrodes squalidus*.

This new genus and species of our Southern Alps was founded (Man. N.Z. Coleopt. p. 955) on a single female discovered by Mr. G. M. Thomson, about twelve years ago, at an elevation of 6000 feet on Mount Tyndall. Quite recently, Mr. J. H. Lewis kindly sent me some males which he had found on Obelisk Peak, Carrick Range, at an elevation of 4100 feet. These males exhibit several discrepancies of sculpture and antennal structure when carefully compared with the typical female, so it was considered best to draw up the subjoined description so that others may not make the mistake of treating the sexual forms as distinct species.

*Body* broadly oviform, only moderately convex, nigrescent, nearly nude.

♂. *Antennæ* rather short, without pubescence. The basal joint equals the following four conjointly in length, but the portion visible from above barely exceeds the second in length, it is gradually thickened towards the oblique apex, which bears three or four elongate setæ; second nearly twice as long as broad, somewhat pyriform, but unsymmetrical, the inner side being straight whilst the outer is swollen; third subtriangular, obviously smaller than the contiguous ones; fourth triangularly cordiform, about twice the breadth of the preceding one; fifth remarkably short, as wide as the

extremity of the fourth. Club moderately short, rather closely punctured and bearing minute brassy setæ, triarticulate, its third lobe either slightly concave or grooved along the outside so as, in some lights, to indicate a fourth joint, which, however, does not exist.

*Head* coarsely and irregularly punctured, the punctures twice as numerous as in the typical female; it is sparingly fringed with somewhat rufescent outstanding setæ, and in a small fovea close to the front of each eye there is a cluster of about six setæ. *Thorax* twice as broad as it is long; the front angles attain the middle of the eyes, the posterior are obtusely rectangular and rest on the shoulders; the sides are finely margined and so little curved as to appear nearly straight except where they are narrowed towards the front; its surface is distinctly but irregularly punctured, between the middle and each side the punctuation, on some spots, is not so close, but there are no very evident smooth spaces, the punctures usually contain greyish scale-like or sappy matter. *Elytra* almost as broad as they are long, moderately transversely convex, shoulders oblique, sides regularly slightly rounded, apex rounded; each with six rather broad but not deep striæ, beyond these, laterally and apically, the sculpture is rugose and punctate, the striæ, however, are not very definitely punctured, but the whole surface being more or less rugose some parts of the striæ appear crenate; the interstices are broad and punctate; the lateral margins are not distinctly reflexed, but the channels are broad, with coarse, transverse, and rather shallow sculpture.

*Underside* sparingly pilose, glossy black, the ventral segments with a transverse series of setigerous punctures on each.

*Tibiae* sparsely setose or hairy, the anterior a little expanded, oblique at apex, tridentate externally, the inner calcar attains the base of the second tarsal joint.

♂. Length 8; breadth  $5\frac{1}{4}$  lines.

### Group Cryptorhynchidæ.

#### *Acalles fuscatus*, sp. n.

*Ovate-oblong*, transversely convex, opaque, rufo-fuscous, densely covered with depressed pale brown scales and sappy matter and numerous greyish-yellow erect setæ; antennæ and tarsi ferrugineous.

*Rostrum* as long as thorax, red, squamose at base, very gradually and moderately narrowed towards the middle,

finely punctured and irregularly longitudinally strigose. *Head* immersed up to the rather flat eyes. *Thorax* one-third broader than long, much contracted in front, base very feebly sinuated, sides medially rounded, but narrowed behind; its punctuation close and moderately coarse, but concealed by the covering. *Scutellum* invisible. *Elytra* oblong, rounded and nearly vertical posteriorly, coarsely striate-punctate.

*Underside* rufescent, moderately coarsely and closely punctured, with greyish-yellow squamæ and a few setæ. *Pectoral canal* profound, limited behind by the semi-circularly raised margins of the mesosternum. *Metasternum* very short. *Abdomen* large; basal segment, in the middle, as long as the following three conjointly, second as long as the next two, third and fourth short, with deep straight sutures, fifth about the length of the preceding two, with a median fovea-like impression.

*Legs* long and stout, their clothing like that of the body. *Tarsi* stout, third joint bilobed, but only moderately expanded. *Antennæ* elongate, inserted just before the middle of the rostrum, their pubescence yellowish; scape clavate and slightly flexuous, reaching backwards to the eye; funiculus rather longer than the scape, second joint nearly as long as the first, but not so stout, joints 3-7 of nearly equal size, the seventh, however, rather broader than the others; club elongate, oval, apparently triarticulate.

In superficial appearance this insect is somewhat similar to the much larger *Sympedius vexatus* (no. 890).

Length, rostr. excl.,  $1\frac{1}{4}$ - $1\frac{1}{2}$ ; breadth  $\frac{3}{4}$  lines.

Two examples from Mr. J. H. Lewis.

#### *Acalles multisetosus*, sp. n.

*Convex*, subovate, fuscous, covered with brownish-grey scales; coarse, greyish, squamiform setæ form a sort of fringe round the thorax, on the hind-body there are many outstanding, but more slender and sometimes infusate setæ, whilst the legs and underside bear conspicuous coarse grey ones.

*Rostrum* stout, slightly rufescent, squamose, finely punctured. *Thorax* of nearly equal length and breadth, constricted in front, rounded at the middle; usually with two grey, squamose, longitudinal streaks near the base, its surface is moderately coarsely punctured. *Elytra* oviform, obviously broader than the thorax; they are striate-punctate, the sculpture, however, is not easily seen.

*Legs* stout; tibiæ slightly reddish; tarsi almost testaceous. The *pectoral canal* extends almost to the middle of the intermediate coxæ. *Metasternum* very short, but the basal ventral segment is large, the terminal one is red.

This minute species is most nearly allied to Pascoe's *A. perpusillus* (no. 870).

Length, rostr. excl.,  $\frac{3}{4}$ ; breadth  $\frac{3}{8}$  line.

This species also is from the collection of Mr. Lewis.

#### Group *Cossonidæ*.

##### *Agastegnus rufescens*, sp. n.

*Elongate*, subdepressed, subcylindric, finely pubescent, moderately glossy, infuscate-red; rostrum and thorax quite red, head darker.

*Rostrum* shorter than thorax, nearly cylindric, but contracted at the base and slightly narrowed between the middle and the apex, finely and distantly punctured in front, more closely behind. *Head* immersed up to the eyes, much curvedly narrowed anteriorly, so punctured as to appear rather dull. *Eyes* flat, lateral. *Thorax* somewhat oviform, but constricted near the apex; its disk subdepressed and medially furrowed, distinctly yet finely and not closely punctured; it bears distinct decumbent golden hairs near the sides. *Scutellum* small, but distinct. *Elytra* elongate, somewhat gradually narrowed towards the base, broadly, but not very obviously, transversely depressed between the middle and the base, sparingly clothed with yellow and greyish hairs; punctate-striate, intermediate striæ shallow or obsolete, the two suturals deep at the base; interstices apparently impunctate, the third carinate towards the apices.

*Legs* long, rather stout, finely and sparingly pubescent; tibiæ flexuous, with well-developed hooks. *Tarsi* 4-jointed, penultimate moderately expanded and sub-bilobed, the apical joint nearly as long as the other three conjointly, their soles with scattered outstanding slender hairs.

*Antennæ* reddish, scape flexuous and a little thickened towards the extremity, quite as long as the funiculus, which is 5-jointed, with the basal joint obconical, second nearly twice as long as broad and more slender than the contiguous ones, third and fourth apparently transversely quadrate, though slightly narrowed near the base, fifth transverse, broader than the preceding ones; the club densely but finely pubescent, oblong-oval, large, indistinctly articulated, about the length of joints 2-5 of the funiculus taken together.

*A. distinctus*, also from Otago, may be distinguished by its thicker, almost parallel-sided rostrum, stouter and shorter antennae, evidently shorter second joint of the funiculus, by its deeper thoracic channel, and the double clytral transverse impressions, one being behind the middle femora and the other in line with the posterior pair.

Length, rostr. incl.,  $1\frac{1}{8}$ ; breadth quite  $\frac{1}{4}$  lines.

Described from a single mounted specimen sent by Mr. J. H. Lewis, who found it at Otago.

V.—*Descriptions of Three new Fishes from Yunnan,*  
collected by Mr. J. Graham. By C. TATE REGAN, B.A.

*Schizothorax taliensis.*

Depth of body 5 to 6 in the length, length of head  $4\frac{2}{3}$  to 5. Diameter of eye  $3\frac{1}{2}$ – $3\frac{3}{4}$  in the length of head, length of snout  $3\frac{2}{3}$ , interorbital width 3. Mouth terminal, with the jaws equal anteriorly; maxillary extending to below anterior edge of eye; fold of the lower lip not continuous; barbels short. 85 to 100 scales in the lateral line, 24 to 29 between dorsal fin and lateral line, 12 to 15 between lateral line and root of ventral. Scales irregular; thorax and a median abdominal strip naked. Dorsal IV 7, its origin nearly equidistant from tip of snout and base of caudal; the compound serrated ray strong, its length  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of head; free edge of the fin concave. Anal III 5, when laid back extending to the base of caudal. Pectoral  $\frac{3}{4}$  the length of head, extending  $\frac{1}{2}$  or a little more than  $\frac{1}{2}$  of the distance from its base to the origin of ventrals. Ventrals 9- or 10-rayed, originating a little behind the origin of dorsal, extending  $\frac{1}{2}$  to  $\frac{2}{3}$  of the distance from their base to the origin of anal. Caudal forked. Caudal peduncle twice as long as deep. Silvery; back bluish.

Four specimens, 130 to 210 mm. in total length, from the Tali Fu Lake, 300 miles W. of Yunnan Fu.

*Discognathus yunnanensis.*

Depth of body 5 in the length, length of head  $4\frac{1}{2}$ . Eye slightly nearer to edge of operculum than to tip of snout, its diameter  $\frac{1}{4}$  the length of head and  $\frac{1}{2}$  the width of the slightly convex interorbital region. Barbels 2 on each side, short,

subequal. 40 scales in a longitudinal series, 5 between dorsal fin and lateral line, 3 between lateral line and root of ventral fin. Dorsal III 8; origin nearly equidistant from tip of snout and base of caudal; longest ray nearly as long as the head; free edge of the fin slightly concave. Anal III 5. Caudal deeply forked. Pectoral as long as the head, not reaching the ventrals, which originate below the middle of the dorsal and extend to the origin of anal. No well-defined spots or markings.

A single specimen, 53 mm. in total length, from the lake at Yunnan Fu.

*Silurus Grahami.*

Depth of body 6 in the length, length of head 5. Breadth of head  $1\frac{2}{3}$  in its length, diameter of eye 8, interorbital width  $3\frac{1}{3}$ , length of snout  $3\frac{1}{3}$ . Lower jaw projecting; vomerine teeth in separate patches; 4 barbels, the maxillary ones reaching the ends of the pectorals, the mental ones  $\frac{2}{3}$  as long. Dorsal 4, its distance from tip of snout slightly more than  $\frac{1}{2}$  its distance from the caudal. Anal 73, continuous with the caudal, which is subtruncate. Pectoral with I 13 rays; spine with the outer edge weakly denticulated and the inner edge entire, its length  $\frac{2}{3}$  that of the fin, which is  $\frac{3}{4}$  as long as the head and does not reach the ventral. Ventrals 12-rayed, extending to the third or fourth ray of anal. Greyish brown.

A single specimen, 260 mm. in total length, from the Chien Kiung Lake, 30 miles S.E. of Yunnan Fu.

This species is very close to *S. mento*, Rgn., from Yunnan Fu Lake, which has shorter barbels, the inner edge of the pectoral spine serrated, and the ventrals 10-rayed.

VI.—*Diagnoses of new Central-American Freshwater Fishes of the Families Cyprinodontidæ and Mugilidæ.* By C. TATE REGAN, B.A.

1. *Rivulus flabellicauda.*

D. 9. A. 12. Sc. 42. Diameter of eye 4 in the length of head. End of anal below middle of dorsal. Brownish, edges of scales darker; vertical fins with some small darker spots; a caudal ocellus.

*Hab.* Costa Rica, Juan Veñas (*Underwood*).

Total length 70 mm.

2. *Rivulus Godmanni*.

D. 8. A. 11. Sc. 35. Diameter of eye 3 in the length of head. End of anal below middle of dorsal. Olivaceous, a darker spot on each scale; operculum blackish; vertical fins dusky, the caudal with a narrow pale edge and below with a blackish intramarginal stripe; caudal ocellus sometimes present.

*Hab.* Guatemala (*Godman*).

Total length 40 mm.

3. *Pæcilia salvatoris*.

*Pæcilia thermalis* (non Steind.), Günth. Cat. Fish. vi. p. 341 (1866).

D. 10-11. A. 8-9. Sc. 27-30. Closely allied to *P. splenops*, C. & V., but with the body not so deep, the interorbital space broader, and the free edge of the dorsal fin straight instead of convex. Olivaceous; males with more or less distinct cross-bars; dorsal with 2 series of vertically expanded blackish spots, sometimes absent in females; caudal, in the males, with oblong blackish spots.

*Hab.* San Salvador, in warm springs (*Dow*).

Total length 55 mm.

4. *Xiphophorus strigatus*.

*Xiphophorus Helleri* (non Heck.), Meek, Zool. Pub. Columbian Mus. v. 1904, p. 157.

D. 12-14. A. 9-10. Sc. 28-30. A blackish lateral stripe from eye to base of caudal; no additional stripe in the males.

*Hab.* Southern Mexico, Vera Cruz and Oaxaca.

The true *X. Helleri* is the species named *X. jalapæ* by Meek, males of which have two lateral stripes.

5. *Xiphophorus brevis*.

D. 13-15. A. 9-10. Sc. 27. Depth of body  $2\frac{1}{2}$  to  $2\frac{2}{3}$  in the length. 3 or 4 indistinct dark longitudinal stripes at the edges of the series of scales on the sides of the body.

*Hab.* British Honduras, Stann Creek (*Robertson*).

Total length 75 mm.

6. *Agonostomus macracanthus*.

D. IV, I 8. A. II 10. Sc. 41-43. Upper lip very thick, as in *A. nasutus*. Maxillary extending to below middle of eye. Dorsal spines strong, the first  $\frac{1}{2}$ - $\frac{2}{3}$  the length of head or

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$\frac{2}{3}$ – $\frac{3}{4}$  the distance between the origins of the dorsal fins and as long as the longest rays of the second dorsal. Pectoral  $\frac{2}{3}$  the length of head, extending to or a little beyond the vertical from the origin of spinous dorsal.

*Hab.* Guatemala, Rio Guacalate (*Salvin*).

Total length 210 mm.

#### 7. *Agonostomus Salvini*.

D. IV, I 8. A. II 10. Sc. 38–40. Closely allied to *A. nasutus*, but upper lip not so thick, eye smaller, lower jaw a little longer, pectoral fin shorter. Maxillary extending to below anterior  $\frac{1}{4}$  or  $\frac{1}{3}$  of eye. Dorsal spines moderate, the first  $\frac{2}{3}$  (adult) or  $\frac{1}{2}$  (young) the length of head or of the distance between the origins of the dorsals. Pectoral  $\frac{2}{3}$  the length of head or less, not extending to below the spinous dorsal.

*Hab.* Guatemala, Rio Nacasil (*Salvin*).

Total length 270 mm.

### VII.—*A Contribution towards a Knowledge of the Entozoa of British Marine Fishes.*—Part I. By WILLIAM NICOLL, M.A., B.Sc., Gatty Marine Laboratory, St. Andrews.

[Plates I.–IV.]

THE following account of an as yet little-known province of British marine zoology can hardly be regarded as more than a mere preliminary. The original intention was to have treated the subject in a systematic manner, dealing with the Entozoa of each of the natural groups of fishes—Gadidæ, Pleuronectidæ, &c.—separately; but as this was found impossible for the time being, the most satisfactory remaining course seemed to be to study the easily accessible fishes as they came to hand. It will be seen that these fall under two classes: (1) the commoner littoral fishes, gunnel, stickleback, &c.; (2) the commoner food-fishes, haddock, dab, &c. A large number of each species, except in a few instances, having been examined, the results obtained may be regarded as fairly accurate and the parasites from each host as comparatively typical. Special attention has been devoted to the Trematode forms; cestodes occurred but rarely, except in the form of scolices. Nematodes and Acanthocephala were frequent, but, for the most part, assignable to common species. Several forms remain unnamed, mostly young Ascarids, which are difficult to diagnose.

No Elasmobranch fishes are noted in this paper, and of the Teleostei, three groups—Pharyngognathi, Lophobranchii, and Plectognathi—are unrepresented. Of the remaining three groups upwards of 60 species are recorded from St. Andrews Bay, but only 50 of these are at all common. About half of these are dealt with here. A few yielded no parasites, a notable case being *Blennius pholis*, which will be referred to later; amongst the others an individual not harbouring its quota of parasites was exceptional.

A striking feature of the herein-noted results is the large number of instances in which a parasite is recorded from a new host, although the new species are few. This may be due to a particular host not having been examined before or to its not having harboured Entozoa in the localities where it had previously been examined. A third possibility suggesting itself is that two species of fish may have been confused or regarded as identical, and the parasites of one attributed to the other. A case in point is that of *Cottus scorpius*, Bloch, and *C. bubalis*, Euphr., between which I have sometimes found difficulty in deciding. I have, however, carefully compared each specimen examined with Day's descriptions of the two species, and in so far as he is to be depended upon the results may be regarded as correct. The large number of forms new to *Cottus bubalis* may be explained in this way; moreover, almost every one occurred in an example which was unmistakably *Cottus bubalis*, Euphr.

This leads us to a consideration of the work of previous observers. Two most important attempts have been made towards a systematic and exhaustive knowledge of the Entozoa of the North Sea fishes—the one by Olsson\* in 1867, the other by P. J. van Beneden † in 1870. The work of the former was done in the waters off the west coast of Norway, which can hardly be regarded, strictly speaking, as the North Sea; but since the majority of the species which he examined are common to our shores, we can include his results under those for fish taken within the North Sea. Van Beneden deals with fish from the Belgian coast and from further out at sea. Both examined a very large number of fishes, especially the commoner varieties. Amongst the littoral fishes neither Olsson nor Van Beneden makes mention of *Gobius Ruthensparri* and *Liparis Montagu*. Olsson, in addition, omits *Zoarces viviparus*; Van Beneden, *Cottus*

\* "Entozoa hos Skandinaviska hafstiskar," Lunds Univ. Årsskrift, vol. iv. 1867, no. viii.

† "Les Poissons des Côtes de Belgique," Mém. Acad. Belg. xxxviii. 1871.

*bubalis*. From their observations no parasite appears to infest the fish haunting the pools and crevices along the shore in the same way as *Podocotyle atomon*, Rud., has been found to do at St. Andrews. The presence of this Trematode is quite a feature; it occurs in eight out of the nine species examined. Another common form is *Echinorhynchus acus*, Rud., which was found in four species. Amongst the fishes from deeper waters the widely-spread *Hemiurus* forms and *Derozenges varicus*, Müller, are recorded very frequently by both the above-mentioned observers. As might have been expected, the same is true in the present instance.

Fish, such as the herring and haddock, which roam far and wide in their search after food tend to exhibit the same parasitic fauna in whatever quarter they are taken, but the littoral fish, with their more circumscribed lives, are dependent on local faunæ for food, and in consequence their parasites vary according to the locality.

A case like that of *Podocotyle atomon*, Rud., would almost lead one to enunciate the hypothesis that the Entozoa of a particular fish depend more on its environment than on the species to which it belongs; that is to say, that no matter what the species of fish the parasites found in it ought to be the same as those found in other species from the same neighbourhood. This raises the very important question of idiosyncrasies in feeding, for it is well known that different species, although living quite close together, have often entirely different modes of feeding. Van Beneden took some pains to note the food of the various fish which he examined; but into this matter I do not propose at present to enter. One case, however, that of the shanny, *Bleinnius pholis*, cannot be overlooked. It occurs here commonly, and I had an opportunity of examining a large number, but in no instance did a single parasite present itself. Such a fact is not remarkable in itself, but, in view of the frequency with which other fish in the vicinity were infected, it is striking enough. Van Beneden found the food of the shanny to consist of crustaceans, *Balanus* for the most part. In addition to crustaceans I have met with excessive numbers of small gastropods, especially young *Littorina*. Thus the food is apparently not so very different from that of other species. The presence of the large number of shells in the intestine might be offered as a reason for the absence of parasites, but shells and other hard débris are found in fish in which parasites abound. Another explanation might be sought in some constitutional peculiarity of the shanny which renders it an unsuitable host. Similar instances—e. g. *Agonus*

(*Aspidophorus*) *cataphractus*, *Ctenolabrus rupestris*, and *Brosmius brosme*—occur in Olsson's observations, although he makes no comment upon them.

Neither Olsson nor Van Beneden made any attempt towards a solution of the life-history of the forms with which they deal. The subject is difficult and requires special and long continued study. Levinsen\* made an extensive search amongst the marine Invertebrata of Greenland for intermediate forms, and was successful in three or four cases. His results have not been confirmed. Lately some important work has been done in this direction by Miss Lebour in Northumberland †. She has investigated many of the commoner Mollusca and has recorded from them quite a number of sporocysts and cercarie. The difficulty of tracing these to their final host still remains.

In the Irish Sea at the Liverpool Laboratory considerable additions have been made to the British Entozoa fauna by Johnstone ‡. Very few Trematodes are mentioned, Cestodes receiving most attention. His note on *Distomum valdemflatum*, Stoss., is interesting and will be referred to later. The occurrence of *Hemiurus appendiculatus* in very small ( $\frac{1}{2}$ -1 in.) plaice and dabs is curious, for this Trematode has never been recorded from these fish in their adult state. The mention of a form (*Distomum gulosum*, Linton) first described from America is also noteworthy. Linton's work on the American fishes § reveals many forms which are the same as or almost identical with species already known from corresponding European fish. He himself is unable in several cases to establish their identity with absolute certainty. His work is valuable on account of the care with which he has studied and measured the various important organs, but unfortunately little exact information is to be derived from his plates.

Some experiments which I had an opportunity of conducting with sticklebacks may conveniently be described here. The fact that the sticklebacks from brackish ditches were infected with *Podocotyle atomon*, Rud., to as great an extent as those from the marine rock-pools suggested ascertaining the effect

\* "Bidrag til Kundskab om Grönlands Trematodfauna," Oversigt Kgl. Dansk. Selskab. 1881, pp. 52-84, pls. ii., iii.

† "Notes on Northumbrian Trematodes," Northumberland Fisheries Report for 1905.

‡ "Internal Parasites and Diseased Conditions of Fishes," Lancashire Sea-Fisheries Report for 1904, p. 98; 1905, p. 151.

§ Proc. U.S. Nat. Mus. xx. pp. 423-456, pls. xxvii.-xxxiv. and pp. 507-548, pls. xl.-liv.

of pure fresh water. Some examples, both from pools and from ditches, were confined in a tank of fresh water. For two months they were supplied with pond-weeds, snails, grubs, &c., which, however, they did not accept very readily. At the end of that time some were examined and found to contain the parasites as frequently as before. No new parasites had made their appearance. For another two months the sticklebacks received no food at all, and on examination thereafter no diminution in the number of parasites was observable, although by this time the fish were in a very poor condition. This is at variance with the observations of Zschokke and others, who found that in fish migrating from the sea to rivers the parasites acquired during their sojourn in the sea were gradually killed off by the fresh water of the river. The above experiment appears to indicate that the disappearance of the parasites in certain cases is not wholly attributable to the effect of the fresh water, but that some other factor must enter into account. The length of time (four months) during which the fish were confined to the fresh water was ample for any effect due to the water to have taken place. The only noteworthy circumstance observed was the largely increased number of ova extruded from the parasite in the intestine of the host.

The following is a list of the hosts examined, with their respective parasites; the habitat is also noted. An asterisk prefixed to the habitat denotes that the parasite is recorded for the first time from this situation; an asterisk prefixed to the name of the parasite denotes that it is here recorded for the first time from this host. The fish are named according to Day's 'British Fishes.'

## ACANTHOPTERYGII.

<i>Gasterosteus aculeatus</i> , Linn.	3-spined Stickleback.
Podocotyle atomon, Rud.	Stomach, intestine.
(= <i>Psilostomum redactum</i> , mihi.)	
* <i>Ascaris</i> sp. (juven.).	Body-cavity.
<i>Cottus scorpius</i> , Bloch.	Bullhead.
Podocotyle atomon, Rud.	Intestine.
(= <i>Distomum simplex</i> , Rud.)	
<i>Derogenes varicus</i> , Müller.	Stomach and *intestine.
<i>Distomum</i> sp.	Gills in capsules.
<i>Echinorhynchus acus</i> , Rud.	Intestine.
<i>Bothriocephalus punctatus</i> , Rud.	Intestine.
<i>Cottus bubalis</i> , Euphr.	Father-lasher.
Podocotyle atomon, Rud.	Intestine.
* <i>Hemiurus appendiculatus</i> , Rud.	Stomach.
* <i>Derogenes varicus</i> , Müller.	Stomach.
* <i>Prosorhynchus squamatus</i> , Odhner.	Intestine and pyloric appendages.

* <i>Ascaris</i> sp.	Body-cavity.
* <i>Ascaris</i> capsularia, <i>Rud.</i>	Peritoneum.
* <i>Ascaropsis</i> morrhue, <i>v. Ben.</i>	Intestine.
* <i>Echinorhynchus</i> acus, <i>Rud.</i>	Intestine.
<i>Bothriocephalus</i> punctatus, <i>Rud.</i>	Intestine.
* <i>Scolex</i> polymorphus, <i>Rud.</i>	Intestine and rectum.
* <i>Distomum</i> sp. (juven.).	Skin, muscles, &c., in capsules.
<i>Gobius Ruthensparri</i> , <i>Euphr.</i>	Double-spotted Goby.
* <i>Podocotyle</i> atomon, <i>Rud.</i>	Stomach and intestine.
* <i>Distomum</i> sp. (juven.).	Gills in capsules.
* <i>Ascaris</i> sp. (juven.).	Body-cavity.
* <i>Scolex</i> polymorphus, <i>Rud.</i>	Intestine.
<i>Cyclopterus lumpus</i> , <i>Linn.</i>	Lump-sucker.
<i>Scolex</i> polymorphus, <i>Rud.</i>	*Stomach and intestine.
<i>Liparis Montagui</i> , <i>Donov.</i>	Montague's Sucker.
* <i>Podocotyle</i> atomon, <i>Rud.</i>	Intestine.
* <i>Prosorhynchus</i> squamatus, <i>Odhner.</i>	Intestine and pyloric appendages.
* <i>Echinorhynchus</i> acus, <i>Rud.</i>	Intestine.
* <i>Ascaris</i> sp. (juven.).	Body-cavity.
<i>Centronotus gunnellus</i> , <i>Linn.</i>	Gunnel.
* <i>Podocotyle</i> atomon, <i>Rud.</i>	Intestine and rectum.
* <i>Hemiurus</i> appendiculatus, <i>Rud.</i>	Intestine.
* <i>Ascaris</i> sp. (juven.).	Peritoneum.
<i>Zoarces viviparus</i> , <i>Linn.</i>	Viviparous Blenny.
* <i>Podocotyle</i> atomon, <i>Rud.</i>	Intestine.
* <i>Echinorhynchus</i> acus, <i>Rud.</i>	Intestine.

ANACANTHINI.

<i>Gadus ceglefinus</i> , <i>Linn.</i>	Haddock.
<i>Lepodora</i> rachiaea, <i>Cobbold.</i>	Intestine.
* <i>Hemiurus</i> communis, <i>Odhner.</i>	Stomach.
<i>Ascaris</i> communis, <i>Dies.</i>	*Body-cavity.
<i>Ascaris</i> clavata, <i>Rud.</i>	*Stomach.
* <i>Ascaris</i> sp.	Intestine.
* <i>Agamonema</i> commune, <i>Dies.</i>	Liver and pyloric appendages in capsules.
* <i>Heterakis</i> foveolata, <i>Rud.</i>	Intestine.
* <i>Ascaropsis</i> morrhue, <i>v. Ben.</i>	Mouth, œsophagus, stomach, intestine.
<i>Echinorhynchus</i> acus, <i>Rud.</i>	Intestine.
<i>Bothriocephalus</i> rugosus, <i>Rud.</i>	Intestine and pyloric appendages.
* <i>Scolex</i> polymorphus, <i>Rud.</i>	Intestine.
* <i>Scolex</i> sp.	Gall-bladder.
<i>Gadus merlangus</i> , <i>Linn.</i>	Whiting.
<i>Derogenes</i> varicus, <i>Müller.</i>	*Intestine.
<i>Ascaris</i> clavata, <i>Rud.</i>	Intestine.
<i>Filaria</i> echinata, <i>v. Linstow.</i>	Intestine.
<i>Motella mustela</i> , <i>Linn.</i>	Five-bearded Rockling.
* <i>Podocotyle</i> atomon, <i>Rud.</i>	Stomach and intestine.
<i>Ascaris</i> capsularia, <i>Rud.</i>	Peritoneum.
<i>Ammodytes tobianus</i> , <i>Linn.</i>	Sand-Eel.
* <i>Hemiurus</i> communis, <i>Odhner.</i>	Œsophagus, stomach, intestine.

<i>Brachyphallus crenatus</i> , Rud.	Stomach and intestine.
<i>Lecithaster gibbosus</i> , Rud.	Intestine.
* <i>Ascaris</i> sp. (juven.).	Body-cavity.
* <i>Ascaris</i> sp.	Intestine.
* <i>Echinorhynchus acus</i> , Rud.	Intestine.
(?) <i>Scolex ammodytis</i> Tobiani, v. Ben.	Intestine.
<i>Hippoglossus vulgaris</i> , Flem. Halibut.	
* <i>Stephanochasmus baccatus</i> , sp. n.	Rectum.
* <i>Hemiurus appendiculatus</i> , Rud.	Stomach.
<i>Derogenes varicus</i> , Müller.	Stomach.
* <i>Derogenes cacozelus</i> , sp. n.	Intestine and rectum.
<i>Ascaris capsularia</i> , Rud.	Peritoneum.
<i>Ascaris collaris</i> , Rud.	Intestine.
* <i>Ascaris</i> sp.	Rectum.
* <i>Ascaropsis morrhuæ</i> , v. Ben.	Stomach.
* <i>Filaria echinata</i> , v. Linstow.	Rectum.
<i>Heterakis foveolata</i> , Rud.	Stomach.
<i>Scolex polymorphus</i> , Rud.	Intestine and *rectum.
<i>Rhombus maximus</i> , Linn. Turbot.	
* <i>Zoogonoides viviparus</i> , Olsson.	Rectum.
* <i>Derogenes varicus</i> , Müller.	Mouth, œsophagus, and stomach.
<i>Bothriocephalus punctatus</i> , Rud.	Intestine.
<i>Scolex polymorphus</i> , Rud.	Intestine.
<i>Rhombus levis</i> , Rondelet. Brill.	
<i>Derogenes varicus</i> , Müller.	*Stomach.
* <i>Ascaris collaris</i> , Rud.	Intestine.
<i>Pleuronectes limanda</i> , Linn. Dab.	
<i>Zoogonoides viviparus</i> , Olsson.	Intestine and rectum.
<i>Steringophorus furciger</i> , Olsson.	Stomach and intestine.
* <i>Derogenes varicus</i> , Müller.	Mouth, œsophagus, and stomach.
* <i>Derogenes cacozelus</i> , sp. n.	Intestine.
<i>Ascaris capsularia</i> , Rud.	Peritoneum.
* <i>Ascaris</i> sp.	Intestine and pyloric appendages.
<i>Scolex polymorphus</i> .	Intestine.
<i>Pleuronectes platessa</i> , Linn. Plaice.	
<i>Zoogonoides viviparus</i> , Olsson.	Intestine and rectum.
<i>Heterakis foveolata</i> , Rud.	Intestine.
<i>Scolex polymorphus</i> , Rud.	Intestine.
<i>Pleuronectes microcephalus</i> , Flem. Lemon-dab.	
<i>Distomum</i> sp.	Intestine.
* <i>Ascaris</i> sp.	Intestine.
* <i>Ascaropsis</i> (?) sp. (juven.).	Intestine.

## PHYSOSTOMI.

<i>Clupea harengus</i> , Linn. Herring.	
* <i>Hemiurus Lüheï</i> , Odhner.	Stomach and cæcum.
<i>Agamonema capsularia</i> , Dies.	Peritoneum.
<i>Anguilla vulgaris</i> , Turt. Eel.	
<i>Hemiurus appendiculatus</i> , Rud.	Stomach.
<i>Lecithochirium rufoviride</i> , Rud.	Stomach.
* <i>Scolex polymorphus</i> , Rud.	Intestine.

## TREMATODA.

*Podocotyle atomon*, Rud. (Pl. I. figs. 1, 2.)

*Distoma simplex*, Rud. †, Olsson, Levinsen, Grönlands Trematodfauna, p. 8, pl. iii. fig. 1.

*Albercudium atomon* (Rud.), Odhner, Zool. Jahrb. Syst. xiv. p. 506, pl. 33. figs. 9, 10.

*Podocotyle atomon* (Rud.), Odhner, Fauna Arctica, iv. (2) p. 320, pl. ii. figs. 9, 10.

*Psilostomum redactum*, sp. n., Nicoll, Ann. & Mag. Nat. Hist. (7) xvii. p. 525, pl. xiii. figs. 9, 10.

This is a species which Odhner regards as wrongly identified by Olsson \*, although the latter had some doubt on the matter himself. Olsson assigned his specimens to *Distoma simplex*, Rud., and was followed by Levinsen and Linton. Odhner, by elucidating the structure of *Distomum atomon*, Rud., shows that they ought really to have been assigned to this species. He also includes *Distomum reflexum*, Creplin, under this species, although he excludes the forms which Olsson † and Zschokke ‡ identified as such. As *Psilostomum redactum* I described what I considered to be a distinct species, but I must now regard it as identical with *Podocotyle atomon*, Rud.

Of Rudolphi's *Distoma simplex* (= *Fasciola aglefine*, Müller) no specimens remain, so that Odhner regards the species as unidentifiable. He omits notice of the fact that Van Beneden § found in *Gadus aglefinus* what he apparently regarded as *Distomum aglefine*, Müller. Van Beneden is slightly confusing, for while he marks the form "sp. nov." in his notes, without any attempt at description, the accompanying figure is marked *D. aglefine*, Müller, and we may suppose that this was his real intention. Von Linstow || notes both *D. simplex*, Rud., and *D. aglefine*, van Beneden, under *Gadus aglefinus*, so that he was either misled by van Beneden or he regarded the two species as distinct. Stossich ¶ falls into the same error. Van Beneden's figure is meagre, but, so far as it goes, exhibits a certain resemblance to the form we are here dealing with. The large elliptical ventral sucker, the position of the genital aperture, the male genital

\* "Entozoa iaktt hos Skandinaviska hafsfiskar," in Lunds Univ. Årsskrift, iv. p. 34, pl. iv. figs. 81, 82.

† Lunds Univ. Årsskrift, iv. (8) p. 52.

‡ Verhandl. Gesell. Basel, Tbl. 8, Mit. 3, p. 789, pl. xi. fig. 1.

§ "Poissons des Côtes de Belgique," p. 56, pl. iv. fig. 14, in Mém. Acad. Roy. Belg. xxxviii.

|| Compend. d. Helminthol. p. 236.

¶ Dist. d. Pesci, p. 61.

apparatus, the vitelline glands, testes, and ova, all point to its being a member of the genus *Allocreadium*. The ova are excessively large and the ovary is absent, and on this account it is impossible to assign this form to any of the already known members of the genus, so that the difficulty of proving the identity of *Dist. simplex*, Rud., still remains.

Olsson found this parasite occurring in *Sebastes norvegicus* (one or two fairly often), *Gadus melanostomus* (frequently numerous), *Raniceps niger* (once, in great numbers), *Anguilla vulgaris* (a single specimen). Levisen found it fairly often in *Cottus scorpius* and *Cottus gobio* (*Phobetor ventralis*) from Greenland. Rudolphi's specimens were from the stomach of *Pleuronectes flesus*. Odhner adds that he "has met with it in a very considerable number of other Scandinavian marine fishes from the west coast of Sweden," although I have seen no list of such forms. I have already recorded it from *Gasterosteus aculeatus* (var. *trachurus*), and to this I have to add *Cottus bubalis*, *Cottus scorpius*, *Gobius Ruthensparri*, *Centronotus gunnellus*, *Zoarces viviparus*, *Motella mustela*, and *Liparis Montagu*. About 70 per cent. of the total number of fish of these species examined were infected, usually with three or more adult parasites and often a large number of young. Thus it may be understood that this form is exceedingly frequent.

Olsson determines the length of his specimens at 3-9 mm.; Levisen found somewhat smaller examples in *Cottus scorpius* (3-5 mm.); Odhner gives the average length as about 2 mm., and is inclined to regard Olsson's larger specimens as a variety. He also differentiates a medium-sized variety corresponding with Levisen's specimens and also with *Dist. reflexum*, Crepl. My examples only in rare cases exceed 3 mm., the majority being 1.5-2.5 mm., so that as far as length is concerned they correspond with Odhner's smallest variety, *i. e.* with the Rudolphi type. Fully developed adults were found as small as 1 mm.; one small example from the stickleback measured 1.01 mm., and contained seven ova measuring  $.081 \times .047$  mm., *i. e.* of fully normal size. The largest immature individual observed was .90 mm. in length; it contained no ova, but the penis was well developed, and the testes were as large as  $.28 \times .11$  mm.

The general shape of the body is elongate-ovoid, depressed, somewhat attenuate anteriorly, more rounded posteriorly. Like the other species of the genus, it is extremely mobile, the ant-acetabular region being capable of great extension and contraction, the post-acetabular part less so, but the

cuticle of the latter is often thrown into irregular wrinkles. The constriction at the level of the testes, noted by Olsson, is not of invariable occurrence, and the outline of preserved (pressed) specimens is comparatively even. The colour viewed by transmitted light is greenish yellow, darker posteriorly from the presence of the yolk-glands and golden yellow centrally from the ova.

The cuticle is of no great thickness, devoid of spines, and striated longitudinally and transversely. The suckers are fairly well developed: the oral sucker is subterminal and globular, with a circular aperture; its diameter is usually about  $\frac{1}{10}$  of the length of the body, but it is proportionately larger in the younger examples than in the older, the observed limits being  $\cdot 12$  mm. in the smaller ( $1\cdot 0$  mm.) and  $\cdot 29$  mm. in the largest ( $3\cdot 15$  mm.). The ventral sucker is more variable; it is always elliptical in outline, with a corresponding aperture, the long axis being transverse and usually about half as long again as the diameter of the oral sucker, *i. e.*  $\frac{1}{4}$  of the total body-length, but here again the proportion decreases with increase in size. The measured dimensions were  $\cdot 22$ – $\cdot 42$  mm. These figures agree very closely with those of Odhner, *viz.*  $\cdot 12$ – $\cdot 25$  mm. for the oral and  $\cdot 25$ – $\cdot 44$  mm. for the ventral sucker. Linton's American specimens yield pretty much the same figures.

Another feature to which some importance is attached is the distance between the suckers (*i. e.* length of neck). My observations coincide with those of Levinsen, *viz.*  $\frac{1}{5}$ – $\frac{1}{4}$  of the length of the body and  $\frac{1}{3}$  in young individuals. Odhner also determines the limits at  $\frac{1}{5}$ – $\frac{1}{3}$ .

The alimentary system conforms to the genus type, except that a distinct prepharynx is present, first noted by Odhner. It appears as a dilated tube about half as long as the pharynx and considerably wider than the œsophagus. The pharynx is almost globular, with a diameter of about  $\cdot 10$  mm., but its breadth usually exceeds its length slightly. The œsophagus may be twice as long as the pharynx, but on contraction it is bent in the form of an S, and appears short then. The bending takes place either laterally or dorso-ventrally.

The excretory vesicle is a long simple closed sac extending as far forward as the level of the ovary, and opening posteriorly by a terminal pore. To it run down two narrow convoluted tubules, one on either side.

The genital aperture lies almost midway between the two suckers and also midway between the median line and the extreme left edge of the body. It is thus to the left of the œsophagus and between the pharynx and intestinal

bifurcation. The cirrus-pouch is long and narrow, extending some distance behind the ventral sucker. It contains at its posterior end a large bipartite vesicula seminalis, from the anterior end of which issues the ductus ejaculatorius. The latter bends back almost immediately to lie alongside the vesicula seminalis, but bending again it passes forward to the penis. This organ is long and slender, and when well extended is curved. It has a squarely-cut end, but instead of being inflated at its termination, as Olsson represents it, it is somewhat tapering. The configuration of the internal genitalia is precisely as Odhner\* represents it.

In one case I was fortunate enough to witness the fertilization and formation of the ova. The worm was under pressure, and the unfertilized ova passed along the oviduct fairly rapidly. As each arrived opposite the receptaculum seminis, it was surrounded by sperms, and shortly afterwards two or three yolk-plugs were congregated round it. The mass was forced on towards the uterus, receiving as it went a shell-coating and gradually acquiring the characteristic elliptical shape. The whole process did not last longer than ten minutes.

The vitelline glands consist of numerous follicles, not by any means so regular or so large as Odhner represents them. He is correct in saying that they do not extend in front of the ventral sucker, although occasionally a follicle or two is to be found in the neck.

The uterus is short and rarely contains more than 20-40 eggs; Odhner says 20-30, and yet in his figure † he represents upwards of 80 eggs. The ova are light yellow to yellowish brown in colour, and measure, according to my observations, .075-.084 mm. in length by .040-.054 mm. in breadth. These rather wide limits include measurements of the ova from various hosts. The details in four cases are as follows:—

	mm.	mm.
From <i>Gasterosteus aculeatus</i> . . . . .	.075-.081	× .040-.044
" <i>Cottus bubalis</i> . . . . .	.075-.081	× .044-.054
" <i>Centronotus gunnellus</i> . . . . .	.075	× .050-.052
" <i>Zoarces viciparus</i> . . . . .	.031-.084	× .046-.050

Odhner's figures are .060-.084 mm. × .010-.045 mm. The minimum length-limit seems rather small. I have certainly never observed ova (mature, at least) approaching that small size. My measurements were usually determined

\* *Loc. cit.* pp. 510-511, pl. 33, fig. 10.

† *Loc. cit.* pl. 33, fig. 9.

from ova as near the terminal portion of the uterus as possible. Linton's figures for the ova of his American specimens are  $\cdot 084 \times \cdot 04$  mm., so that they also correspond with other observations.

This parasite is usually confined to the intestine of its host, though occasionally one or two specimens are to be found in the stomach and in one host (*Gadus melanostomus*), according to Olsson, it occurs in the pyloric caeca.

While studying this form, I examined sticklebacks from three different regions, viz. (1) rock-pools, (2) brackish ditches communicating with the sea, (3) streams near their entrance into the sea. In the first two instances I obtained *Gasterosteus aculeatus*, var. *trachurus*; in the third, var. *gymnurus*. The river sticklebacks were much smaller than those from the sea, and in no case did they harbour *Podocotyle atomon*. The specimens from the pools and ditches were identical and were each equally subject to infection.

Levinsen asserts that the intermediate host of *Distomum simplex* is *Themisto libellula*. This crustacean is not recorded from the St. Andrews district, so that it cannot be the intermediate host here.

*Lepodora rachiaea*, Cobbold\*. (Pl. I. figs. 3, 4.)

*Distomum rachion*, Cobbold, Trans. Linn. Soc. xxii. p. 158, pl. xxxi. figs. 9, 10; Stossich, Dist. d. Pesci, p. 43; Linton, Proc. U.S. Nat. Mus. xx. p. 538, pl. liii. figs. 3-7.

*Lepodora rachiaea*, Odhner, Fauna Arctica, iv. (2) p. 332, pl. ii. figs. 12-15.

To reconcile Cobbold's figure of *Distomum rachion* with the one which I herewith submit seems at first sight difficult. The disposition of the genital glands and uterus appears to effectually separate them. The resemblance in other respects, however, is striking enough, and as it is possible to interpret correctly the structures misrepresented by Cobbold, I have little doubt that his specimens and mine are identical, and this is endorsed by the facts that the organization of the parasite is definitely characteristic and that *Gadus aeglefinus* figures as the host in both instances.

Cobbold's description is embodied in a few lines, but this brevity is remedied by a boldly drawn figure. In interpreting this figure we must suppose either that he drew from the living animal, when the thickness of the body would prevent him seeing clearly the organs in the posterior part, or that his preserved specimens were not sufficiently cleared.

\* Odhner's amended descriptions of this species and others did not come to hand until the present paper was in the press.

The anterior region is correct except that the genital aperture is rather far forward and the cuticular spines have assumed enormous proportions. The ventral sucker has a somewhat powerful appearance, and the vesicula seminalis extends as far back as the anterior testis. The testes are correctly enough placed, but the ovary is posterior to them instead of in front. The uterus displays the greatest divergence; it is represented as two tubes, winding down, one on each side of the body, to the extreme posterior end. It is to be presumed that Cobbold here confused the uterus with the vitelline glands, the rounded follicles of which might be mistaken for ova. The uterine walls must have been supplied from imagination.

Cobbold fancies a resemblance between this species and *Distomum scabrum*, Zed., and *D. appendiculatum*, Rud. Wherein this lies I fail to perceive, even in Cobbold's figure, for the organization of the alimentary system with its long pre-pharynx, the presence of the large spines, and the disposition of the entire genital system are widely different from the corresponding structures in the above-mentioned species.

Stossich's description of this form is merely a brief translation of Cobbold's. Along with von Linstow\* he falls into the error of attributing it to the cod (*Gadus morrhua*) instead of *Gadus aeglefinus*, although Cobbold is perfectly clear on this point.

A not uncommon parasite of the haddock, it occurred in rather more than 50 per cent. of individuals examined, always in the intestine and never in large numbers. It is of moderate size: length 1.88-4.17 mm., maximum breadth .61-.90 mm.; average size 2.65 x .69 mm.; body of elongated oval outline, rounded at both ends, somewhat attenuate anteriorly. It is of compact build, sluggish in movement, and does not long survive removal from its host. The cuticle is beset with stout regularly arranged spines covering the whole of the ant-acetabular region and gradually disappearing behind the ventral sucker. A few spines are to be found laterally within a short distance of the tip of the tail. The length of the spines is about .012 mm., but they are shorter in front and longer posteriorly. They have comparatively broad bases and are arranged so that the spines of each row alternate with those of adjacent rows.

The oral sucker is almost terminal, of fair size (diameter .24-.38 mm.), but not very muscular. The ventral sucker is remarkably small and feeble; it is situated almost centrally

\* Compend. d. Helminthol. 1878, p. 238.

and has a diameter of  $\cdot 14$ – $\cdot 23$  mm. Both are circular in outline with circular apertures.

The alimentary system is well developed. The mouth opens into a long pre-pharynx (about  $\cdot 3$  mm. long in an average specimen), which is followed by a pharynx of large size ( $\cdot 21 \times \cdot 16$  mm.); the œsophagus is very short and the diverticula into which it divides are of great width and extend to the end of the body.

The excretory vesicle is a simple sac of no great extent, in the posterior end of the body and opens by a terminal pore.

The testes are median, one behind the other, in the posterior third of the body. They are globular or ovoid in shape and of considerable size ( $\cdot 25$  mm. diameter). The edge of the posterior testis is at a distance of about  $\cdot 6$  mm. from the end of the body. The ovary lies directly in front of the testes and is much smaller than them. The receptaculum seminis is an elongated vesicle lying between the ovary and the anterior testis. The vitelline glands are extensive and well-defined; situated laterally from the level of the ventral sucker to the posterior extremity of the body. They consist of numerous, compact, irregular follicles.

The ova are few in number (about 30) and are confined to the space bounded by the ovary, the ventral sucker, and the two intestinal diverticula. Light yellow in colour, ovoid in shape, they measure  $\cdot 059$ – $\cdot 068$  mm. in length and  $\cdot 033$ – $\cdot 040$  mm. in breadth.

The genital aperture is in front of the ventral sucker, but to the left of the middle line; it is within the intestinal fork. The sphincter muscle surrounding it is sometimes very prominent.

The penis-sac (Pl. I. fig. 4) is of large size and divided into two portions by a constriction. The anterior part is the penis-sac proper, containing the retracted penis and the prostate, neither of which is very large. This part is regularly ovoid and lies in front of and dorsal to the ventral sucker. Joined to this by a narrow neck is a large sac containing a long rather narrow vesicula seminalis. This sac is capable of considerable extension and contraction, and in the latter state the vesicula seminalis becomes bent up, as is shown in the figure. There is a short non-prostatic part of the ductus ejaculatorius issuing from the anterior end of the seminal vesicle.

Linton describes a form from *Gadus callarias*, which he identifies as *Distomum rachion*, Cobbold, or a species very near it. His description is short, but the measurements he notes for the various organs show a remarkable agreement

with those obtained from my specimens. It deals mainly with the external appearance, and as his figure is poor little exact knowledge of the more important internal organs is to be derived from it. The suckers and alimentary canal are distinctly reproduced, as are also the testes. The penis-sac ("cirrus-pouch") occupies its proper position, but the genital aperture is in the middle line almost directly over the intestinal bifurcation. Two round bodies are figured in front of the testes, but their nature is not noted. From analogy the posterior of the two bodies would represent the ovary, but it is much larger than I am accustomed to see it, and, in fact, is as large as either of the testes. In the same way the anterior body would be the vesicula seminalis, but it is much further behind the ventral sucker than in my specimens. The yolk-glands are not well indicated. A most important feature of difference lies in the arrangement of the spines, which, if Linton's figure is to be depended on, would distinctly differentiate his specimen. He represents them as scales (from the anterior region), in close array, overlapping but not arranged alternately. On no part have I observed such an arrangement; the spines are certainly scale-like on the neck, but they are well spaced and always alternate with those of the next row. Thus, in the absence of more exact information, it is impossible to determine whether Linton's one specimen is *Lepodora rachisæ*, Cobbold, or not, but it is certainly very near it.

Subfamily *ECHINOSTOMINÆ*, LOOSS.

Genus *STEPHANOCHASMUS*, LOOSS.

1899. *Stephanostomum*, Lss. Zool. Jahrb. Syst. xii. p. 576.

1900. *Stephanochasmus*, Lss. Zool. Anz. xxiii. p. 603.

*Stephanochasmus baccatus*, sp. n. (Pl. II. figs. 5-7.)

Of this species I have been able to obtain only one specimen. It occurred in the rectum of a halibut (*Hippoglossus vulgaris*), and at first sight appeared to correspond so closely with my recollection of *Stephanochasmus cesticillus*, Molin, that I regarded it as such and placed it aside. A note by Looss\* on some examples of this latter form, drawing attention to an error or variation in the number and arrangement of the circumoral spines, induced me to re-examine my specimen. Several features of difference at once presented themselves; moreover, comparison with the

\* Zool. Jahrb. Syst. xii. p. 696.

other species of the genus did not admit its inclusion with any of them. It thus falls to be described as a new species.

The following description as well as the figure are from the preserved specimen, so that the measurements may admit of modification:—

The body is depressed, elongate-ovate, somewhat attenuate in front, rounded behind, with a small but distinct terminal prominence. Length 3·34 mm.; maximum breadth (at ventral sucker) ·75 mm. Ant-acetabular region (neck) comprises  $\frac{1}{4}$  of length of body. Anteriorly the cuticle is beset with numerous irregularly arranged spines, becoming fewer behind the ventral sucker and absent from the greater part of the post-acetabular region. Closely apposed to the margin of the oral sucker are two rows of large spines. The spines in the first row are shorter than those in the second, the lengths being about ·031 mm. and ·037 mm. respectively, but there is some variation. The number and disposition of these spines are characteristic of the species, and serve to distinguish it from other species of the genus. They occur in two regular uninterrupted rows; there are 28 spines in each row, making a total of 56, and the spines of one row alternate with those of the other. In no other species are the spines so numerous, the nearest approximation being 48, as recorded by Looss in *Stephanochasmus caducus*, Lss. *Steph. pristis*, Deslongch., according to Looss, has 36 spines. A point which Looss lays stress on is that in his examples of *Steph. cesticillus* the second row of spines numbers one less than the first. This is due to the absence of a spine of the second row in the mid-ventral line. No such arrangement occurs in *Steph. baccatus*; each row is complete, so that there is no gap in the mid-ventral line. In *Steph. cesticillus*, moreover, the spines of the first row are longer than those of the second. Between the two species another feature of difference presents itself in the disposition of the other cuticular spines. In Looss's figure these do not start immediately behind the cephalic spines, so that a small triangular bare area is left. This does not occur in *Steph. baccatus*, for irregular scattered spines are seen on the neck immediately behind the cephalic spines.

The suckers are comparatively small and not very muscular. The oral sucker is terminal and cup-shaped; its diameter is ·23 mm., while the aperture is ·19 mm. At the lateral margins of the rim, projecting into the aperture, a little nodule is apparent. Whether this is a natural condition or the result of preservation I am unable to say. The ventral sucker is at a distance of ·87 mm. from the anterior

end. It is approximately globular, and has a diameter of .33 mm. with a circular aperture.

The alimentary system is fairly typical. The prepharynx is shorter than in *Steph. cesticillus*, being only .17 mm. long. The pharynx is large and almost horseshoe-shaped, with the convexity directed backwards; it measures .21 × .16 mm. The œsophagus is extremely short. The diverticula extend to the posterior extremity, and are wide and irregularly dilated. The bifurcation occurs just a little in front of the ventral sucker.

The testes are situated in the posterior third of the body, one behind the other in the middle line. In shape they are ovoid, and have a greatest diameter (longitudinal) of .38 mm. The ovary lies directly in front, almost median or a little to the right, and is less than the testes (.21 mm.). The vitelline glands are lateral, extending from the posterior end of the body to a short distance behind the ventral sucker; they consist of small compact follicles.

There are very few ova (17), but they are of large size, measuring .087–.091 mm. × .044–.053 mm. The shape is unusual, pointed at one end and truncated at the other\*. The uterus lies entirely between the ovary and the ventral sucker, and is confined laterally by the intestinal diverticula. There is a long club-shaped penis-sac extending some distance behind the ventral sucker, though not so elongated as in *Steph. cesticillus*. The posterior portion is occupied by a large ovoid vesicula seminalis. There is a considerable pars prostatica. The genital aperture is median, directly in front of the ventral sucker.

It is evident that this species differs very considerably from already known forms. In the first place the body is much less elongated, and the suckers are proportionately further apart and larger. The cephalic spines, besides being more numerous than in any other species, are differently disposed, those in the anterior row being shorter than those

\* Three ova were observed lying within the ventral sucker. This recalls a condition already noted (Ann. & Mag. Nat. Hist. (7) xvii. p. 520) in a parasite inhabiting the cloaca of *Larus argentatus*. The supposition which I then hazarded seems to be strengthened by this case. Both are forms living in the terminal portion of the gut of their host, and the possibility suggests itself that in both the ova may be retained for some time within the ventral sucker in order to prevent their being excreted in too immature a condition. Many forms having a similar habitat display adaptations in the ova, having apparently the same end in view. The precocious development of eye-spots in several species and the ciliated embryos in *Distomum viviparum*, Olsson (from the end-gut of Pleuronectid fishes), are illustrative cases.

in the posterior. In *Steph. minutus*, Looss\*, they are of equal size in the two rows, but in the other species the anterior row contains the larger spines. In addition the ova are much larger than those of any other species except *Steph. cesticillus*.

*Zoogonoides viviparus*, Olsson.

(Pl. II. fig. 8 ; Pl. III. fig. 9.)

*Distomum viviparum*, Olsson, Lunds Univ. Årsskrift, 1867, iv. no. 8, p. 28, pl. iv. figs. 73-75.

*Zoogonus viviparus*, Looss, Centralbl. Bakt. 1ste Abtheil. xxix. p. 440.

*Zoogonoides viviparus*, Odhner, Centralbl. Bakt. 1ste Abtheil. xxxi. p. 62, fig. 2.

This species, first discovered by Olsson in *Pleuronectes microcephalus* and incorrectly described by him, has been fully described by Odhner. Looss assigned it to the genus *Zoogonus*, Lss., along with *Z. mirus*, Lss., but Odhner with reason regarded it as the type of a new genus. Olsson was only able to discover two specimens, occurring, as he believed, in the stomach of the host. Odhner, however, correctly points out that the true habitat of the species is the terminal portion of the intestine. He found it in *Pleuronectes flesus*, *Pl. limanda*, *Pl. platessa*, *Pl. microcephalus*, *Hippoglossoides platessoides*, and *Callionymus lyra*. I have found it here in *Pl. limanda*, *Pl. platessa*, and *Rhombus maximus*, and always in the lower reaches of the intestine, particularly the rectum. It always occurs in large numbers, usually accompanied in *Pleuronectes limanda* by *Steringophorus furciger*, Olsson.

Odhner's description of the species is almost exhaustive. The limits of size which he gives, however, are rather narrow. I have found mature examples as small as .8 mm. and, in *Rhombus maximus*, as large as 1.6 mm.; in *Pleuronectes limanda* they never exceed 1.2 mm. The maximum breadth is .31-.42 mm. The diameter of the oral sucker lies within Odhner's limits, viz. .14-.16 mm.; but the ventral sucker is never twice as large, as Odhner has it, and its aperture is nearly circular, or if elliptical the eccentricity is small. The cuticular spines are very minute, arranged in a regular diamond pattern, and cover the whole body except a small part at the posterior end. The intestinal diverticula do not extend beyond the posterior border of the ventral sucker.

The testes are two ovoid bodies, situated about the level

\* Centralbl. für Bakter. 1ste Abtheil. xxix. p. 604, figs. 5, 5a.

of the posterior border of the ventral sucker and symmetrically placed, one on either side of this. In the living specimen it is difficult to fix the exact position of the testes and ovary, for they move backwards and forwards with the movements of the animal. Sometimes one testis is a little further forward than the other, and sometimes the ovary is on a level with one or both. In preserved specimens the position is pretty much as shown in the figure (Pl. II. fig. 8, *T*). The ovary is to the rear of the ventral sucker, almost median or somewhat to the right. It is smaller and more globular than the testes. I find the size of the miracidium-containing capsule to be  $.086-.094 \times .042-.044$  mm., which is larger than Odhner has it.

Subfam. *HEMIURINÆ* (Looss, ex p.), Lühe.

Looss\* included in this subfamily the appendiculate Distomes and their congeners. Lühe†, however, saw fit to restrict the name to a certain group of these forms represented by two genera, *Hemiurus*, Rud. (ex p.), and *Lecithocladium*, n. g. Odhner later‡ removed *Hemiurus crenatus*, Rud., from the former genus and made it the type of a distinct genus, *Brachyphallus*. Of the members of this subfamily we have here to deal with *Hemiurus appendiculatus*, Rud., and *Brachyphallus crenatus*, Rud.

Genus *HEMIURUS*, Rud. (ex p.), Lühe.

Within this genus Lühe includes only *H. appendiculatus* (Rud., 1802), *H. Stossichii* (Montic., 1891), *H. crenatus*, Rud., 1802 (= *Distomum ocreatum*, Olsson, 1867), *H. levis*, Linton, and *H. grandiporus*, Molin. These all agree in having the yolk-glands compact, rounded or only slightly lobed, situated close behind the ovary and almost touching each other. The features in which they present differences are, amongst others, the relative sizes of the suckers, the proportionate length of the appendix, the position of the genital aperture, the length of the pars prostatica, and the position of the vesicula seminalis.

I have had before me during my investigation specimens of appendiculate Distomes belonging to the genus *Hemiurus* from four different hosts:—*Clupea harengus*, *Hippoglossus*

\* Zool. Jahrb. Syst. xii. p. 640.

† Zool. Anzeig. xxiv. p. 394.

‡ Fauna Arctica, iv. (2) pp. 352, 353.

*vulgaris*, *Gadus aeglefinus*, and *Ammodytes tobianus*. From the first three *Distomum appendiculatum*, Rud., has already been recorded, but, as Lühe points out, identification has in many cases been totally erroneous. Each of the four varieties which I have examined agree well enough on superficial inspection with the accepted idea of *Distomum appendiculatum*, Rud., but on closer investigation they are found to differ each from the other to a greater or less degree and all from Lühe's amended definition \* of *Hemiurus appendiculatus*, Rud.; they approach more nearly to *H. Stossichii* (Montic.), Lühe †. The chief features of difference between the above-mentioned varieties are the situation of the testes and the length of the pars prostatica and consequent position of the seminal vesicle. In these respects the examples from the haddock, sand-eel, and halibut agree closely with each other and differ markedly from the herring specimens. We must therefore regard the former as distinct from the latter. To fully reconcile either with already existing descriptions and in particular with the definitions of Lühe is impossible. For the present, however, I shall include the specimens from *Clupea harengus* under *Hemiurus Lühei*, Odhner, while those from *Ammodytes tobianus* are noticed under *Hemiurus communis*, Odhner.

*Hemiurus Lühei*, Odhner [= *H. Stossichii* (Montic.), Lühe].

From the stomach and cæcum of *Clupea harengus*.

The already recorded host of this form is *Clupea pilchardus*, and the fact that this fish is a member of the same family as the herring strengthens the probability that the forms from both are identical. Without attempting a full description of the species I shall endeavour to make clear wherein my specimens differ from Lühe's definition.

Its occurrence in the herring was frequent and in great numbers, and it was the only intestinal parasite to be met with. The body is very much elongated. The length, including the extended appendix, is 2.70-4.14 mm. Of this the appendix comprises about  $\frac{1}{3}$ - $\frac{1}{4}$  (i. e. the appendix =  $\frac{1}{4}$ - $\frac{1}{3}$  of the rest of the body). The breadth was measured at two points, (1) just behind the ventral suckers, (2) immediately in front of the appendix; it was found remarkably constant, viz. .28-.33 mm.  $\times$  .35-.40 mm., representing a somewhat more attenuate condition than Lühe admits in *H. Stossichii*. The length of the neck (taken as the distance between the

\* Zool. Anzeig. xxiv. p. 396.

† *Ibid.* p. 398.

centres of the two suckers) has also a fairly constant proportion. It was  $\cdot33$ – $\cdot40$  mm., representing a proportion of  $\frac{3}{8}$ – $\frac{1}{6}$  of the body (without appendix). The oral sucker has a diameter of  $\cdot11$ – $\cdot13$  mm. and the ventral  $\cdot18$ – $\cdot24$  mm. The relative proportion may therefore be approximately 1 : 2 or 2 : 3, not invariably 2 : 3 as Lühe has it. The pharynx is contiguous with the oral sucker and has a length of  $\cdot06$  mm. with a breadth of  $\cdot06$ – $\cdot07$  mm. The œsophagus is very short or absent. The intestinal diverticula may extend into the appendix, but usually do not. The cuticle of the body is ringed ("geringelt"), that of the appendix is deeply striated.

The genital aperture lies a short distance behind the ventral lip of the oral sucker; the genital sinus is long and extends almost as far back as the ventral sucker. The pars prostatica is also of great length; the prostate cells are very numerous and form a dense mass behind the ventral sucker. In consequence of the length of the prostate, the vesicula seminalis is at a great distance behind the ventral sucker. The distance as measured is from  $\cdot6$  mm. to  $\cdot9$  mm., *i. e.* rather more than  $\frac{1}{4}$  of the body-length. The seminal vesicle is double and usually lies towards the left side. The testes are just behind it and one is almost directly behind the other, the obliquity being very slight. They are globular or somewhat ovoid and of fair size (diam.  $\cdot14$ – $\cdot16$  mm.). The ovary and vitelline glands lie almost midway between the testes and the beginning of the appendix. The ovary is always elliptical, the long axis being transverse, and measures  $\cdot13$ – $\cdot18 \times \cdot11$ – $\cdot12$  mm. It is thus about the same size as the testes. The yolk-glands lie close behind and ventral to the ovary, and are each about the same size as the ovary; they are slightly lobed, one usually having three, the other four lobes. This coincides, curiously enough, with Lühe's observations in the cases where the yolk-glands are tubular. The glands are at a distance of  $\cdot4$ – $\cdot6$  mm. from the appendix. The uterus is very voluminous and may extend a short distance into the appendix, but usually does not. The ova are numerous and measure  $\cdot022$ – $\cdot028$  mm.  $\times$   $\cdot011$ – $\cdot012$  mm.

#### *Hemirus communis*, Odhner.

From the œsophagus, stomach, and intestine of *Ammodytes tobianus* and from the stomach of *Gadus aeglefinus*.

This species shows very great resemblance both to *H. appendiculatus* and to *H. Lühei*. It is differentiated from the former by the situation of the testes, which are close

behind the ventral sucker and markedly oblique; also by the relative sizes of the suckers. From *H. Luhei* it differs in the length of the œsophagus, in the shortness of the pars prostatica, and in the forward position of the vesicula seminalis and testes. It differs from both in the length of the appendix.

Mature examples were found in the sand-eel, varying in length (including appendix) from 1.5–2.5 mm. Of this the appendix often comprised as much as  $\frac{2}{3}$  (*i. e.*  $\frac{2}{3}$  of the rest of the body); usually somewhat smaller, but never less than half as long as the rest of the body. The examples from the haddock and the halibut agree in this respect. The body is not so attenuated as in the form from *Clupea harengus*, the breadth being .37–.38 mm. just behind the ventral sucker and .42–.57 in front of the appendix. The neck (distance between centres of suckers) is also much longer than in the above form, being  $\frac{1}{3}$  of the body-length. The oral sucker has a diameter of .11–.18 mm. and the ventral a diameter of .16–.26 mm., so that the relative size is from  $\frac{1}{2}$  to  $\frac{2}{3}$ , more usually the latter. The pharynx is contiguous with the oral sucker and measures .06 × .07. There is a distinct œsophagus, about as long as or longer than the pharynx. The intestinal diverticula may extend a considerable distance into the appendix, but often stop short of it. The cuticle of the body is ringed, but the rings become faint towards the appendix. The striations on the latter are not very distinct. It is usually divided into two portions of almost equal length, the posterior of which becomes invaginated within the other when the appendix is retracted.

The genital aperture occupies the same position as in the preceding species; the genital sinus is not quite so long. The pars prostatica is shorter and the seminal vesicle, which is double, is immediately behind the ventral sucker. The testes are globular or ovoid and are not far behind the seminal vesicle; somewhat obliquely situated, the left is almost entirely in front of the right. They have a diameter of .10–.16 mm. The ovary is ovoid, the long axis being transverse, and measures .11–.16 mm. × .09 mm. The yolk-glands are behind the ovary and contiguous with it; they are usually slightly lobed as in the preceding species. The uterus is voluminous and may extend into the appendix. The ova are numerous and measure .022–.031 mm. × .009–.013 mm.

The specimens from *Gadus æglefinus* present slight variations from the above and tend more to *H. appendiculatus*, but they certainly cannot be included under that species according to Lühe's definition.

An interesting occurrence was witnessed while a living specimen from the sand-eel was being examined. The left yolk-gland was observed to gradually, but rapidly disappear, so that not a trace was left. The preserved specimen exhibits only one yolk-gland. This may afford a possible explanation of Monticelli's observation of only one gland in *Hemiurus Stossichii*, a case which Lühe has difficulty in reconciling with his own observations\*.

In an example of *Hemiurus appendiculatus* from the halibut (Pl. III. fig. 11) a rare condition was met with, namely, pigment-spots in the ova. The presence of eye-spots in the ova of Hemiurinae is not usual, and on that account I regarded the case as suspicious. On close examination some of the ova displayed two spots, one at each pole; others had several spots congregated at one end, but in the majority the appearance simulated the usual occurrence of eye-spots. Indications of pigmentation, however, were found throughout the body and large patches were discovered in the substance of both suckers. Another smaller example showed no spots in the ova, but the suckers contained several black patches. The explanation of this seems difficult; the case is certainly unique in my experience, and I can only attribute it at present to some diseased condition.

*Brachyphallus crenatus* (Rud.), Lühe.

*Distoma crenatum*, Rud. Entoz. Hist. ii. p. 404, pl. v. fig. 1.

*Distoma ocreatum*, Olsson, Lunds Univ. Årsskrift, iv. (8) p. 48, pl. v. figs. 96-98.

*Hemiurus crenatus*, Lühe, Zool. Anzeig. xxiv. p. 399; Lander, Bull. Mus. Harvard, xlv. no. 1.

*Brachyphallus crenatus*, Odhner, Fauna Arctica, iv. (2) p. 352.

Amongst the numerous examples of *Hemiurus communis* from the sand-eel several specimens of this species were found. It is at once differentiated by the almost equal size of the suckers. The length of my examples, which were pretty nearly all of one size, was 2.12-2.38 mm., with an appendix of 1.08-1.18 mm., *i. e.* the appendix equals about half the length of the rest of the body. This corresponds very well with the observations of Lander and Odhner. Lühe makes the length 1.25-1.35 mm. and the appendix  $\frac{3}{4}$  as long as the trunk. The breadth behind the ventral sucker was .52-.64 mm., and near the appendix it was .71-.77 mm. These figures are much in excess of any found by other observers.

\* Zool. Anzeiger, xxiv. p. 399, note 13.

The diameter of the oral sucker was  $\cdot 21$ – $\cdot 26$  mm., that of the ventral sucker  $\cdot 28$ – $\cdot 30$  mm., the proportion therefore being 6 : 7, which is identical with that found by Lander and Odhner. The genital aperture lies midway between the suckers: Lander says nearer the oral sucker, Odhner nearer the ventral. The appendix always appears in two parts and the intestinal diverticula reach to nearly its extreme end. It is deeply striated.

The pharynx is contiguous with the oral sucker. Between the observations of the above observers there is some divergence, Odhner's dimensions being much less than those of Lander. I have found it to vary, the breadth as often as not exceeding the length. Length  $\cdot 09$ – $\cdot 12$  mm., diameter  $\cdot 09$ – $\cdot 11$  mm. These figures agree more with Lander's. In my specimen the left testis is further forward than the right, which disagrees with both Odhner and Lander's figures. The ovary is globular or ovoid and smaller than the testes. The yolk-glands are usually compact, but sometimes they are more or less scattered, a part being occasionally found at some distance from the main mass and connected with it by a narrower portion. In one case single follicles were observed scattered throughout the body near the appendix. The ova measure  $\cdot 021$ – $\cdot 023$  mm.  $\times$   $\cdot 015$ – $\cdot 016$  mm.; they are thus somewhat broader than those measured by Odhner.

#### Subfamily LECITHOCHIRINÆ, Lühe.

#### Genus LECITHASTER, Lühe.

*Lecithaster gibbosus*, Rud. [= *L. mollissimus*, Levinsen].

From a sand-eel (*Ammodytes tobianus*) I obtained what I believe to be a specimen of this parasite. It occurred only once, although more than fifty sand-eels were examined, so that it is extremely rare. It was, unfortunately, damaged during inspection, but not before I had observed the following particulars:—

A large vesicula seminalis lay at the level of the ventral sucker and dorsal to it. A ductus ejaculatorius, with prostatic cells, stretched forward to open a little way behind the oral sucker. In the posterior part of the body the yolk-glands were arranged in seven or eight lobes radiating from a common centre. There was a small caudal appendix. In the position of the testes were situated two circular bodies, displaying internally a system of concentric rings. For this appearance I am unable to account. The ovary could not be

distinguished, and there were no ova (so that the specimen was probably immature). Together with the size of the body and the condition of the suckers these characters seem sufficient to establish identity with *Distomum mollissimum* as described by Levinson\*.

### GENUS DEROGENES, Lühe.

#### *Derogenes varicus*, Müller.

This has proved one of the most widely distributed Trematodes in this locality, and has occurred in the following hosts:—*Gadus merlangus* (intestine), *Hippoglossus vulgaris* (stomach), *Rhombus maximus* (oral cavity, œsophagus, and stomach), *Rhombus levis* (stomach), *Pleuronectes limanda* (oral cavity, œsophagus, and stomach), and *Cottus scorpius* (intestine). It is here recorded for the first time from *Rhombus maximus* and *Pleuronectes limanda*, and in these it has occurred most frequently.

Its characters are so well known that it calls for no description here. The limits of size are wide, Stossich giving them as 1.5–7 mm. I have found adult specimens less than 1 mm. long, and the largest example obtained was 3.4 mm. long from the stomach of the turbot. The most common size is 1.5–2.0 mm. The oral sucker in individuals of that size has a diameter of .19–.24 mm., and the ventral sucker .33–.40 mm. The ova vary greatly in specimens from different hosts. The limits in length are .050–.062 mm., and in breadth .025–.034 mm. Those in front of the ventral sucker are always larger than those behind, and it is in the latter that the greatest variations are to be observed. Thus in an example from the halibut the ova in the anterior part of the body measured .059 × .032 mm., in the posterior part .057 × .027 mm. The approximate size of the ova just about to be extruded may be taken as .056–.060 × .031–.034 mm.

#### *Derogenes cacozelus*, sp. n. (Pl. III. fig. 10.)

Found in the intestine and rectum of *Hippoglossus vulgaris* and the intestine of *Pleuronectes limanda*. It is not at all common, only a few specimens having been obtained. It bears a close resemblance to *Derogenes varicus*, Müller, but the large vesicula seminalis and the small ova differentiate it at once from that species.

The body is elongated, cylindrical, broadest in the middle,

\* Oversigt Kgl. Dansk. Selskab. 1881, pp. 59–61, pl. ii. fig. 4.

tapering towards each end. Length  $\cdot 87$ – $1\cdot 51$  mm. The section is approximately circular. The cuticle is unarmed, but very faint transverse wrinkles appear on the surface. The oral sucker is subterminal, globular, with a diameter of  $\cdot 16$  mm. (in a specimen of length  $1\cdot 5$  mm.). The ventral sucker is somewhat prominent, globular, and lies in front of the middle of the body ( $\cdot 57$  mm. from anterior end); its diameter is  $\cdot 23$  mm. Both have circular apertures.

There is a large muscular pharynx, almost globular, with a diameter of  $\cdot 08$  mm. The œsophagus is extremely short and the intestinal bifurcation takes place immediately behind the pharynx. The diverticula are wide, irregularly dilated, and extend to the posterior extremity of the body. The excretory system resembles that of *Derogenes varicus*.

The testes are obliquely placed behind the ventral sucker; they are two ovoid bodies, with a maximum diameter of  $\cdot 12$  mm. The ovary is more nearly globular: diameter  $\cdot 10$  mm. It is situated almost midway between the ventral sucker and the tip of the tail. Behind it lies a pair of large vitelline glands having the same structure and disposition as in *Derogenes varicus*. The uterus is much convoluted and fills a large portion of the body. The eggs are very numerous and rather small, ovoid in shape. Size  $\cdot 021$ – $0\cdot 23$  mm.  $\times$   $\cdot 014$ – $0\cdot 16$  mm.

There is a large ovoid vesicula seminalis lying on the same level as the ventral sucker and dorsal to it, measuring  $\cdot 23 \times \cdot 17$  mm. From it issues a somewhat narrow ductus ejaculatorius, leading forward to the penis-sac. The duct is surrounded for two thirds of its length by numerous prostate-gland cells lying free in the body-substance. The penis-sac resembles that in *Derogenes varicus*. It is somewhat pear-shaped or almost globular. The aperture is situated in the mid-ventral line at a distance of  $\cdot 21$  mm. from the edge of the oral sucker.

*Distomum* sp. (Pl. III. fig. 12; Pl. IV. fig. 13.)

From the muscles &c. of *Cottus bubalis*.

While collecting one day I observed a *Cottus* lying in a small rock-pool. I approached it cautiously, but it seemed unaware of my presence until I seized it, and even then its struggles to escape were feeble. In a tank it took no notice of food or objects placed near it, but lay torpid. It appeared to be blind. On dissection the cause was revealed. The whole body, skin, muscles, bones, and the layers of the eye were impregnated with small masses of black pigment,

accompanied by cysts containing Trematode cercariæ. The only parts not affected were the brain and the abdominal organs. The pigment-spots appeared to follow the course of the blood-vessels, as is evident from fig. 13, and they are probably spread throughout the body by means of the blood. The nature of the pigment I did not ascertain. The Trematode is a small tailless larva, having the body entirely covered with minute spines, two small suckers, and with intestinal diverticula extending to the tip of the tail. I am at present unable to assign it to any known species.

This occurrence may admit of explanation in the same way as Johnstone\* accounts for a similar infection of *Pleuronectes limanda*, although the parasites in the two cases are not identical.

#### *Distomum* sp.

From gills of *Cottus scorpius* and *Gobius Ruthensparri* in capsules.

This occurred rarely, but in infected specimens the numbers were large. The wall of the cyst was thin, so that the enclosed larva could be easily seen. It possessed few distinctive features, so that identification was, for the time being, impossible.

#### NEMATODA.

*Ascaropsis morrhua*, van Beneden. (Pl. IV. figs. 14-16.)

*Ascaropsis morrhua*, van Beneden, Mém. Acad. Belg. 1871, xxxviii. p. 56, pl. iii. fig. 11.

Van Beneden appears to have instituted this genus and species at one and the same time, but he gives no definition of the genus or description of the species except a few words in a footnote and drawings of the head, tail, and ovum. From these, however, I am able to establish the identity of the specimens which I assign to this species.

Van Beneden found it in the intestine and pyloric cæca of the cod (*Gadus morrhua*). I have to record it from *Gadus æglefinus*, *Hippoglossus vulgaris*, and *Cottus bubalis*. In each of the two latter only one specimen occurred, but in the haddock it was extremely numerous and was met with throughout the whole anterior part of the alimentary canal.

The body is elongated, narrow, and cylindrical, of almost uniform girth; attenuated anteriorly and posteriorly, with a

\* Report Lancashire Sea-Fisheries Laboratory for 1904, p. 101.

ventral excavation at the tail. Length 6-8 mm., breadth 8-9 mm. Cuticle annulated by furrows, which are continuous for more than one annulus. Van Beneden represents each ring as complete, probably owing to his not having studied the character of the annulation. Towards the anterior end the furrows become faint and disappear. Projecting forward from the head are two small spines, omitted by van Beneden; these are largest in the example from *Collus bubalis*, and almost invisible in that from the halibut.

The mouth is terminal and appears to consist of two equal-sized but little-differentiated lips. There is a long œsophagus and a long simple intestine pursuing an uneven course towards the anus, which opens in the excavation at the tail. In adult specimens the ovary and uterus occupy almost the whole of the remainder of the body. The ovary arises at the posterior extremity of the body and passes forward, twisting round the intestine in its course. The middle third of the body is usually completely filled with ova. These have the characteristic shape, with the two flagella at one pole, noted by van Beneden. Size .039-.040 mm. × .021-.022 mm. These measurements are almost uniform in the specimens from each of the three hosts.

A form somewhat resembling this was taken from the intestine of *Pleuronectes microcephalus*. It displayed the characteristic annulation, but on the head, instead of two spines, appeared two prominent circular marks. No ova or genitalia were present, so that the specimen was immature and identification was impossible.

## EXPLANATION OF THE PLATES.

The following letters apply to all the figures:—

<i>BSN.</i> Ventral sucker.	<i>PG.</i> Genital aperture.
<i>CB.</i> Penis-sac.	<i>Ph.</i> Pharynx.
<i>DE.</i> Ductus ejaculatorius.	<i>PPh.</i> Prepharynx.
<i>DSt.</i> Vitelline glands.	<i>PPr.</i> Pars prostatica.
<i>Ev.</i> Excretory vesicle.	<i>Pr.</i> Prostate glands.
<i>J.</i> Intestinal diverticula.	<i>T<sub>1</sub>, T<sub>2</sub>.</i> Testes.
<i>KSt.</i> Ovary.	<i>RS.</i> Receptaculum seminis.
<i>LC.</i> Laurer's canal.	<i>SD.</i> Shell-gland.
<i>MSN.</i> Oral sucker.	<i>Ut.</i> Uterus.
<i>Oe.</i> Oesophagus.	<i>Vg.</i> Vagina.
<i>Ov.</i> Ova.	<i>VS.</i> Vesicula seminalis.
<i>P.</i> Penis.	

## PLATE I.

*Fig.* 1. *Podocotyle atomon*, Rud. Anterior part, to show pre-pharynx: dorsal view.

- Fig. 2. *Podocotyle atomon*, Rud. Shell-gland complex; ventral view. DG, yolk-duct; YR, yolk-receptacle; KG, oviduct.  
 Fig. 3. *Lepodora rachiana*, Cobbold. Ventral aspect.  
 Fig. 4. Ditto. Male genital apparatus; penis retracted; dorsal view.

## PLATE II.

- Fig. 5. *Stephanochasmus baccatus*, sp. n. Ventral aspect.  
 Fig. 6. Ditto. Head, showing spines; ventral aspect.  
 Fig. 7. Ditto. Outline of ovum.  
 Fig. 8. *Zoogonoides viviparus*, Olsson. Ventral aspect. Em, embryo.

## PLATE III.

- Fig. 9. *Zoogonoides viviparus*, Olsson. Penis-sac; penis retracted, showing the spines; ventral view.  
 Fig. 10. *Derogenes cacozelus*, sp. n. Right lateral aspect.  
 Fig. 11. *Hemimurus appendiculatus*, Rud., from *Hippoglossus vulgaris*. Loop of uterus, showing ova with pigment-spots.  
 Fig. 12. Head of *Cottus bubalis*, Euphr. Eye removed, to show pigment-spots in the eye-socket.

## PLATE IV.

- Fig. 13. Head of *Cottus bubalis*, Euphr. Lower jaw divided and turned to the sides; gills bent back, to show the pigment-spots in the roof of the mouth, following the course of the blood-vessels.  
 Fig. 14. *Ascaropsis morrhue*, van Ben., from *Gadus aeglefinus*. a, cephalic spines; b, termination of annulating furrow; c, end of oesophagus; d, ova.  
 Fig. 15. *Ascaropsis morrhue*, van Ben., from *Cottus bubalis*. Highly enlarged view of head, showing the two spines.  
 Fig. 16. Ditto. Tail; ventral aspect. Int, intestine; An, anus.

The drawings, with the exceptions of figs. 2, 4, 8, 9, were made from preserved specimens.

VIII.—*Descriptions of Fifteen Terrestrial Mollusca from South Africa.* By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY, F.Z.S.

[Plate VI.]

THREE years having now elapsed since our last communication\*, we now venture to offer an eighteenth contribution upon the subject, mainly consisting of the descriptions of seven *Enneæ* and several Helicoids, mostly collected by Miss Hickey, Messrs. J. McBean, J. Farquhar, and H. C. Burnup, to whom our best acknowledgments are due, while we would

\* Ann. & Mag. Nat. Hist. ser. 7, vol. xii. (December 1903), pp. 595 sqq.

take this opportunity of especially thanking the last-named for his continued valuable critical assistance.

*Ennea Aliciae*, sp. n. (Pl. VI. fig. 1.)

*E. testa* rimulata, obtuso-cylindrica, lævissima, pellucida, tenui, nitida, lubrica; anfractibus 9, quorum apicales 3 subconici, cæteris ventricosulis, apud suturas impressis, ultimo paullum producto, ad basin arete striato; apertura semicirculari, peristomate incrassato, nitido, plicis dentibusve quatuor munito: plica parietali acinæiformi, acuta, intrante, dente labiali bi- vel trifido, magno, plica basali incurva, columellari omnino interna, bimamillata, magna, aperturam fere claudente.

Long. 9·5, lat. 4·5 mm.

*Hab.* Makowe, Zululand (*Burnup*).

A large and handsome species, slightly recalling *E. formosa*, M. & P., in general appearance; but it is a much smoother shell, with subconical apex, whorls broader and tun-shaped, mouth-processes differing in the absence of a columellar tooth, in the tendency of the labial tooth to become trifid, the internal columellar plait being almost identical in both species.

To Mrs. Alice Burnup, companion of her husband on so many successful expeditions in South Africa, this conspicuous *Ennea* is dedicated.

*Ennea johannesburgensis*, sp. n. (Pl. VI. fig. 2.)

*E. testa* parva, subrimata, dolioliformi, solidula, pallide straminea, apice obtusissimo; anfractibus 7, paullum ventricosis, apud suturas impressis, undique longitudinaliter obliquistriatis; apertura fere rotunda; peristomate albo, nitido, incrassato: plica parietali acuta, intrante, fere recta, dente labiali acuto, basali obtuso, plica columellari conspicue et omnino intrante, rotundata, mammæformi.

Long. 6, lat. 2 mm.

*Hab.* Johannesburg, Transvaal (*McBean, Johnson*).

More than a dozen examples of this species have been inspected, besides one or two that were received a few years since from Mr. Johnson, shortly after his first arrival in South Africa. One of these slightly exceeds 6 mm. in length. It belongs to the alliance of *S. eximia*, *Collieri*, *Wottoni*, M. & P., or *infans*, Craven, from which it chiefly differs in the presence of an obtuse basal tooth.

*Ennea phragma*\*, sp. n. (Pl. VI. fig. 3.)

*E. testa* cylindrica, dolioliformi, apud basin pone labrum conspicue scrobiculata, recta, parva, pallide albo-straminea, apicem versus

\* φράγμα, a palisade or fence.

planata; anfractibus, inclusis apicalibus, 7, ad suturas impressis, undique arcu longitudinaliter liratis, liris obliquis; apertura ovata; peristomate incrassato, sinuoso, albo, nitido, dentibus plicisve quatuor munito: plica parietali conspicua, magnopere intrante, dente labiali crasso, acuto, basali parvo, plica columellari bifida, superficialiter dentiformi, multum intrante, subtus mammaeformi.

Alt. 3.5, diam. 1.5 mm.

*Hab.* Waku District, Cathcart, near the Klipplatz River (*Miss Hickey*).

Smaller, narrower, and more cylindrical than *E. drakensbergensis*, M. & P., and in general form more resembling *E. caryatis*, M. & P., but differing from that species entirely as regards the disposition of the oral plaits and teeth. It may be compared also with *E. montana*, M. & P., from Mountain Drive, Grahamstown, the aperture of which is trigonous, with finer and closer spirals on the whorls.

*Ennea stauroma* \*, sp. n. (Pl. VI. fig. 4.)

*E. testa* subrimata, ovato-oblonga, lævigata, nitida; anfractibus, apicali incluso, 8, omnibus pellucidis, perlævibus, vitreis; apertura rotunda; peristomate incrassato, nitente, albido, plicis dentibusve complicatis fortiter munito: plica parietali crassa, labiali magnopere intrante, 3- vel 4-partita, devia, dente basali minore, squaroso, plica columellari omnino interna, tridentata, magna, aperturam semiclaudente.

Alt. 6, diam. 3 mm.

*Hab.* Melmoth, Zululand, at 3000 feet, with "no water near the spot" (*Miss Hickey*).

Several examples of a pellucid, very smooth and shining *Ennea*, eight-whorled, oval or oval-oblong in form, with very complicated peristomatal processes, the most peculiar being the thrice or four times divided labial tooth or plait, proceeding deeply within, and irregularly serrulate. The moderately-sized basal tooth is squarely oblong, the columellar process wholly internal, half closing the orifice below.

We take as the type the ovate form. One specimen is decidedly oblong, in all other respects similar.

*Ennea vallaris* †, sp. n. (Pl. VI. fig. 5.)

*E. testa* breviter cylindrica, crassa, parva, solidula; anfractibus 8, apice ipso obtusissimo, cæteris arcuissime obliquicostulatis; apertura subrotunda; peristomate albo, nitido, crassiusculo,

\* *σταύρωμα*, a palisade, from the oral processes.

† *Vallis*, belonging to a fortification or rampart.

plicis dentibusve 5 prædito: plica parietali acinaciformi, intrante, plicis duabus labialibus, extus dentiformibus, longe intrantibus, dento basali simplicie, acuto, parvo, plica columellari mammariformi, profunda, aperturam fere claudente.

Alt. 4, diam. 1.5 mm.

*Hab.* Melmoth, Zululand (*Miss Hickey*).

Four examples, all precisely similar, of a small peculiarly incrassate species, something like *E. crassidens*, Pfr., and other members of that alliance in miniature. The peristomatal processes are very marked, almost between them closing the roundish aperture.

*Ennea xysila* \*, sp. n. (Pl. VI. figs. 6, 6 a.)

*E. testa* recta, cylindrica, variabili, parum rimata, nunc majore, solida, albo-cinerea, longitudinaliter indistincte et oblique crassicostrata, nunc (var. *hyalina*) lævi, pellucente, nitida; anfractibus 7-9, quorum apicales obtusissimi, subplanati, cæteris rectis; apertura ovata vel ovato-rotunda; peristomate nitido, albo, incrassato, dentibus plicisve quinque instructo: plica parietali acuta, longe intrante, dentibus duobus labialibus, quorum superior bifidus, dente basali conspicuo, acuto, plica columellari omnino interna, magna, mamillata.

Long. 5, lat. 2 mm. (sp. min., var. *hyalina*).

„ 8, „ 3 „ (sp. maj.).

*Hab.* Johannesburg, Transvaal (*Johnson, McBean*); Pretoria (*McBean*).

A variable species, the smaller, very smooth, shining, transparent form (var. *hyalina*) offering considerable contrast to the large, more coarsely longitudinally striate shell which attains the maximum development as given above, and was collected by Mr. Johnson.

The mouth-processes in both are virtually identical. With the larger form *E. vanstaadensis*, M. & P., is comparable, as also are *E. instabilis* and *ampullosa*, Stur. (= *obovata*, Pir. ?), but our species differs in the more cylindrical contour and bolder disposition of peristomatal plaits. Another marked characteristic in *E. xysila* is the bifurcation of the upper labial tooth.

Our best thanks are due to Mr. Henry C. Burnup for having devoted much time to the elucidation of this very interesting but variable species.

*Ennea zelota* †, sp. n. (Pl. VI. fig. 7.)

*E. testa* ovato-oblonga, politissima, obtecte rimata, apud apicem

\* ξύσιλος, smoothish.

† ζηλωτός, enviable.

obtusa, albo-hyalina, vel pallide straminea; anfractibus 8, parum ventricosis, levissimis, striis longitudinalibus fere evanidis, non nisi apud basin (vel, in uno specimine, obscurissime juxta suturas); apertura ovata; peristomate albo, nitido, sex plicis dentibusve instructo: plica parietali conspicua, dente ad sinistram minuto addito, dentibus labialibus duobus, inferiore forti, bifido, superiore minuto, dente basali bene definito, columellari magna, haud profunde intrante.

Long. 5, lat. 2 mm.

*Hab.* Port Shepstone (*Burnup*).

A remarkable *Eumea*, without a near ally in the disposition of its very elaborate peristomatal processes. The shell is smooth, shining, oblong-ovate, remarkably obtuse, with only occasional faint signs of striation; there exists a small parietal tooth near the strong deep-seated plait; the labial teeth are two in number, the lower being very well defined and bifid; the basal and columellar teeth are likewise conspicuous.

*Natalina arguta* \*, sp. n. (Pl. VI. fig. 8.)

*N.* testa profunde umbilicata, late rufo-brunnea, depresso-orbiculari, undique arcte longitudinaliter striata, apud basin nitidior; anfractibus ad 5, ventricosulis, ultimo magno; apertura rotundo-lunari; peristomate, præcipue apud regionem columellarem, paullum reflexo.

Alt. 14, diam. 21 mm.

*Hab.* East London (*Burnup*).

Allied to *N. Trimeni*, M. & P., that species being more globose, of olivaceous rather than rufous-brown hue, not so regularly striate throughout, the base being smoother and far more shining, the umbilicus narrow, and aperture slightly oblique. *N. arguta*, in brief, is a brighter-coloured and handsomer form in every way.

*Natalina insignis*, sp. n. (Pl. VI. fig. 9.)

*N.* testa magna, depresso-globosa, profunde sed anguste umbilicata, sordide olivacea; anfractibus ad 5, convexiusculis, longitudinaliter rudi-striatis, striis irregularibus, subtus apud basin nitidam fere evanidis; apertura rotundo-lunari; peristomate apud marginem paullum incrassato, ad umbilicum triangulatim reflexo.

Alt. 23, diam. 30 mm. (sp. maj.).

*Hab.* Teafontein, Grahamstown.

May be compared with *N. eumacta*, M. & P., a more

\* *Argutus*, clear, distinct.

globular species, and *Rhytida Kraussii*, Pfr.\* We have only as yet seen two examples of this interesting mollusk, the first being in the British Museum (Natural History). This is taken as the type.

*Helicarion asthenes* †, sp. n. (Pl. VI. fig. 10.)

*H.* testa ampla, suborbiculari, læte olivacea, vel rufescenti-cornea, tenui; spira depresso-conica, tenui; anfractibus 5, ultimo rapide accrescente, magno, superficie undique sericea, paullum nitida (præcipuo ad basin in statu juvenili); apertura lata, ovali; peristomate tenuissimo.

Alt. 13, diam. 21 mm.

*Hab.* Cradock (*J. Farquhar*).

A brightly coloured shell, of a yellowish or rufous olive, somewhat depressed, thin, effuse; surface entirely silky, shining only in young examples basally. In size approximating *H. fuscicolor*, M. & P., which is only four-whorled, with slightly iridescent epidermis, and of a peculiar warm sepia coloration.

*Trachycystis paula*, sp. n. (Pl. VI. fig. 11.)

*T.* testa minuta, umbilicata, depresso-globosa, cornea, tenui; anfractibus 4, ventricosis, undique longitudinaliter sparsim lirato-plicatis, liris irregularibus, rarius arctis, hic illic rugulosis, obliquis; apertura rotunda; peristomate tenui, apud umbilicum triangulatim reflexo.

Alt. 1, diam. 1.75 mm.

*Hab.* Johannesburg (*J. McBean*).

Very small, with narrow but deep umbilicus, depressedly globose, four-whorled, the plaited liræ being irregular, obliquely disposed, sometimes wrinkled, and rarely close-set. A few specimens. It seems comparable with *T. somersetensis*, M. & P. †, both of these species being only provisionally located in the genus *Trachycystis*.

*Trachycystis rotula*, sp. n. (Pl. VI. figs. 12, 12 a.)

*T.* testa minuta, depressa, profundissime umbilicata, cornea, delicata, tenui, interne circa basin concentricè sulcata; anfractibus 5-6,

\* The opportunity may be taken to mention that further comparison of *Dorcasia inhluzana*, M. & P. (Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 91, pl. i. fig. 4; 1895, vol. xv. pl. xii. figs. 6, 6 a), with *Rhytida Kraussii*, Pfr., convinces us they must, if not varieties of each other, be placed in the same genus.

† ἀσθενής, from its fragility.

‡ Ann. & Mag. Nat. Hist. vol. xi. (1893) p. 19, pl. iii. fig. 2.

angustis, ventricosulis, apud suturas multum impressis, undique sub lente arcissime liratis, liris tenuibus; apertura lunari, peristomate tenui.

Alt. 75, diam. 1.5 mm.

*Hab.* Fern Kloof, Grahamstown (*J. Farquhar*).

Another exceedingly minute species, with deep perspective umbilicus. With the aid of a lens the whole surface, which is horny and subpellucid, is seen to be very closely lirato-striate. There is a single broadish spiral groove present, running through the centre of the body-whorl, but not quite extending to the orifice, this being an unusual character, and one which we have not before met with in any other South-African Helicoid. A few examples only.

*Trachycystis spissicosta* \*, sp. n. (Pl. VI. fig. 13.)

*T.* testa parva, depresso-globosa, umbilicata, tenui, subpellucida, cornea; anfractibus 4, ad suturas multum impressis, apice ipso lævi, aliter undique arcissime longitudinaliter tenuiliratis; apertura rotundo-lunari, peristomate tenuissimo.

Alt. 4, diam. 6.5 mm.

*Hab.* Near the racecourse, Grahamstown (*J. Farquhar*).

A pretty species, of the same alliance as *T. biscalpta*, Bens., *bathyæle* and *epetrima*, M. & P., &c., very strongly costulate, thin, horny, globosely depressed in form, and narrowly but deeply umbilicate.

? *Phasis sollers* †, sp. n. (Pl. VI. fig. 14.)

*Ph.* testa anguste umbilicata, tenui, delicata, pallide straminea, globoso-conica; anfractibus 5, apud suturas impressis, undique, præcipue superne, irregulariter et oblique plicato-liratulis, superficie omni, præcipue ad basin lævigatam, spiraliter tenuissime sub lente sericeo-striata, ultimo ad peripheriam angulato; apertura late lunari; peristomate tenui, marginem apud columellarem, supra umbilicum, triangulatim reflexo.

Alt. 4.5, diam. 7 mm.

*Hab.* Melmoth, Zululand (*Miss Hickey*).

A very few examples only have yet been received of a little Helicoid with a certain resemblance to *Phasis capensis*, Pfr., but entirely differing in texture, as seen by the above description. The spiral, silky, close striation is only visible with a powerful lens. We are not quite sure of its right generic location, but provisionally place it in *Phasis*.

\* *Spissus, costa*, with close-set ribs.

† *Sollers*, adroit, expert.

*Euonyma platyacme*, sp. n. (Pl. VI. fig. 15.)

*E. testa* elongata, imperforata, albida, epidermide olivacea contacta, haud nitente, tenui; anfractibus 12, quorum apicales duo obtusi, clavulati, parvi, tres superni his proximi recti, angusti, cæteris leniter accrescentibus, undique irregulariter oblique rudi-plicatis, ultimo et penultimo fere rectis; apertura ovata; peristomato tenuissimo.

Alt. 38, diam. 11 mm. (sp. maj.).

*Hab.* Kei Road Bush (*Miss Hickey*, May 1906).

Semi-fossilized specimens, with but scant remains of epidermis, have as yet come to hand, and though in the opinion of the discoverer it may be an "extinct species" (*Miss Hickey, in litt.*), we consider the evidence of the fragmentary epidermis militates against this theory. The gradually increasing whorls, club-shaped apex, and absence of any umbilical perforation characterize this species, which differs considerably from any form hitherto known from the South-African region. We place it in the genus *Euonyma*, recently monographed\* by Pilsbry, who has included in it not only the original sinistral type (*E. laocochlis*, M. & P.), but likewise "*Bulimus*" *turriformis*, Krauss, and its allies. Compared with its nearest ally, *E. lanceolata* (Pfr.), the proportionate size of the last whorl is striking. This last species is, so far as is yet known, confined to Natal.

## EXPLANATION OF PLATE VI.

- Fig.* 1. *Ennea Alicia*.  
*Fig.* 2. — *johannesburgensis*.  
*Fig.* 3. — *phragma*.  
*Fig.* 4. — *staurema*.  
*Fig.* 5. — *vallis*.  
*Fig.* 6. — *xysila*.  
*Fig.* 6a. — —, var. *hyalina*.  
*Fig.* 7. — *zelota*.  
*Fig.* 8. *Natalina arguta*.  
*Fig.* 9. — *insignis*.  
*Fig.* 10. *Helicarion asthenes*.  
*Fig.* 11. *Trachycystis paula*.  
*Fig.* 12. — *rotula*.  
*Fig.* 13. — *spissicosta*.  
*Fig.* 14. ? *Phasis sollers*.  
*Fig.* 15. *Euonyma platyacme*.

\* *Man. Conch., Pulmonata*, vol. xviii. p. 38.

IX.—*On Three Mollusk-infesting Trematodes.* By MARIE V. LEBOUR, B.Sc., Armstrong College, Newcastle-upon-Tyne.

[Plates VII. & VIII.]

MUDDY and sandy flats which are left uncovered by the tide for several hours of the day and are the haunts of numerous sea-birds are specially good ground for larval Trematodes and the mollusks and other invertebrates which harbour these worms. Fenham Flats, the land between Holy Island and the mainland of Northumberland, is one of these good localities, and the shore of Loch Ryan, at Stranraer, in Galloway, is another. Numerous Trematodes are to be found in both places, three of which seem to be specially worthy of attention and are here described.

The greater part of the flats near Holy Island is uncovered for several hours each day, but the Mussel Scaup, which lies to the south-west, remains almost completely covered except at spring-tides. Here the ground is more gravelly and many mollusks abound. Cockles are fairly numerous, but perhaps the commonest shell is the little white whelk *Purpura lapillus*, which preys continually on the mussels and is found in clusters all over the scaup. It is, however, a very small form.

The shores of Loch Ryan at Stranraer are chiefly made up of muddy sand, with large stones strewn about, and the tide leaves a long stretch of ground uncovered for several hours each day. The usual common mollusks are found, *Purpura lapillus* being particularly large and fine.

The Trematodes to which I should like to draw attention are all species of *Distomum*. The first infests the cockle, *Cardium edule*, and was noticed some time ago in one cockle out of many examined from Budle Bay, Northumberland, and was imperfectly described and figured by me ('Northumberland Fisheries Report' for 1905, p. 100, pl. ii. fig. 3).

Mr. James Johnstone, of the Liverpool Fisheries Laboratory, sent me another specimen of the cockle infested with this parasite from Ycoman Wharf, Morecambe Bay, and kindly allows me to use his drawing of the living sporocysts (Pl. VII. A). In October 1906 I again found this Trematode in a cockle from the Mussel Scaup, Holy Island, and am now able to describe it more in detail. The visceral mass of the cockle, which is whitish and unhealthy-looking, is almost completely riddled with sporocysts, especially where the

gonad usually is, but that organ is quite obliterated. The liver is more or less infected, in the Holy Island specimen hardly at all. Each sporocyst is about 0.6 mm. long and 0.15 mm. broad. It is colourless, transparent, and some are very contractile, assuming all kinds of shapes, while others are inert and move little. Inside the sporocysts are small granules and large opaque round masses from two to twelve in number, which, on closer examination, are seen to be encysted cercariae. More or less developed tailed cercariae are also sometimes to be seen in the sporocysts along with the encysted forms. They are very contractile and are constantly shifting their position inside the sporocyst, the tail moving incessantly. The cercaria sheds its tail before encysting, and in several sporocysts tails were to be seen moving quickly round the encysted worms when only these latter were present in the sporocysts. The free tails were excessively active. The cyst is about 0.14 mm. across and is very thin. The enclosed cercaria is seen to be covered with short spines and has two suckers, both usually visible when the worm is curled up in the cyst. When pressed out from the cyst it is about 0.19 mm. long (see Pl. VII. B), the spines covering it are conspicuous and form circular rows round the anterior sucker and all over the body. The anterior sucker is large (0.04 mm. across), and leads by a short oesophagus to a thick-lipped pharynx (which, however, often appears to be continuous with the sucker owing to the contracting of the animal). The pharynx leads to the intestine, which almost immediately bifurcates into two lobes, reaching nearly to the posterior end. The small ventral sucker is slightly posterior to the centre of the body. There is a large clear excretory sac opening posteriorly, but excretory canals could not be distinctly made out. The tailed cercaria (see Pl. VII. C) is much the same, but the spines had not appeared in those I saw and the intestine did not branch so soon, probably because the worm was stretching itself more than the encysted form. Two ducts each side of the anterior sucker can be indistinctly seen, probably coming from the glands which serve for the secretion of the material for the cyst, as they disappear in the later stages, after the worm has encysted. The intestine is very indistinct, owing to the opacity of the animal, and can only be completely seen by staining.

The less-developed cercariae in the sporocysts are small, granular, oval masses, then a trace of a tail appears, after that the clear excretory sac is seen, then the anterior sucker, and later the posterior sucker. The cercaria may be half the

size of the encysted form and possess both suckers, pharynx, excretory sac, and tail.

It is remarkable that the cercaria should possess a tail when it encysts in the sporocyst, as the organ must be quite useless. The encysting within the sporocyst is not usual, but Filippi states that the Trematode which he describes as *Cercaria echinatoïdes* encysts in the same *Paludina* in which it was developed from rediæ without quitting that mollusk, and it has a tail which it throws off before encysting (Ann. des Sci. Nat. 4<sup>e</sup> sér., Zool. 1854, p. 255).

The above-mentioned Trematode from the cockle is not common—one infested specimen occurring from Budle Bay in March 1905 out of two hundred examined, one found by Mr. James Johnstone from Morecambe Bay in April 1906, and one out of one hundred examined from Holy Island in October 1906. In the two first-mentioned specimens found in March and April no tailed cercariæ were seen. They were found only in the cockle from Holy Island in October. Possibly examination of many cockles in the summer months may show us younger stages of the worm.

The second Trematode to be described is from the common shell, *Purpura lapillus*, from Holy Island and also on the shores of Loch Ryan to the west of Stranraer. Two hundred and eight specimens from the Mussel Scaup, Holy Island, were examined in October 1906, and the liver in two of these was found to be infested by a Trematode. At Stranraer at the beginning of September 1906 it occurred more abundantly, five specimens out of thirteen containing it. The liver in healthy specimens of *Purpura lapillus* is a bright yellow, but when this parasite is present it is a yellowish white and is full of long and not very active rediæ, which are transparent and colourless, with the exception of the sac-like intestine, which is coloured yellow from granules of food-material (Pl. VIII. B). Each redia is about 1.8 mm. long, with a conspicuous pharynx and intestine, and is full of rather opaque cercariæ in various stages of development. The cercaria (see Pl. VIII. A) is tailed, and when full-grown is about 0.45 mm. in length without its tail, which is about two thirds the length of the body. The head-region is more transparent than the rest of the body, and is separated from it by a slight constriction; the body is coarsely granular and opaque and is covered (but only in fully developed specimens) with blunt spines. The tail is blunt, not so opaque as the body, and, as usual, comes off at the slightest touch. A large anterior sucker leads into a short œsophagus, which is often obscured by contraction, and this leads by a thick-lipped and

conspicuous pharynx to a narrow intestine bifurcating about a third of the way down the body, each lobe reaching nearly to the posterior end. Two clear excretory canals beginning in the head-region run down the sides of the body, and join just before they reach the clear excretory sac opening posteriorly. The ventral sucker, which is larger than the anterior, is placed slightly behind the centre of the body. The cercaria is very contractile, and when moving uses its body more than its tail, shortening and elongating itself continually.

It is an interesting fact that these specially large and fine-looking *Purpura lapillus* from Stranraer are much more frequently infested with this Trematode than the poor undersized specimens from Holy Island. One would imagine that the reason for this is the greater prevalence at Stranraer of the host in which the adult worm lives, in all probability a sea-bird.

The third Trematode is not unlike the second, but is somewhat slimmer in build and has a distinct double row of spines round the head. It occurred in one specimen of the common limpet, *Patella vulgata*, out of sixteen examined from the shores of Loch Ryan, east of Stranraer, in September 1906, completely obliterating the gonad and riddling the liver. The worm occurred as long narrow rediæ about 1·8 mm. long, transparent and colourless (see Pl. VIII. D). A pharynx can be distinctly seen, but I could make out no enteron in any of the specimens. Tailed cercariæ fill the rediæ and move about inside them, contracting and elongating in much the same way as those from *Purpura lapillus*. The blunt tail is less than half the length of the animal (see Pl. VIII. C). The cercaria is about 0·50 mm. long without the tail; its head is transparent, surrounded by a collar of two rows of fine spines, and is constricted off slightly from the rest of the body, which is coarsely granular and opaque, and in fully developed specimens covered with short blunt spines. A large anterior sucker leads to a narrow œsophagus, which leads by a small pharynx to a narrow intestine running down for about two fifths of the length of the body before it branches into two lobes nearly reaching to the posterior end. Two very granular excretory canals begin in the head-region, run down the sides of the body, and pass into a clear excretory sac opening posteriorly. A large ventral sucker occurs behind the centre of the body. This worm seems to be an *Echinostomum*, and the last species was so like this that one would expect it to belong to the same subgenus; but no spines were seen on the head.

I think these three larval Trematodes are new to our fauna; no other stages in their life-history have yet been found.

#### EXPLANATION OF THE PLATES.

##### PLATE VII.

Trematode from *Cardium edule*.

- A. Sporocysts enclosing cercariæ.
- B. Cercaria pressed out of cyst.
- C. Tailed cercaria.

##### PLATE VIII.

A & B. Trematode from *Purpura lapillus*.

- A. Cercaria.
- B. Redia enclosing cercariæ.

C & D. Trematode from *Patella vulgata*.

- C. Cercaria.
- D. Redia enclosing cercariæ.

X.—*Preliminary Diagnoses of Six new Mysidæ from the West Coast of Ireland.* By W. M. TATTERSALL, B.Sc., Department of Agriculture and Technical Instruction, Fisheries Branch, Dublin.

THE six new forms, of which preliminary descriptions are now offered, were captured off the southern part of the west coast of Ireland in depths ranging from 465 to 800 fathoms, by the S.S. 'Hielga,' the fishery cruiser of the Department of Agriculture for Ireland. These depths have been but rarely reached by the bottom-fishing apparatus of the 'Hielga,' and the fact that thus early in their exploration six new species of Mysidæ have been brought to light suggests the existence of a fauna rich in undescribed forms.

All six species belong to the subfamily *Leptomysinae*\* of the Mysidæ. Two are types of new and interesting genera, while the other four belong to two recently defined deep-water genera characterized by the imperfectly developed eyes possibly modified for tactile functions.

##### GENUS METAMBLYOPS, NOV.

Characters generally as in *Amblyops*, G. O. Sars, except:—

*Carapace* produced in front into a well-developed, rather long and acute rostrum.

\* I cannot agree with Norman's recent proposal to raise his sub-families to family rank (*cf.* Norman and Scott, 'Crustacea of Devon and Cornwall,' London, 1906).

*Eyes* well developed, normal in appearance and structure, pigment light reddish brown.

*Telson* entire, lanceiform in shape, its margin armed with more or fewer spines, median setae absent.

*Inner uropod* with a few spines on its inner margin in the region of the otoeyst.

Female with only two pairs of incubatory lamellae.

Type species, *Metamblyops oculata*.

The genus *Chalcophthalmus*, Illig, 1906, would appear to be rather closely allied to the present one, but judging from Illig's figures *Metamblyops* is a more compact and robust form, the carapace covers all the thoracic segments, the eye is much larger and its papilla quite minute, and the antennal scale comparatively much longer. The chief distinction lies in the structure of the first thoracic limbs, which in *Chalcophthalmus* are described as being devoid of endopods, while in *Metamblyops* both endopod and exopod are fully and normally developed.

*Metamblyops oculata*, sp. n.

*Carapace* covering all the thoracic segments; produced in front into a slightly upturned, acute rostrum reaching as far as, or a little beyond, the eyes, and partially covering the eye-stalks; terminal angle about  $60^\circ$ , its apex produced into a short acute point; evenly rounded at the antero-lateral corners and slightly emarginate behind.

*Pleon* longer than carapace; the first segment one and a half times as long as the second, which is subequal to the third and fourth; fifth segment slightly longer than the fourth; sixth segment twice as long as the fifth.

*Eyes* large, well developed and normal in structure; extending to the distal margin of the first joint of the antennular peduncle; pigmented portion equal in width to the last pleon-segment, a minute papilla on the inner distal part of the peduncle where it joins the cornea; visual elements well developed; pigment light reddish brown.

*Antennular peduncle* about twice as long as the eye; third joint a little shorter, but considerably stouter than the first and more robust in the male than in the female; second joint small; male appendage well developed and densely hirsute, but otherwise of normal appearance.

*Antennal peduncle* short, not extending beyond the distal end of the second joint of the antennular peduncle and composed of three subequal quadrangular joints.

*Antennal scale* about one-third as long again as the anten-

nular peduncle and twice as long as the antennal; about three and a half times as long as broad; outer margin entire and terminating in a strong spine, beyond which the apex of the scale is not produced; spine on the outer distal margin of the basal joint quite short.

*Mouth-parts* not exhibiting any striking points of difference from those of *Amblyops abbreviata*, except that the second joint of the mandibular palp is considerably broader.

*First thoracic limb* with the endopod almost exactly as in *Amblyops abbreviata*.

*Second thoracic limb* with the endopod of the same form as in *A. abbreviata*, but comparatively much longer; twice as long as that of the first thoracic limb and longer than its own exopod.

*Remaining thoracic limbs* rather long and slender, with the tarsus longer than the merus and composed of three joints, the third joint longer than the second; dactylus well developed.

*Exopods* of all thoracic limbs having the basal joint lamelliform with a small spine at the outer distal corner; flagelliform part composed of nine to ten joints.

*Incubatory lamellæ* of the female, two pairs.

*Pleopods in the male* agreeing essentially with those of the males of the genus *Amblyops*.

*Telson* not quite so long as the last segment of the pleon and twice as long as broad at its base, where the margins are slightly expanded; entire and lanciform in shape, tapering distally to a narrowly rounded apex; the distal two thirds of its margins armed with from twenty-eight to thirty-two spines increasing in length towards the apex; terminal spine about one sixteenth of the length of the telson; median setæ absent from the apex.

*Cropods* slender: inner, about one and a half times as long as the telson, with six spines on its internal margin in the region of the otcyst; outer, about twice the length of the telson.

*Length* of the largest female 16 mm., of the largest male 15 mm. Female with about twenty young in the marsupium.

*Locality.* Fourteen females and thirteen males from S.R. 352, 92 miles S.W. by W. of Bull Rock, Co. Kerry, lat.  $50^{\circ} 22' N.$ , long.  $11^{\circ} 40' W.$ , 800 fath., August 1906, Petersen trawl at 750-800 fath.

The external appearance of this species with its large well-developed eyes and long acute rostrum at first suggests a species of *Boreomysis*, such as *B. arctica*, but the details of

the various appendages, the number of incubatory lamellæ in the female, and the form of the telson and uropods clearly indicate its position in the Leptomysinæ, among the numerous genera of which *Amblyops* seems to be its nearest relative. The characters of the rostrum, eye, antennal scale, and telson combined abundantly distinguish it from all other genera in the subfamily.

Genus DACTYLERYTHROPS, Holt & Tattersall, 1905.

Non *Dactylerythroops*, Illig, 1906.

This genus when first described was compared with *Metythroops*, S. I. Smith. The discovery of two further species and of the closely allied genus *Dactylamblyops*, H. & T., indicates that it is perhaps more nearly related to the genus *Amblyops*, G. O. Sars, and it may thus be more accurately redefined in the light of this new material as follows:— Characters generally as in the genus *Amblyops*, G. O. Sars, except:—

*Eyes* small; not exhibiting any definite eye stalk, but joined at their bases by a membranous integument; visual elements imperfectly developed, not reaching to the surface of the eye, but rather deeply seated in its tissues; outer distal corner produced into a rather long digitiform flexible process.

*Telson* entire, rather small, subtriangular or lanceolate in shape, lateral margins armed distally with more or fewer spines, median apical pair of setæ present or absent.

*Incubatory lamellæ* in the female, two pairs.

Type species, *Dactylerythroops dactylops*, H. & T.

*Dactylerythroops orcuata*, Illig, should more properly be referred to the genus *Dactylamblyops*.

*Dactylerythroops bidigitata*, sp. n.

*Carapace* covering all the thoracic segments; cervical sulcus well marked; produced in front into a broadly rounded obtuse rostrum which reaches to about the centre of the eyes; antero-lateral corners rounded; emarginate on its posterior border.

*Pleon* longer than the carapace; the first segment one and a half times as long as the second, which is subequal to the third and fourth; fifth segment slightly longer than the fourth, sixth segment twice as long as the fifth.

*Eyes* small with their basal parts covered by the rostrum; as far as can be seen, joined to each other at the base by a

membranous integument such as is described for *D. dactylops*; the outer distal corner produced into a rather long digitate and flexible process; a shorter and firmer process on the inner and upper face of the eye, which a raised ridge connects to the main parts of the eye, so that the whole organ is triangular in cross-section and not flat; visual elements much more numerous than in *D. dactylops*, confined to a triangular area on the outer part of the eye at the base of the outer process; pigment confined to the visual elements, pale purplish pink in freshly preserved specimens.

*Antennular peduncle* rather short, with the third joint a little longer and very much stouter than the first and more swollen in the male than in the female; second joint small; male appendage well developed, but only slightly hirsute, as the specimen is still immature.

*Antennal peduncle* shorter than the antennular and having the second joint slightly larger than the subequal first and third joints.

*Antennal scale* almost twice the length of the antennular peduncle; about four to four and a half times as long as broad; outer margin entire and ending in a strong spine, beyond which the apex of the scale is not produced; no spine on the basal joint.

*Mouth-parts* fundamentally as in the genus *Amblyops*.

*First and second thoracic limbs* likewise agreeing with those of the genus *Amblyops*, except that the second limb is comparatively longer.

*Remaining thoracic limbs* broken away.

*Exopods* of all the thoracic limbs with the outer distal corner of the basal joint slightly acuminate; flagelliform part well developed and composed of about seventeen joints.

*Incubatory lamellæ* of the female, two pairs.

*Pleopods* in the only male, which is immature, have the inner branch of the first pair already more developed than in *D. dactylops* and armed with many more setæ; otherwise they conform to the *Amblyops* type.

*Telson* comparatively short; about two thirds (slightly less) of the length of the last segment of the pleon; sub-triangular in shape; one and a half times as long as broad at its base; margins tapering evenly to a bluntly rounded apex; the distal third of its margins armed on each side with ten rather stout spines increasing slightly in length towards the apex; a pair of median plumose setæ situated at the apex between the terminal spines of the margins.

*Uropods* moderately slender: inner, one and two-thirds of

the length of the telson, apparently without spines on its inner margin; outer, twice the length of the telson.

*Length* of a mature female 16 mm., of an immature female 14 mm., and of an immature male 15 mm.

*Locality.* Two females and one male from S.R. 352, 92 miles S.W. by W. of Bull Rock, Co. Kerry, lat.  $50^{\circ} 22' N.$ , long.  $11^{\circ} 40' W.$ , 800 fath., August 1906, Petersen trawl at 750-800 fath.

This species while obviously congeneric with *D. dactylops* is abundantly distinguished from it by the better developed rostrum, the two processes of the eye, the longer antennal scale, and the greater number of spines arming the margins of the telson.

*Dactylerythrops gracilura*, sp. n.

*Carapace* covering all the thoracic segments; broadly and evenly rounded in front, without any trace of a rostral projection; antero-lateral corners rounded; emarginate on its posterior border.

*Pleon* a little longer than the carapace; first segment a little shorter than the second, which is subequal to the third and fourth; fifth segment slightly longer than the fourth; sixth segment one and a half times as long as the fifth.

*Eyes* very small, almost entirely covered by the carapace; very thin and membranous; united at their bases by a membranous integument; outer distal corners produced into a very acute fairly long flexible process; a shorter and less acute process on the inner corner; visual elements very imperfectly developed, confined to a small deeply-seated mass at the base of the outer process; no pigment observed in preserved specimens.

*Antennular peduncle* rather short; about half as long as the antennal scale; basal joint flattened and broader than the other two; second joint small; third joint the longest, moderately stoutly built, produced ventrally between the bases of the two flagella into a short process armed with about six strong setæ; the whole appendage in lateral view appears curiously contorted.

*Antennal peduncle* slightly shorter than the antennular peduncle and likewise slightly contorted in lateral view; rather stout; second joint the largest.

*Antennal scale* almost twice as long as the antennular peduncle; from two and a half to three times as long as broad; outer margin entire, terminating in a strong spine, beyond which the apex of the scale is produced for a length

equal to about one-eighth of the total length of the scale; no spine on the basal joint.

*Mouth-parts and first and second thoracic limbs* not differing in any important point from those of the last species.

*Remaining thoracic limbs* with the tarsus equal to the merus, three-jointed, the first joint the longest; nail well developed, but shorter than the last joint of the tarsus.

*Exopods* of all the thoracic limbs with the outer distal corner of the basal joint slightly acuminate; flagelliform part of ten joints.

*Incubatory lamellæ* of the female, two pairs.

*Telson* diverging somewhat from the type met with in *D. dactylops* and *D. bidigitata*, and shaped almost exactly as in the genus *Meterythrops*; equal in length to the last segment of the pleon and twice as long as broad at its base where the margins are somewhat inflated; margins rapidly converging to a very narrow truncate apex armed with two spines set close together and equal in length to one twelfth of the length of the telson; median setæ absent from the apex; distal half of the lateral margins armed with about nineteen short spines.

*Uropods* slender: inner, about one and a half times as long as the telson, without spines on its inner ventral margin; outer, nearly twice as long as the telson.

*Length* of a mature female 15 mm.

*Locality.* Four females from S.R. 352, 92 miles S.W. by W. of Bull Rock, Co. Kerry, lat.  $50^{\circ} 22' N.$ , long.  $11^{\circ} 40' W.$ , 800 fath., August 1906, Petersen trawl at 750–800 fath.

This form diverges somewhat from the other two species of the genus in the shape of the telson, which in its narrowly lanceolate form and want of apical setæ approaches that of members of the next genus. The eyes, however, conform to the general type of *Dactylerythrops*, and to that genus the species is provisionally referred. The eyes are rather remarkable and enable the species to be readily distinguished; they are almost entirely covered by the carapace, only the two digitate processes projecting beyond the latter.

#### GENUS DACTYLAMBLYOPS, Holt & Tattersall, 1906.

Syn. *Dactylerythrops*, Illig, 1906.

This genus is undeniably very closely allied to the preceding one, but may be distinguished by the following characters:—

*Eye* small, with distinct and definite eye-stalks; more or less pyriform in shape; visual elements, though imperfectly

formed, are better developed and more numerous than in *Dactylerythrops*, reaching to the surface of the eye and probably directly functional as organs of sight; outer distal corner rounded and not produced into a digitiform process; a short process always present on the inner and upper surface.

Type species, *Dactylamblyops Hodgsoni*, H. & T.

The type and the two new species described below appear to form a natural group chiefly distinguished from the genus *Dactylerythrops* by the above points, and in the present state of our knowledge of the group this generic division may well be allowed to stand.

*Dactylerythrops arcuata*, Illig, should be referred to this genus, and is, in fact, synonymous with the type species, *D. Hodgsoni*.

*Dactylamblyops thaumatops*, sp. n.

*Carapace* covering all the thoracic segments except the last; produced in front into a short, broadly rounded, obtuse rostrum, which extends to the distal end of the first joint of the antennular peduncle and partially covers the eye-stalks; evenly rounded at the antero-lateral corners and emarginate behind; cervical sulcus well marked.

*Pleon* longer than the carapace; the first segment a little longer than the second, which is subequal to the third, fourth, and fifth; sixth segment twice as long as the fifth.

*Eyes* small, extending forwards to the distal end of the second joint of the antennular peduncle; pyriform in shape, with distinct eye-stalks; each eye with a short digitiform process on the inner and upper face; a broad membranous ledge projecting at right angles to the surface of the cornea starts at the outer lateral part of the eye-stalk and runs equatorially round the outer part of the eye, terminating just ventral to the digitiform process and dividing the cornea into a dorsal and ventral portion; the ledge is broadest about the centre of the cornea and narrows off at either end; visual elements imperfectly developed, numerous, reaching to the surface of the eye; pigment pale purplish pink.

*Antennular peduncle* about twice as long as the eye and three quarters of the length of the antennal scale; third joint slightly longer than the first; second joint small.

*Antennal peduncle* about half as long as the scale; the three joints roughly subequal in length.

*Antennal scale* about one third as long again as the antennular peduncle and twice as long as the antennal; about four times as long as broad; outer margin entire and

terminating in a spine, beyond which the apex of the scale is not produced; spine on the outer distal corner of the basal joint obsolete.

*Mouth-parts and first and second thoracic limbs* not differing in any striking way from those of the type species.

*Remaining thoracic limbs* missing.

*Exopods* of all the thoracic limbs with the outer distal corner of the basal joint slightly acuminate and the flagelliform part composed of ten joints.

*Incubatory lamellæ* of the female, two pairs.

*Telson* not quite so long as the last segment of the pleon and once and two thirds as long and broad at its base, where the margins are somewhat expanded; entire and lanciform in shape, tapering distally to a narrowly rounded apex; distal two thirds of its margins armed with about twenty-four short spines, increasing in length towards the apex; median apical setæ absent.

*Uropods* moderately slender: inner, about one and a half times as long as the telson, otocyst rather large, with apparently no spines on its inner margin; outer, broken in both specimens.

*Length* of both specimens (immature females) 11 mm.

*Locality.* Two immature females from S.R. 352, 92 miles S.W. of Bull Rock, Co. Kerry, lat.  $50^{\circ} 22' N.$ , long.  $11^{\circ} 40' W.$ , 800 fath., August 1906, Petersen trawl at 750-800 fath.

This species is readily distinguished by the remarkable structure of the eye, which is one of the most wonderful among the many varied forms met with in Schizopoda. The exact function of the external membranous l'dge is not quite clear. In other characters the species is rather closely allied to the type.

#### *Dactylamblyops goniops*, sp. n.

*Carapace* covering all the thoracic segments except the last, which is fully exposed; evenly rounded in front and not produced into a rostral projection; antero-lateral corners rounded; emarginate behind; cervical sulcus well marked.

*Pleon* longer than the carapace, first segment slightly longer than the second, which is subequal to the third, fourth, and fifth; sixth segment rather long, two and a half times as long as the fifth.

*Eyes* a little larger than in the last species, set close together and rather subquadrangular than pyriform in dorsal outline; the digitiform process on the inner and upper face more slender and a little longer than in either the type or

the last species; visual elements imperfectly developed, numerous; pigment pale purplish pink.

*Antennular peduncle* in the female extending slightly more than halfway up the scale, third joint rather shorter and not wider than the first; in the male relatively a little longer, with the third joint slightly longer and more robust than in the female; male process well developed and hirsute.

*Antennal peduncle* only slightly shorter than the antennular; third joint the longest and most robust.

*Antennal scale* extending for rather less than half its length beyond the antennular peduncle; about three times as long as broad; outer margin slightly sinuate and terminating in a very strong spine which projects for its entire length beyond the apex of the scale; outer distal corner of the basal joint prolonged into a long acute spine.

*Telson* about three quarters of the length of the last segment of the pleon and slightly less than twice as long as broad at its base; entire and lanciform in shape, tapering distally to a narrowly rounded apex; the distal two thirds of its margin armed with about eighteen long slender spines, increasing in length towards the apex; the terminal spines about one seventh of the total length of the telson; a single very slender median spine at the apex between the terminal spines of the margins; median setae absent.

*Uropods* slender: inner, only a little longer than the telson plus the terminal spines and with four long spines on its ventral inner margin in the region of the otcyst; outer, about one and a half times as long as the telson.

*Length* of an adult and mature male and female, 10 mm.

The third to the eighth thoracic limbs are broken off in both specimens. The first and second thoracic limbs and the mouth-parts, as well as the male pleopods, are in substantial agreement with the same parts in both the type and the foregoing species, except that the last joint of the mandibular palp is shorter and somewhat more robust.

*Locality.* An adult male and female from S.R. 359, 56 miles W. by N. of Tearaght, Co. Kerry, 465-492 fath., August 1906, tow-net on trawl.

This species is at once distinguished from its congeners by the characters of the eye, antennal scale, telson, and inner uropods. The sixth pleon-segment is also relatively longer than in either of the other two species. The antennal scale resembles rather closely that figured for *Paramblyops rosstratu*, H. & T., 1905.

## GENUS BATHYMYSIS, nov.

*Carapace* evenly rounded in front, without any trace of rostral projection.

*Eyes* set close together, apparently without definite eye-stalks, somewhat flattened and subquadrangular in shape; visual elements imperfectly developed and unpigmented in preserved specimens.

*Antennal scale* shortly lanceolate in shape, setose all round.

*Mouth-organs and first and second thoracic limbs* as described by Sars for the genus *Leptomysis*, except that the terminal joint of the palp of the second maxilla is expanded at its apex and armed with numerous short stout spines, the whole appendage being generally as figured by Sars for *Schistomysis spiritus*.

*Tarsus* of the remaining thoracic limbs four-jointed; nail long and slender.

*Telson* fairly long; very deeply cleft, the cleft serrated; lateral margins armed throughout their length with spines.

*Inner uropod* with a row of spines all along its inner margin.

*Pleopods* in the male exactly as for the genus *Leptomysis*.

Type species, *Bathymysis Helgæ*.

In the general structure of the appendages of the thorax (with the exception of the second maxillæ), and especially of the pleopods of the male, this genus agrees almost exactly with *Leptomysis*, G. O. Sars. The chief points of difference are to be found in the second maxillæ, telson, and eyes. The first two of these structures are interesting as exhibiting a form met with in many of the genera of the subfamily *Mysinæ*, while the eyes appear to have undergone specialization and reduction along lines very similar to *Amblyops*, the eyes of which they strongly recall, though rather smaller in size. *Bathymysis* also bears considerable resemblance to the genus *Pseudomysis*, G. O. Sars, but the greatly different form of the telson at once distinguishes it.

*Bathymysis Helgæ*, sp. n.

*Carapace* covering all the thoracic segments; evenly rounded in front and at the antero-lateral corners; without trace of rostral projection.

*Pleon* longer than the carapace; the first segment equal in length to the fifth and slightly longer than the subequal

second, third, and fourth segments; sixth one and a half times as long as the fifth.

*Eyes* strongly recalling those of *Amblyops*, rather small, somewhat flattened and subquadrangular in shape, not reaching to the distal end of the first joint of the antennular peduncle; apparently without definite peduncles; set very close together; visual elements imperfectly developed and without pigment in preserved specimens.

*Antennular peduncle* a little shorter than the telson, moderately stout, third joint equal in length to the basal two combined; male appendage well developed and densely hirsute.

*Antennal peduncle* a little shorter than the antennular, slender, the second joint one and a half times as long as the third.

*Antennal scale* equal in length to the telson and a little longer than the antennular peduncle; about four and a half times as long as broad; shortly lanceolate or oval in shape; setose all round; spine on basal joint almost obsolete.

*Mouth-parts and thoracic limbs* as described above in the generic definition. The exopods have the outer corner of the basal joint rounded and the flagelliform part composed of twelve joints.

*Pleopods* of the male as described for *Leptomysis*. The fourth pair have the outer ramus longer than the inner; the last three joints are devoid of setæ; the antepenultimate joint carries a single long and powerful plumose or barbed spine; a similar but much shorter spine is found on the penultimate joint, while the terminal joint has two of these long barbed spines.

*Telson* a little longer than the last segment of the pleon and twice as long as broad at its base; narrowing slightly towards the apex, where its breadth is equal to one third of the total length; cleft very deep and fairly wide, extending for one third of the total length; the apical lobe on each side of the cleft bluntly rounded at its tip; cleft serrated, with about thirty spines on each side; lateral margins armed throughout their entire length with about forty spines, which increase slightly in length towards the apex, but there is no single outstanding long spine at the apex of each lobe as seen in species of *Mysis* and *Schistomysis*.

*Uropods* broken in the specimen; inner one with a row of spines all along its inner ventral margin, thirty-four being counted on that part of the uropod which remained and which extended a little beyond the apex of the telson.

Length of the only specimen (a mature male) 15 mm.

Locality. S.R. 364, lat. 51° 25' N., long. 11° 29' W., to lat. 51° 25' N., long. 11° 36' W., 620-695 fath., August 1906, fine net on trawl.

Two species new to the British and Irish list may also here be noticed, *Hansenomysis Fyllæ* (Hansen) and *Erythropis microphthalmia*, G. O. Sars, having been taken in 400-800 fathoms off the coast of Kerry, in August 1906.

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#### XI.—On further new Mammals obtained by the Ruwenzori Expedition. By OLDFIELD THOMAS.

##### *Sylvisorex Granti*, sp. n.

A medium-sized species, with tail about equal to the head and body.

Size much less than in the other Ruwenzori species, *S. lunaris*, about the same as in the Nyasan *S. sorella*\*. Fur very long; hairs of back over 7 mm. in length. General colour dark slaty grey above, little paler below, but as the only specimen is in spirit, the tones cannot be described with accuracy. Hands and feet pale brown, the digits rather lighter. Tail almost as long as the head and body, finely haired, brown above, rather paler below.

Skull short, broad, and rounded, not unlike that of *S. sorella*, but with a broader flatter brain-case and an even shorter muzzle. Teeth practically as in *S. sorella*, the second and third upper unicuspid rather more nearly subequal.

Dimensions of the type (a spirit-specimen):—

Head and body 55 mm.; tail 54; hind foot 13.1.

Skull: condylo-lasal length 17; breadth across palate 5.3;

\* P. Z. S. 1897, p. 930.

breadth across brain-case 8.9; front of  $i^2$  to back of  $m^1$  6.4; length of lower tooth-row 7.

*Hab.* Ruwenzori East. Alt. 10,000'.

*Type.* Adult male in spirit. B.M. no. 6. 12. 4. 85. Collected 9th April, 1906, by R. E. Dent.

This species is of the intermediate size found in *S. sorella*, being markedly smaller than *S. lunaris* and *morio*, and equally larger than the pigmy *S. Johnstoni*. From *S. sorella* it is at once distinguished by its far shorter tail.

I have had much pleasure in naming this distinct mountain-shrew in honour of my colleague Mr. W. R. Ogilvie-Grant, to whose exertions as originator and manager science is indebted for the remarkable results obtained by the Ruwenzori Expedition of Mr. Woosnam and his companions. No less than twenty new species and subspecies have now been described from their collections, and the specimens registered in the Museum collection amount to over three hundred.

*Mungos* \* *gracilis proteus*, subsp. n.

A very variable form, usually strongly affected by melanism.

In the single wholly non-melanistic specimen the colour throughout, of body, limbs, and tail (apart from the black terminal pencil), is grizzled tawny ochraceous, darkened on the posterior back, the upper surface of the hands and feet terminally rich rufous. From this there is a complete series of intergradations to one in which the body is blackish bistre, the tail even darker, practically black throughout, and the feet deep glossy black. The type is an intermediate specimen, its general colour mummy-brown, but its feet and tail wholly blackish.

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

Head and body 306 mm.; tail 260; hind foot 59; ear 25.

Skull: condylo-basal length 61.

*Hab.* Ruwenzori East. Alt. 7000' (ranging from 5000').

*Type.* Adult female. B.M. no. 6. 12. 4. 35. Original number 115. Collected 13th March, 1906, by R. E. Dent.

This remarkably variable mungoose forms a parallel to the Alpine squirrels, which are commonly affected by melanism in a similar way. Possibly something of the same sort occurs in Abyssinia, where the dark "*mutyigella*" has been considered to be the same species as the true *gracilis*. Elsewhere

\* *Mungos*, E. Geoff. & G. Cuv. Mag. Encycl. ii. pp. 184-187 (1795).

*Herpestes*, Ill. Prodr. Syst., Mamm. p. 135 (1811).

Cf. Palmer, Index Gen. Mamm. 1904.

in Africa forms of the *gracilis* group are very constant in colour.

No members of this group, light or dark, have been described from the Lake region of Central Africa.

*Crossarchus fasciatus macrurus*, subsp. n.

Size larger than in true *fasciatus* and tail markedly longer.

Colour quite as in Zululand specimens of *fasciatus*, the general tone similarly deep and rich, and the shoulders equally shaggy haired and suffused with fulvous (not clear grey). Hands and feet nearly wholly deep glossy black.

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

Head and body 378 mm.; tail 250; hind foot 70; ear 26.

Skull: condylo-basal length 71; basal length 67; zygomatic breadth 38.5; median length of nasals 12.5; palatal length 38; greatest diameter of  $p^4$  6.

*Hab.* Ruwenzori South-east. Alt. 3400'.

*Type.* Male, adult but not old. B.M. no. 6. 12. 4. 29. Original number 133. Collected 30th April, 1906, by R. E. Dent. A second specimen (no. 671), collected the same day by R. B. Woosnam.

Two examples of true *fasciatus*, collected in Zululand by C. H. B. Grant, measure—head and body 333 and 335 mm., tails 207 and 209 mm. respectively. No. 671 of *macrurus* measures—head and body 380, tail 270 mm. There is evidently, therefore, so material a difference in size and in length of tail between the Ruwenzori form and the South-African that subspecific distinction is necessary, in spite of the close resemblance in other characters.

*Sciurus rufobrachiatatus semlikii*, subsp. n.

Most closely allied to *S. r. nyansæ*, Neum.\*, with which it agrees in the extent of the rufous on the limbs, but distinguished by the speckling of the back being very much finer and by its greyer general colour. In *nyansæ* there is a strong suffusion of buffy or fulvous in the dorsal colour, the rings of the longer hairs and the ends of the wool-hairs being markedly tinged with buffy; in *semlikii*, on the other hand, the former are almost white and the latter are dull greyish buffy. As a result the general tone of *semlikii* is a nearly pure dark grey, between grey no. 6 and "smoke-grey" of Ridgway, the middle line of the back only with slight yellowish suffusion.

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

Head and body 225 mm.; tail 251; hind foot 49; ear 16.

\* SB. Ges. nat. Fr. Berl. 1902, p. 56.

*Hab.* Beni, Semliki River. Alt. 3000'.

*Type.* Adult male. B.M. no. 6. 12. 4. 64. Original number 153. Collected 22nd July, 1906, by R. E. Dent.

This handsome squirrel is no doubt nearly allied to *S. r. nyanza*, but in the very fine speckling of the body and its greyer colour shows a relationship to the form found in the Gaboon, to which the name of *S. r. Aubryi*, M.-Edw.\*, is applicable. The latter, however, has not the richly rufous feet characteristic of both the Central-African subspecies.

It may be noted that the Ruwenzori squirrel described by Schwann as a subspecies of *S. rufobrachiatatus* † proves, on the arrival of a good series, to be a quite distinct species, characterized not only by its greenish olivaceous colours, the absence of red on the limbs, and its white ventral line, but by its possession of two upper premolars, *S. rufobrachiatatus* having only one. It should therefore stand as *L. ruwenzorii*.

#### THAMNOMYS, gen. nov. (*Murina*).

Type ‡ *Th. venustus*, sp. n.

In pointing out recently the advisability of generically distinguishing *Micromys* from *Mus* § on account of its possession of the "x" or postero-internal cusp on its first and second upper molars, I mentioned that two African species, hitherto assigned to *Mus*—*M. arborarius* and *rutilans*—possessed the same character; and I now take this occasion to separate them and their allies also from the parent genus, which greatly needs reducing. From *Micromys*, which is entirely Palaearctic, they may be distinguished by being tree- or bush-, instead of terrestrial mice, and by having therefore the usual pencilled tail found in such forms.

The genus *Thamnomys* divides into two sections—the one consisting of Peters's *Mus rutilans* and the new Ruwenzori species *Th. venustus*, which I propose to take as type of the genus; and (2) the less strongly marked group containing *Mus dolichurus*, Smuts, *M. arborarius*, Peters, and their allies.

\* *Sciurus Aubryi*, M.-Edw. Rev. Zool. xix. p. 228 (1867). Stated by Jentink and Trouessart to be based on a young specimen of the *S. rufobrachiatatus* group. Collected by Aubry Le Conte in the Gaboon.

† Ann. & Mag. Nat. Hist. (7) xiii. p. 71 (1904).

‡ *Th. venustus* is selected as the type in order to avoid any possible complication which might arise should our examples of *Mus rutilans*, Peters, prove to be wrongly determined. This course is the more advisable as Peters says of *rutilans*, "Backzähne von gewöhnlichen Proportionen," as though there were nothing special about the dentition.

§ Ann. & Mag. Nat. Hist. (7) xv. p. 492 (1905). See also *op. cit.* (7) xvii. p. 85 (1906).

While the first of these groups unquestionably deserves distinction from *Mus*, the second is more or less intermediate in its tooth-characters; but since it shows a distinct tendency to the true *Thamnomys* type of teeth, and has absolutely the same external characteristics, I think it advisable to refer it to the new genus rather than to leave it in *Mus*.

In the typical *venustus-rutilans* group all the supplementary cusps of the teeth are highly developed, and the  $x$  cusp in particular is a distinct separate cusp almost equalling in size the other internal cusps in front of it, and there are consequently nine well-marked cusps along the inner side of the upper tooth-row.

On the other hand, in the *dolichurus* group the  $x$  cusp is but little developed, and in fact is usually represented by a mere ridge running backwards from the hinder edge of the second internal cusp of  $m^1$  and  $m^2$  and joining the inner side of the median cusp of the hinder lamina of each tooth.

In the lower jaw the postero-external supplementary cusp of  $m_1$  is decidedly larger than in *Mus*, nearly as large in area and at least half as high as the main posterior cusp against which it lies.

Externally, as already noted, the mice of the genus *Thamnomys* are characterized by their terminally pencilled tails, in the same way as the analogous forms *Rhipidomys* and *Æcomys* in S. America. The feet are similarly modified for climbing, with broad rounded sole-pads, and the fifth hind toe reaches nearly to the end of the second phalanx of the fourth, and is therefore nearly as long as the second.

#### *Thamnomys venustus*, sp. n.

Allied to *Th. rutilans*, Peters, but larger and with much longer fur.

Fur of back about 15 mm. in length. General colour above dark rufous (in spirit), a brighter line along the sides; belly white, with a faint buffy suffusion, the basal halves of the hairs slaty. Ears dull greyish. Upper surface of feet buff, becoming whiter on the toes. Tail long, pencilled terminally, uniformly dark brown, as in *Th. rutilans*. Mammæ 0—2=4.

Skull decidedly larger than in *Th. rutilans*; muzzle long, parallel-sided; interorbital region narrow, the edges not so widely expanded as in *rutilans*; palatine foramina long, not expanded mesially, reaching back to the level of the front of  $m^1$ ; bullæ rather larger than in *rutilans*. Molars large, heavy, the series markedly larger than in *rutilans*.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 125 mm.; tail 181; hind foot 25; ear 18.

Skull: greatest length 34.5; basilar length 28; greatest breadth 17.2; nasals 12.5; interorbital breadth 4.9; breadth of brain-case 14.3; palatilar length 15; diastema 9.4; palatal foramina 8.2; length of upper molar series 6.1.

*Hab.* Ruwenzori East. Alt. 7000'.

*Type.* Adult female in alcohol. B.M. no. 6. 12. 4. 106. Original number 615. Collected by R. B. Woosnam.

Unfortunately only one specimen of this fine species was obtained by the expedition, and that was preserved in spirit. However, its longer skull, larger teeth, longer fur, and the slaty mixture of its belly-colour will readily distinguish it from *Th. rutilans*, to which alone it is nearly allied.

*Thamnomys dryas*, sp. n.

A member of the *Th. dolichurus* group, but with the mammæ only 0-2=4.

Quite similar to the more rufous forms of *dolichurus*, e. g. those from Nyasa and East Africa, the general colour tawny, greyer on the head, richer on the rump, sides paler, a well-marked buffy or ochraceous line edging the belly, which is white, sometimes tinged with buffy, the hairs not slaty at base. Ears with proectote tawny brown or blackish; metentote rich buffy; a pale buffy spot behind their posterior base. Upper surface of hands and feet pale buffy. Tail long, pencilled, uniformly dark brown. Mammæ 0-2=4.

Skull lightly built. Palatal foramina reaching just to the level of the front of  $m^1$ . Bullæ small. Molars light and delicate.

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

Head and body 118 mm.; tail 185; hind foot 24.5; ear 19.

Skull: greatest length 31.3; basilar length 24.5; zygomatic breadth 15.3; nasals 11.5; interorbital breadth 4.7; breadth of brain-case 13.6; palatal foramina 7.2; length of upper molar series 4.3.

*Hab.* Ruwenzori East. Alt. 6000'-7000'.

*Type.* Adult female. B.M. no. 6. 7. 1. 136. Original number 207. Collected 30th December, 1905, by D. Caruthers. Nine specimens, of which six are females, including one in spirit.

The presence of only four mammæ in this mouse is a very curious fact, as there are six in all the other members of the *Th. dolichurus* group, even those from comparatively near localities. Specimens from Shoa (*Zaphiro*), Mt. Elgen (*Jackson*), Nyasa (*Johnston*), Angola (*Ansorge*), and South Africa all show this latter number.

XII.—*Note on Ochotona (Conothoa) aurita, Blanf., from Ladak.* By J. LEWIS BONHOTE, M.A.

SINCE writing my paper on the genus *Ochotona* (P. Z. S. 1904, ii. pp. 205 *et seqq.*) I have through the kindness of Col. A. E. Ward received some specimens of an *Ochotona* from the Pangong Lake, the typical locality of Blanford's *O. aurita*, which, from reference to his description and plate, I have no hesitation in referring to that species.

In my paper quoted above I considered, in default of specimens, that Blanford's *O. aurita* was probably identical with Günther's *O. macrotis*; this, however, is *not* the case, though in view of the stress laid by the describer on the large size of the ears, as also evinced by the name, the mistake was perhaps natural and pardonable. The following is a description of Col. Ward's specimens from the Pangong Lake, Ladak, and Nubia Valley:—

General appearance very similar to Blanford's plate. Colour above buffish grey grizzled with black, each hair being black at its base with a buffish subterminal portion and a black tip, which tips are frequently worn off to a greater or less extent. The feet are white with a tendency to yellowish in their median portion. The underparts are pure white with an indistinct narrow median line of yellowish. Between the ears, across the shoulders, and reaching down the sides of the neck is a broad band of pure buff, divided in two in the middle line by a few of the hairs having black tips. The whole of the head is rather brighter and yellower than the rest of the body, but there is no trace of the rufous suffusion of this part which is found in both *O. Roylei* and *O. macrotis*. The skull is typical of the *Curzoniæ* (=subgen. *Conothoa*) group. But in some specimens the anterior portion of the large palatine foramen does not immediately broaden out from its anterior end, but the two sides run parallel for a short distance; they, however, never show any tendency to approach each other and can therefore not be confounded with the *rufescens* (=subgen. *Ochotona*) group.

In general features the skull resembles most closely that of *O. Curzoniæ*, from which there is little to distinguish it, except that the postorbital process of the zygoma is not so long and narrow; in size it is about the same. From *O. Roylei* the skull may be distinguished, apart from its rather smaller size, by the fact that the palatal foramen is more triangular in general outline, the posterior portion tending to open out more on either side.

The skull of *O. macrotis* is larger and the foramen resembles that of *O. Roylei*; it has in addition two oval foramina in the frontal bones which are not found in *O. aurita*.

*Dimensions* of *O. aurita* from Pangong Lake (Coll. A. E. Ward, no. 48):—

Head and body 170 mm.; hind foot 31; ear 21.

*Skull*: greatest length 40; basal length 34; zygomatic breadth 18; length of nasals 13; length of molar series 7.5.

There can be no doubt, from a comparison of the skins, that the present species is closely allied to *O. Curzonie*. It is apparently merely rather darker and the light buff patches behind the ears are deeper in colour as a rule than in typical *O. Curzonie*, though this seems to be a rather variable feature.

Good series of both *O. Curzonie* and *O. aurita* will probably prove the latter to be a geographical form distinguished by some minor but constant differences. The name *aurita* is unfortunate, as the ears are by no means conspicuous or large. *O. macrotis*, except for its large ears, is not unlike a pale greyish *O. Roylei*, a resemblance which is to some extent borne out by the skulls.

The following are the references to *O. aurita*:—

*Lagomys auritus*, Blanford, J. A. S. B. vol. xlv. p. 111 (Oct. 1875);  
id. *loc. cit.* xlv. p. 326 (1877); id. Yark. Mamm. p. 74, pl. vi. fig. 2,  
pl. vii. a. fig. 2 (1879).

### XIII.—On Two new Parasitic Coleoptera (Fam. Staphylinidæ) from South America. By GILBERT J. ARROW, F.E.S.

FIVE species have hitherto been described of the curious parasitic genus *Amblyopinus*, of which four have been brought from the mountain-chain of Western South America and the fifth from the plains of La Plata. I am now adding two more species, one from the north and the other from the extreme south of the continent, and each represented by a single specimen in the British Museum collection. The circumstances in which they were found have not been recorded, but it may be assumed that, like the other species, they are parasites of burrowing rodents.

#### *Amblyopinus angustus*, sp. n.

Pallide testaceus, vix nitidus, elongatus, scutello, clytris abdomineque flavo-pubescentibus; capite sat fortiter punctato, postice

regulariter dilatato, haud angulato, oculis minutis, haud prominentibus; prothorace rugose punctato, lateribus antice arcuatis, approximatis, postice fere rectis, angulis posticis haud late arcuatis, margine basali distincte sinuata; scutello magno, lato, crebro punctato, apice vix angulato; elytris punctato-rugosis; abdomine subtiliter rugose punctato, segmentis postice longitudine valde crescentibus, ultimo quam latitudinem longiore; antennis pedibusque sat brevibus.

Long. 8 mm.

*Hab.* British Guiana, Mt. Roraima. Found by Mr. J. J. Quelch.

This species has a very distinctive aspect, owing to its elongate form. It is small and of a uniformly pale colour, and has the head and thorax closely punctured and not at all shining, the elytra rugose and closely pubescent, and the abdomen finely pubescent, but more shining than the rest of the body. There are two minute black spots at the posterior part of the head, symmetrically placed, but perhaps not constant. The first three joints of the antennæ are elongate and the remainder rather short and equal. The head is dilated behind, but not very strongly, the prothorax is distinctly narrowed in front, and the scutellum is very large, occupying at the base fully a third of the breadth of the insect from shoulder to shoulder. The elytra, beneath which there are no wings, are not elongated in proportion to the rest of the body. The legs and antennæ are shorter than in most of the species, but hardly as short as in *A. Gahani*, Fauvel.

*Amblyopinus fuegensis*, sp. n.

Robustus, sat latus, rufo-ferrugineus, capite prothoraceque nitidis, glabris, elytris, scutello abdomineque dense fulvo-pubescentibus; capite crebre sed distincte punctato, post oculos leviter dilatato, his parvis, paulo prominentibus; prothorace subtiliter punctulato, lateribus arcuatis, angulis posticis oblitteratis, margine basali leviter sinuata, angulis anticis rotundatis; scutello sat parvo, triangulare, apice distincte angulato; elytris brevibus, sicut abdomine haud distincte punctatis, hujus segmento ultimo sat lato, apice vix emarginato.

Long. 8 mm.

*Hab.* Tierra del Fuego, Useless Bay. Found by Capt. R. Crawshay, in December 1904.

This is like *A. Jelskii*, Solsky, but rather larger. The head is relatively larger, the prothorax more circular, with the sides more curved, the posterior angles less apparent, and the surface less punctured and more shining. The scutellum

is longer and more angulated and the elytra and abdomen less distinctly sculptured. The antennæ are rather slender, with the first joint almost twice as long as the second and the three last as broad as they are long, the terminal one having a short finger-like process at the end.

## BIBLIOGRAPHICAL NOTICES.

*Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum.*—Part III. *Macrura*. Fasciculus 1. *The Prawns of the Peneus Group*. By A. ALCOCK, M.B., LL.D., C.I.E., F.R.S. Calcutta: Printed by Order of the Trustees of the Indian Museum. 1906. Price 7 rupees.

THIS is the Third, but an independent, Part of a Monograph of the Decapod Crustacea of that portion of the Oriental Region which lies within the political boundaries of British India; and it deals only with the prawns of the maniple *Peneus*. Nevertheless it should prove of real service to all interested in the study of the Crustacea, for there are few who can draw upon so wide a knowledge of this group as Dr. Alcock. This part, like those which have preceded it, is profusely illustrated by means of a large series of plates, and this should add much to the value of the work.

Dr. Alcock points out that the *Penei* swarm in the warm waters of the Indian seas, and form a large part of the food of many fishes. But, "beyond this," he remarks, "they in themselves constitute a not inconsiderable part of that plenteous harvest of the sea which in this country [India] still runs to waste for want of capital and enterprise. What the prawn-fisheries of India might be worth it is difficult to say; but a statement published by Kishinouye, in the 'Journal of the Fisheries Bureau of Tokyo' for the year 1900, that the dried prawns annually exported from Japan to China are valued at 200,000 yen (or a little over £20,000), shows that there must be possibilities in them."

*A Treatise on Zoology*. Edited by E. RAY LANKESTER, M.A., LL.D., F.R.S.—Part V. *Mollusca*. By PAUL PELSENER, D.Sc. London: Adam & Charles Black, 1906.

WHEN we say that Dr. Pelsener's volume on the Mollusca is in every way worthy of the earlier volumes of this great Treatise, we have bestowed high praise; and in doing so we entertain no fears but that this expression of opinion will meet with the approval of all those who will have occasion to consult its pages.

Written originally in another tongue, it has been translated, and

ably translated, by Dr. Gilbert Bourne, the Linacre Professor of Comparative Anatomy at Oxford.

Designed for the advanced student, this volume, like its predecessors, is of a highly technical character, and bristles with terminology as yet unfamiliar even to those for whom it is intended. So far from this being a drawback, however, it is, on the contrary, a valuable feature—making for clearness, exactitude, and condensation.

Not since the appearance of Ray Lankester's article "Mollusca," in the ninth edition of the 'Encyclopædia Britannica,' has any work on this group appeared comparable to the present volume; hence there can be no question about the welcome that this latest contribution will receive. The 'Encyclopædia' article marked an epoch in the study of the Mollusca, and for many years, indeed, remained the only effectual work of reference on the subject: no more striking testimony as to its solid worth can be found than the fact that all the more important conclusions therein arrived at find a place in the volume now before us.

In one or two minor matters we find cause for complaint. The chief of these concerns the unnecessarily vague statements as to the number of living species of Mollusca. Thus on p. 35 we read: "Descriptive zoologists have enumerated more than 28,000 species of living Mollusca, of which more than half are Gastropods"; while on p. 142 we meet with the statement that "Some thirty thousand species of Gastropoda have been enumerated, of which twenty thousand belong to the present epoch." Comment of this kind may savour of "quibbling": we do not mean to be hypercritical, but desire simply to draw attention to a small point which might be altered in a future edition.

## MISCELLANEOUS.

### *Note of Correction.*

*Parorchis*, n. nom., for *Zeugorchis*, Nicoll, 1906. By WM. NICOLL, M.A., B.Sc., Gatty Marine Laboratory, St. Andrews.

THE name *Zeugorchis*, proposed (Ann. & Mag. Nat. Hist. (7) xvii. p. 519) for a Trematode genus represented by *Z. acanthus*, mihi, from the cloaca of *Larus argentatus*, having previously been assigned by Stafford (Zool. Anz. xxviii. (1905) p. 691) to a genus parasitic in Reptilia, it is necessary to alter this. In its place I propose the name *Parorchis*.

# THE ANNALS

AND

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### XIV.—*On the Bats of the Family Megadermatidæ.*

By KNUD ANDERSEN and R. C. WROUGHTON.

THE following notes are based on an examination of the material in the British Museum of Natural History.

#### *Key to the Genera.*

- A. Frontal shield of skull wider in front than behind. Cusp 2 of  $m^1$ \* much reduced in size or almost entirely disappeared. Antero-internal basal cusp of upper canines always distinct.
- a.  $p^2$ † present. Prenasal notch of skull rounded posteriorly. (Oriental and Malayan.)
- a'. Prenasal notch of skull shallower, extending only to level of front of  $m^1$ . Tragus longer, more slender. General size smaller . . . . . 1. *Megaderma*.

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\* The three cusps forming the tips of the **W** of a typical molar in insectivorous bats are termed, in antero-posterior direction, respectively 1, 2, 3; the two cusps forming the base of the **W**, 4 and 5; the lingual "heel" of the upper molars, when single, 6, when double, 6 and 7: see Herluf Winge, "Om Pattedyrenes Tandskifte, især med Hensyn til Tandernes Former," in Vidensk. Meddel. Naturhist. Foren. Kbhvn. 1882, pp. 15-69, pl. iii. (We prefer Winge's designations to those proposed by Osborn, which, in our opinion, are based on an erroneous idea of the succession of the cusps, and give a mistaken interpretation of the cusps of the lower as compared with those of the upper molars.)

† The small anterior upper premolar.

- b'. Prenasal notch of skull deeper, extending to level of front of  $m^2$ . Tragus shorter, broader. General size larger ..... II. *Eucheira*.
- b.  $p^2$  absent. Prenasal notch of skull pointed posteriorly. Tragus very short and broad. General size very large. (Australian.) ..... III. *Macroderma*.
- B. Frontal shield of skull not wider in front than behind. Cusp 2 of  $m^1$  not or scarcely reduced in size.  $p^2$  absent. (Ethiopian.)
- a. Posterior pair of angles of frontal shield produced to form postorbital processes; upper surface of shield comparatively flat.  $m^1$  quite normal. Antero-internal basal cusp of upper canines present. Nose-leaf very large. Tragus long, narrow. Pollex small ..... IV. *Lavia*.
- b. Posterior pair of angles of frontal shield not produced to form postorbital processes; upper surface of shield strongly concave. Cusp 3 of  $m^1$  moved backward. Antero-internal basal cusp of upper canines absent. Nose-leaf small. Tragus short, broad. Pollex larger. . V. *Cardioderma*.

## I. MEGADERMA, Geoff.

1810. *Megaderma*, Geoffroy, Ann. Mus. d'Hist. Nat. xv. p. 187.

*Diagnosis*.—See "Key" above, p. 129.

*Skull*.—Frontal shield wider in front than behind, its anterior pair of angles situated at the bases of the maxillary processes of the zygomatic arches; the ridges joining them with the posterior pair of angles forming quite normal supra-orbital ridges; looked at from above, the anterior pair of angles are obscured by anteorbital swellings, which, separated by a distinct depression, occupy the whole anterior part of the frontal shield. Prenasal notch shallower, measured from the cingulum of canine equal to about  $\frac{1}{6}$  of total length of skull.

*Teeth*.—A small  $p^2$  present. Cusp 3 of  $m^1$  is moved backward, while cusp 2 is moved inward and reduced in height. In the typical molar of an insectivorous bat the anterior and posterior triangles are practically of the same size; in *Megaderma* the posterior triangle (formed by cusps 2, 3, 5) is distinctly larger than the anterior (formed by cusps 1, 2, 4), though not to the same extent as in *Eucheira*. Antero-internal basal cusp of upper canines quite distinct, but not so strongly developed as in *Eucheira*.

*Nose-leaf*.—Posterior leaf in shape a broad ellipse, rather longer than the horseshoe, with a median longitudinal fold which, seen from the front, appears as a longitudinal ridge; at its base this ridge expands into a broad, heart-shaped, median leaf, which overlaps and conceals the lateral margins of the horseshoe.

*Tragus*.—Both lobes proportionally long and narrow, as compared with those of *Eucheira*.

*Range*.—From the Indian Peninsula and Ceylon eastward as far as the Philippines, Celebes, and Ternate.

*Species*.—Three, viz.: *M. spasma*, *M. carimatæ*, *M. natunæ*.

*Nomenclature*.—The name *Megaderma* was proposed by Geoffroy in 1810 (*l. s. c.*). The author describes the four species included by him in *Megaderma* in the following order:—*M. lyra*, *M. frons*, *M. trifolium*, *M. spasma*. But *M. spasma* is mentioned in the description of the genus in advance of all other species ("je me suis cru fondé à considérer le *V. spasma* et ses congénères comme formant un groupe isolé," p. 190), and in a short summary (p. 197) which professes to give a view of the species in their proper order ("dans l'ordre de leurs rapports") Geoffroy heads the list with *M. trifolium*, *i. e.* the western race of *M. spasma*. In accordance with the generally accepted view we therefore regard *M. spasma* as the type of the genus.

#### Key to the Forms.

- A. Size smaller: skull 25-27 mm.
- |   |                                       |
|---|---------------------------------------|
| a. Ears shorter: from crown 27.0-30.0 mm. . . . .     | 1. <i>M. spasma</i> .                 |
| <i>a'</i> . Lower leg averaging shorter: 28-29.5 mm.  | 1 <i>a</i> . <i>M. s. spasma</i> .    |
| <i>b'</i> . Lower leg averaging longer: 29.5-33.5 mm. | 1 <i>b</i> . <i>M. s. trifolium</i> . |
| b. Ears longer: from crown 31.4-35 mm. . . . .        | 2. <i>M. carimatæ</i> .               |
- B. Size larger: skull 28.5 mm. . . . . 3. *M. natunæ*.

#### 1. *Megaderma spasma*, L.

*Diagnosis*.—Size in every respect smaller than in *M. natunæ*; ears shorter than in *M. carimatæ*.

*Details*.—Distinguishable at a glance from *M. natunæ* by the conspicuously smaller size, especially of the skull and teeth. Total length of skull to front of canines 25-27 mm., in *M. natunæ* 28.5 mm.; length of upper tooth-row (*c-m*<sup>3</sup>) 9.5-10.5 mm., in *M. natunæ* 11.4 mm.; forearm 53-62 mm., in *M. natunæ* 63 mm.\* From *M. carimatæ* it differs only by its somewhat shorter ears.

*Range*.—The same as that of the genus.

*Races*.—Two, viz.: *M. spasma spasma*, *M. spasma trifolium*.

\* We give in the letterpress a few principal dimensions only; a detailed comparative table of measurements will be found at the end of the paper (p. 144).

1 a. *Megaderma spasma spasma*, L.1734. *Glis volans Ternatanus*, Seba, Thesaur. p. 90, pl. lvi. fig. 1.1758. *Vespertilio spasma*, Linnæus, Syst. Nat. ed. x. p. 32.1810. *Megaderma spasma*, L.; Geoffroy, Ann. Mus. d'Hist. Nat. xv. p. 195.1843. *Megaderma philippinensis*, Waterhouse, P. Z. S. p. 69.*Diagnosis*.—Lower leg averaging shorter: 28–29.5 mm.*Specimens examined*.—6 (2 skins) and 6 skulls, from Celebes (3), Philippines (3).*Range*.—"Ternate," Celebes, Philippines.*Nomenclature*.—Linné's *Vespertilio spasma* was based on Seba's "*Glis volans Ternatanus*." Having had no specimens from Ternate for examination, we use the name *spasma* for the race here under consideration, the habitat of which is the nearest to Ternate. Waterhouse described *M. philippinensis* from specimens collected by Cuming, some of which are now in the British Museum Collection. They are in every respect indistinguishable from Celebes individuals.1 b. *Megaderma spasma trifolium*, Geoff.1810. *Megaderma trifolium*, Geoffroy, Ann. Mus. d'Hist. Nat. xv. p. 193.1851. *Megaderma* —, Horsfield, Cat. Mamm. Mus. E. I. Co. p. 32.1863. *Megaderma Horsfieldi*, Blyth, Cat. Mamm. Mus. As. Soc. Beng. p. 23.*Diagnosis*.—Lower leg averaging longer: 29.5–33.5 mm.*Details*.—*M. s. trifolium* can only be distinguished from *M. s. spasma* by its rather longer lower leg. The skull, teeth, and external characters are otherwise the same in the two races.*Specimens examined*.—29 (16 skins) and 29 skulls, from Ceylon (3), W. India (4), Siam and Cochin China (8), Penang (2), Singapore (3), Sumatra (2), Java (6), Borneo (1).*Geoffroy's M. trifolium*.—Type locality: Java. Geoffroy compared his Javan bat with Seba's plate of *Glis volans Ternatanus* (Linné's *V. spasma*), and found it to differ in the shapes of the posterior leaf and the tragus; he therefore described it as a new species, *M. trifolium*. We have examined specimens from Java and can find no validity in these alleged characters. The name *trifolium* is the earliest available for the form here under consideration.*Blyth's M. Horsfieldi*.—In 1851 (*l. s. c.*) Horsfield described a *Megaderma* "from Continental India, contributed by E. Blyth, Esq., on behalf of the Asiatic Society of Bengal"; no name was proposed by Horsfield; it was characterized by

the absence of "transverse lines" from the membrane along the sides of the abdomen, and the presence of "regularly parallel ridges at the base of the ear." The British Museum possesses a specimen (skin, no. 60. 5. 4. 13), received from the India House Collection, which is in all probability the actual individual referred to by Horsfield; the peculiarities emphasized by him are partly due to bad preparation of the specimen and partly are quite individual. In 1863 (*l. s. c.*) Blyth proposed the name *Horsfieldi* for the species described but left unnamed by Horsfield. When the late Dr. J. Anderson (Cat. Mamm. Ind. Mus. p. 21, 1881) registered as "types" of *M. Horsfieldi* two specimens obtained by Mr. Theobald in Tenasserim he was undoubtedly in error. Blyth's *M. Horsfieldi* was, as already pointed out, based on Horsfield's "*Megaderma* ——" from Continental India.

## 2. *Megaderma carimatæ*, Miller.

1906. *Megaderma carimatæ*, Gerrit S. Miller, Jun., Proc. U.S. Nat. Mus. xxxi. no. 1481, p. 65.

The species is known to us only from the published account. Type locality: Karimata Island. According to Miller, it differs from *M. spasma* only in the smaller size and larger ears. The former character must be dropped: Miller gives as length of the forearm (five males and four females) 53.6–58.6 mm., as against 57–61 mm. in *M. spasma* (seven females, Malay Peninsula, *i. e.* *M. s. trifolium* of the present paper): but, first, Miller has compared his *M. carimatæ* with females only of *M. spasma*, and females of this species average larger than males; second, we find in twenty-nine individuals of *M. s. trifolium* the forearm varying between 53 and 62 mm. There remains the alleged greater length of the ears in *M. carimatæ*: measured from the crown "31.4–35 mm." (Miller) against "27–29 mm." (Miller) in *M. spasma*; we find that similar measurements for *M. s. trifolium* range from 27–30 mm. (Malay specimens 28–29 mm.).

## 3. *Megaderma natunæ*, sp. n.

*Diagnosis*.—In every respect larger than *M. spasma*.

*Details*.—The differences between *M. natunæ* and *M. spasma* have been pointed out above under the latter species (p. 131).

*Type*.—♂ ad. (in alc.). Bungaran Island, N. Natunas. Collected by A. Everett, Esq. British Museum no. 94. 9. 28. 30.

*Range*.—As yet known from the type specimen only.

## II. EUCHEIRA, Hodgs.

1847. *Eucheira*, Hodgson, J. A. S. B. xvi. p. 891, footnote (September 1847).

1872. *Lyroderma*. Peters, MB. Akad. Berl. p. 195 (18th March, 1872).

*Diagnosis*.—See "Key," above, p. 130.

*Skull*.—Frontal shield as in *Megaderma*. Prenasal notch deeper, measured from the cingulum of canine about  $\frac{1}{2}$  of total length of skull.

*Teeth*.—A small  $p^2$  present. Cusp 3 of  $m^1$  moved considerably backward; the posterior triangle (formed by cusps 2, 3, 5) at least double the size of the anterior (formed by cusps 1, 2, 4). Cusp 2 moved inward and tending to disappear, being represented only by a small tubercle, much below the level of the other cusps. Antero-internal basal cusp of upper canine very strongly developed, more so than in *Megaderma*.

*Nose-leaf*.—Posterior leaf a rectangle, with slightly convex sides, twice as long as the median leaf; median longitudinal ridge (fold) as in *Megaderma*, but its junction with median leaf forming an obtuse angle on each side, strongly contrasting with the sharply acute angles formed in *Megaderma*.

*Range*.—Indian Peninsula; S. China; there seems as yet to be no record of this genus from Burma.

*Species*.—Two, viz.: *E. lyra*, *E. sinensis*.

*Hodgson's Eucheira*.—Type species, *E. schistacea*, Hodgs., = *Megaderma lyra*, Geoff. The generic name *Eucheira* was proposed by Hodgson because the "phalangeal system [of *E. schistacea*] is apparently irreconcilable with Cuvier's general and Geoffroy's particular definitions" of the common structure of the wing in Chiroptera; but at the same time the description and figure of the wing of *schistacea*, as given by Hodgson himself, are those of a quite normal *Megadermine* wing, and his *schistacea* is undoubtedly nothing but the well-known "*Megaderma lyra*." Although, therefore, the whole basis on which Hodgson founded the genus *Eucheira* is a mistake, still the name, as being the earliest in date, will have to stand according to the current nomenclatural rules. The name *Eucheira* has apparently been overlooked by succeeding writers and is not mentioned in Palmer's 'Index Generum Mammalium.'

*Peters' Lyroderma*.—Type species, *Megaderma lyra*, Geoff. The characters given by Peters for the "subgenus" *Lyroderma* are the shape of the nose-leaf, the flatness of the frontal shield, and the absence of postorbital processes. The name *Lyroderma* is antedated by Hodgson's *Eucheira*.

*Key to the Forms.*

- |  |                            |
|--|----------------------------|
| A. Skull smaller: 27·8–29 mm.; prenasal notch posteriorly wider, flattened ..... | 1. <i>E. lyra.</i>         |
| a. On the average larger: forearm 65–69 mm.....                                  | 1 a. <i>E. l. lyra.</i>    |
| b. On the average smaller: forearm 63–68 mm. ..                                  | 1 b. <i>E. l. caurina.</i> |
| B. Skull larger: 29·3–32 mm.; prenasal notch narrower, rounded posteriorly ..... | 2. <i>E. sinensis.</i>     |

1. *Eucheira lyra*, Geoff.

*Chief characters.*—Skull and teeth markedly smaller than in *E. sinensis*. Total length of skull 27·8–29 mm., in *E. sinensis* 29·3–32 mm.; upper tooth-row 10·8–11·5 mm., in *E. sinensis* 11·5–12·1 mm. Prenasal notch proportionally rather shorter, wider behind, posterior margin flattened.

*Range.*—Indian Peninsula.

*Races.*—Two: *E. lyra lyra* and *E. lyra caurina*.

1 a. *Eucheira lyra lyra*, Geoff.

1810. *Megaderma lyra*, Geoffroy, Ann. Mus. d'Hist. Nat. xv. p. 190.

1839. *Vespertilio* (*Megaderma*) *caruatica*, Elliot, Madr. Journ. vol. x. p. 96.

1844. *Megaderma spectrum*, Wagner, in Hügel's *Kaschmir*, iv. p. 569.

1847. *E. schistacea*, Hodgson, J. A. S. B. xvi. p. 889.

*Characters.*—The present race can only be distinguished from *E. l. caurina* by average characters: skull 29–29·5 mm., upper tooth-row 11·1–11·5, forearm 65–69, against 27·8–28·3, 10·8–11, 63–64 respectively in *E. l. caurina*.

*Specimens examined.*—18 (16 skins) and 20 skulls, viz.: “Madras” (11), Secunderabad (1), Bengal (6).

*Range.*—Indian Peninsula, east of 75° E.

*Geoffroy's Megaderma lyra.*—Type locality: one of the Dutch factories in India, probably East Coast of Madras. Geoffroy separated *lyra* as a distinct species on account of the shape and size of the nose-leaf (“Feuille rectangulaire, la follicule de moitié plus petite,” *l. s. c.*).

*Elliot's Megaderma caruatica.*—Type locality: Southern Maratha Country. Elliot relied on the presence of only three teeth in the upper row behind the canine to justify the separation of *caruatica*, but he seems himself to have been in doubt as to the validity of the species, inasmuch as he added “*M. lyra?*” The British Museum has several specimens collected by Elliot, all of them unquestionably *lyra*.

*Hodgson's Eucheira schistacea.*—Type locality: Siligori, N.E. Bengal. Hodgson left Nepal for good in 1844, and the context (*l. s. c.*) shows that he had never seen any species

of the family Megadermatidæ until he obtained the examples on which he based *schistacea*; these specimens, when later on acquired by the British Museum, were wrongly labelled "Nepal" (see Scully, J. A. S. B. lvi. pt. ii. no. 3, p. 234, 1887). Hodgson's specimens, as well as his published figure of the bat, show that *schistacea* is nothing but *E. lyra lyra*.

*Wagner's Megaderma spectrum*.—Type locality: Kashmir. Apparently based on a single specimen (Baron Hügel's collections). According to Wagner, *M. spectrum* has only four teeth behind the upper canine (*i. e.* one premolar only): but bearing in mind that  $p^2$  is present in *all* known Oriental representatives of the family Megadermatidæ (this small tooth is wanting only in the Ethiopian genera *Lavia* and *Cardioderma* and the Australian *Macroderma*); further, that Wagner's description of *M. spectrum* is based throughout on a comparison with *M. frons* (*Lavia frons*), not with *E. lyra*, with which last he seems to have been unacquainted; again, that  $p^2$ , when present in bats of this family, is extremely small, hidden on the *internal* side of the tooth-row, and therefore very easily overlooked when not searched for; and, finally, that Wagner's figure of *M. spectrum* differs in no appreciable respect from an ordinary *E. lyra*—there can be no reasonable doubt that Wagner's statement as to the number of teeth was wrong; if so, the whole basis of the supposed new species breaks down.

1 b. *Eucheira lyra caurina*, subsp. n.

*Characters*.—See above, under *E. l. lyra* (p. 135).

*Specimens examined*.—8 skins and skulls, all from the West Coast of India.

*Type*.—♀ ad. skin. Surat District, W. India. Collected by R. C. Wroughton, Esq. B.M. no. 98. 4. 2. 2.

*Range*.—India, west of 77° E.

2. *Eucheira sinensis*, sp. n.

*Characters*.—Size somewhat larger than *E. lyra*; see comparative measurements under that species above (p. 135). Prenasal notch proportionally rather longer, narrowed behind, posterior margin rounded.

*Specimens examined*.—2 skins and skulls, viz. Swatow (1), Amoy (1).

*Type*.—Adult (unsexed), skin and skull. Amoy, S. China. Tomes Collection. B.M. no. 7. 1. 1. 339.

*Range*.—S. China.

## III. MACRODERMA, Miller.

1906. *Macroderma*, Gerrit S. Miller, Jun., Proc. Biol. Soc. Wash. xix. p. 84 (4th June, 1906).

*Diagnosis*.—See "Key," p. 130.

*Skull*.—Frontal shield wider in front than behind; its anterior angles raised into the same plane as the posterior (in the two preceding genera the anterior angles are depressed to the bases of the maxillary processes of the zygomatic arches); anteorbital swellings obliterated (distinct in *Megaderma* and *Eucheira*); as a consequence of these modifications the whole area of the pentagonal frontal shield flat and all its angles sharply and strongly defined. Prenasal notch still longer than in *Eucheira* (measured from cingulum of canines about  $\frac{1}{4}$  of total length of skull); posteriorly pointed, not rounded or flattened as in *Megaderma* and *Eucheira*.

*Teeth*.— $p^2$  absent. Cusp 3 of  $m^1$  moved backward as in *Eucheira*; cusp 2 moved inward to a line between cusps 1 and 5, almost obliterated; cusp 4 much reduced, markedly below the level of the remaining cusps. Antero-internal basal cusp of upper canines strongly developed.

*Nose-leaf*.—Posterior leaf ovoid as in *Megaderma*, double the length of the median leaf as in *Eucheira*; median leaf shaped as in *Eucheira*. Front margin of horseshoe plicate, suggesting a rudimentary form of the much more complicated structure in *Lavia*.

*Tragus*.—Both lobes short and broad, even more so than in *Eucheira*.

*Range*.—Central Queensland.

*Species*.—One, viz. *M. gigas*.

*Nomenclature*.—The genus *Macroderma* was established by Miller (*l. s. c.*) for *Megaderma gigas* and characterized by the absence of  $p^2$ , the shape of the frontal shield, and the much greater development of the cartilaginous premaxillaries.

*Macroderma gigas*, Dobs.

1880. *Megaderma gigas*, Dobson, P. Z. S. p. 461, pl. xlvi.

*Diagnosis*.—Forearm 103–104 mm.

*Specimens examined*.—2 (1 skin) and 2 skulls, from Central Queensland.

*Range*.—As yet known only from Central Queensland.

## IV. LAVIA, Gray.

1838. *Lavia*, Gray, Mag. Zool. Bot. ii. p. 490.

*Diagnosis*.—See "Key," p. 130.

*Skull*.—Frontal shield parallel-sided, but appearing wider behind, owing to development of the posterior pair of angles into long processes; otherwise as in *Macroderma*. Prenasal notch about the same proportional length as in *Eucheira*, showing a tendency to become pointed behind in some individuals (compare *Macroderma*).

*Teeth*.— $p^2$  absent. All five cusps of  $m^1$  equally developed and placed in a regular **W**. Antero-internal basal cusp of upper canine about as in *Megaderma*.

*Nose-leaf*.—Posterior leaf in shape a long triangle, with slightly convex sides and truncated apex, three times as long as the median leaf; median longitudinal fold gradually widening anteriorly, the junction with the median leaf forming no appreciable angle on each side; median leaf small, with a lobe on each side anteriorly which reaches to the margin of the horseshoe and covers the nostrils; horseshoe with a notch on each side in front, between which the front margin of the horseshoe is produced into a free lobe; the sides of this lobe folded together downward, and then the whole turned backward to lie on the face of the median leaf.

*Tragus*.—External lobe very long.

*Range*.—W. Coast of Africa, from Cape Verd to the mouth of the Niger; Upper Nile Valley; Uganda; British and German East Africa.

*Species*.—One, viz. *Lavia frons*.

*Nomenclature*.—Type species of the genus, *Megaderma frons*, Geoff. Gray proposed the generic name *Lavia* on account of the shape of the nose-leaf and frontal shield and the absence of  $p^2$ .

1. *Lavia frons*, Geoff.

*Characters and Range*.—Those of the genus.

*Races*.—Two, viz. *Lavia frons frons* and *Lavia frons affinis*.

1 a. *Lavia frons frons*, Geoff.

1759. *La Feuille*, Daubenton, Mém. Acad. Sci. Paris, p. 388.

1800. ? *Vespertilio megalotis*, Bechstein, in Pennant's Uebersicht der vierfüss. Thiere, p. 622.

1810. *Megaderma frons*, Geoffroy, Ann. Mus. d'Hist. Nat. xv. p. 192.

1905. *Lavia rex*, Gerrit S. Miller, Jun., Proc. Biol. Soc. Wash. xviii. p. 227 (9th December, 1905).

*Diagnosis*.—Average size larger.

*Details*.—Can only be discriminated from *L. f. affinis* by average characters: forearm 56–62 mm., skull 24.5–26, upper tooth-row 9–10, as against 52–58 mm., 23.5–24, 8.7–9 respectively in *L. f. affinis*.

*Specimens examined*.—33 (21 skins) and 23 skulls, viz. Gambia (6), Kumasi (1), N. Nigeria (2), Kordofan (4), Ruwenzori (4), Uganda (6), British East Africa (10).

*Range*.—The same as that of the genus (above, p. 138), with the exception of Bahr-el-Ghazal.

*Bechstein's V. megalotis*.—Under the name *V. megalotis* Bechstein describes a bat taken by Levaillant in Great Namaqualand, which, from the absence of the tail and the presence of nose-leaf and tragus, was clearly a member of the family Megadermatidæ. But no species has in recent times been recorded from Africa south of 15° S., and the measurements quoted by Bechstein are so strange (rendered from German inches into millimetres: nose-leaf 35 mm.; body 78 mm.; ear 70 (!) mm.; expanse 210 mm.) that it appears safer to leave Levaillant's bat unidentified.

*Geoffroy's Megaderma frons*.—Type locality: Senegal. Geoffroy's description is based, not on actual specimens, but on Daubenton's description of "La Feuille" (*l. s. c.*), which is undoubtedly the species here under consideration, being a bat with an ovate nose-leaf, "posée verticalement, qui ressemble à une feuille," "huit lignes de longueur sur six de largeur," with the ears "près de deux fois aussi grandes que la membrane" [*i. e.* the nose-leaf], and united "par la moitié de la longueur de leur bord interne," with a long, narrow, pointed tragus, with no tail, with the fur "d'une belle couleur cendrée, avec quelque teinte de jaunâtre," with  $\frac{9}{2}$  incisors,  $\frac{4}{3}$  cheek-teeth, and inhabiting Senegal.

*Miller's Lavia rex*.—Type locality: Taveta, German East Africa. Miller relies for the discrimination of *L. rex* on its greater external dimensions, longer mandible, and heavier teeth: "forearm 60 mm.," "mandible 17.8," "maxillary tooth-row 9.2," instead of "56 mm.," "15.2" mm., and "8.2 mm." respectively in *L. frons*. These measurements, as well as all the others given by Miller, place it beyond doubt that his *L. rex* is *L. frons frons* and that the reason for his describing it as new was that he compared it, not with the true *L. frons frons*, but with the smaller race described in this paper as *L. frons affinis*.

1 b. *Lavia frons affinis*, subsp. n.

*Diagnosis*.—Average size smaller.

*Details*.—Comparative measurements are given above under *L. frons frons* (p. 139).

*Type*.—♂ ad. skin. Kaka, White Nile. Collected by R. M. Hawker, Esq. B.M. no. 1. S. S. 3.

*Specimens examined*.—8 (7 skins) and 6 skulls, viz. White Nile (5), Lake No (1), Lado (1), Wadelai (1).

The British Museum possesses a somewhat damaged skull without skin from Cape Coast Castle (Gold Coast) which seems to belong to this race, and Miller's specimen of "*L. frons*" referred to above under *L. f. frons* (p. 139) appears also to belong to the present race; so it is possible that the range of *affinis* extends westward to the coast.

## V. CARDIODERMA, Peters.

1873. *Cardioderma*, Peters, MB. Akad. Berlin, p. 488 (23rd June, 1873).

*Diagnosis*.—See "Key," p. 130.

*Skull*.—Frontal shield parallel-sided; the centre longitudinally depressed, so as to form a "trough"; all the angles sharply defined, but not produced into processes as in *Lavia*. Prenasal notch about as long as in *Megaderma* ( $\frac{1}{6}$  total length of skull), flatly rounded posteriorly.

*Teeth*.— $p^2$  absent. Cusp 3 of  $m^1$  about as in *Megaderma*. Antero-internal basal cusp of upper canine absent.

*Nose-leaf*.—As in *Megaderma*, but a distinct trace of antero-lateral lobes of the median leaf, as in *Lavia*; in *Megaderma*, *Eucheira*, and *Macroderma* these lobes are merely indicated by faint depressions in the margin of the median leaf.

*Tragus*.—Both lobes very short; the inner flatly rounded at top and excavate at the base in front, so that it seems directed inward rather than upward.

*Range*.—East Africa: Zanzibar, Mombasa, Somali.

*Species*.—One, *C. cor*.

*Nomenclature*.—Type species of the genus, *Megaderma cor*. In 1872 Peters described *Megaderma cor*, and in the following year proposed for this species the subgeneric name *Cardioderma* without any further characterization.

*Cardioderma cor*, Ptrs.

1872. *Megaderma cor*, Peters, MB. Akad. Berl. (18th March, 1872) p. 194.

*Specimens examined*.—10 (3 skins) and 8 skulls, viz. Zanzibar (2), Mombasa (2), Somali (6).

*Peters' Megaderma cor*.—Type locality: Abyssinia. Peters based his diagnosis of *Megaderma cor* on the shape and size of the nose-leaf and tragus.

*Wing-structure.*

The four families Nycteridæ, Megadermatidæ, Hipposideridæ, and Rhinolophidæ are rather closely inter-related; they have probably had a common origin. When trying to form an idea of the stage of development at which the wing-structure of the Megadermatidæ has arrived, it is therefore fair to compare them with such species of the other families as have, in this respect, remained on a low level, f. i. *Hipposiderus diadema*.

In *H. diadema* the third metacarpal is the longest, the fifth the shortest, the indices of the third, fourth, and fifth metacarpals being, respectively, 716, 696, and 640; that this is a primitive condition needs hardly any comment (a similar mutual length of the metacarpals is found in many primitive fruit-bats). In the Megadermatidæ the third metacarpal is the shortest, the fifth the longest, the indices being 727, 784, and 845; the third metacarpal, it will be noticed, has retained practically the same length (727) in proportion to the forearm as in *H. diadema* (716), whereas the fourth and, still more, the fifth have been very considerably lengthened.

In *H. diadema* the first phalanx of the third digit (index: 329) is somewhat less than half the length of the third metacarpal (716); in the Megadermatidæ it is decidedly lengthened (index: 404), being always more than one half of the metacarpal (727). The first phalanx of the fourth digit has retained the same length in proportion to the forearm as in *H. diadema* (242 against 237); the first phalanx of the fifth digit is slightly lengthened (280 against 247).

In *H. diadema* the second phalanx of the third digit (327) is only equal in length to the first phalanx (329); in the Megadermatidæ it is enormously lengthened (693), being almost  $\frac{7}{4}$  of the first phalanx (404). In *H. diadema* the distal phalanges of the fourth and fifth digits are considerably shorter than the proximal phalanges; in the Megadermatidæ the second phalanx of the fourth digit is at least equal to

## Wing-indices.

	Forearm.	3rd digit.				4th digit.			5th digit.	
		Mtc.	1st ph.	2nd ph.	Mtc.	1st ph.	2nd ph.	Mtc.	1st ph.	2nd ph.
<i>Megaderma</i> (36 spems.) .....	1000	745	384	661	807	231	320	856	258	270
<i>Eucheira</i> (27 spems.) .....	1000	731	420	688	791	244	308	869	282	264
<i>Macroderma</i> (2 spems.) .....	1000	710	435	712	773	250	246	820	329	217
<i>Lavia</i> (41 spems.) .....	1000	728	412	723	756	261	261	825	276	285
<i>Cardioderma</i> (10 spems.).....	1000	711	368	669	760	224	334	844	245	289
<i>Megadermatidæ</i> (116 spems.) .....	1000	727	404	693	784	242	277	845	280	279
<i>Hipposiderus diadema, lankadiva, enotis, diuops</i> (37 spems.) .....	1000	716	329	327	696	237	173	640	247	194

(*Macroderma*, *Lavia*), but often much longer than (*Megaderma*, *Eucheira*, *Cardioderma*), the first phalanx; the second phalanx of the fifth digit is in all genera of *Megadermatidæ* approximately equal to, or rather longer than, the

first phalanx, except in *Macroderma*, in which it has remained rather short.

The total result of these modifications is best realized by a comparison of the total index of the third, fourth, and fifth digits: in Megadermatidæ 1824, 1303, and 1404, as against 1372, 1106, and 1081 in *H. diadema* and allied species. The greatest increase (452) falls on the third digit, the next (323) on the fifth, the smallest (197) on the fourth; *i. e.* the area of the wing in the family Megadermatidæ is enormously increased in size, the wing being at the same time much more pointed (lengthening of third digit in proportion to fourth) and much broader (lengthening of fifth digit in proportion to fourth).

#### General Remarks.

The five genera of Megadermatidæ are referable to two fundamental types. In the one, represented by *Megaderma*, *Eucheira*, and *Macroderma*, the frontal shield of the skull is but moderately developed, the median external cusp (cusp 2) of the upper  $m^1$  is more or less on the point of disappearance, and, with the exception of the somewhat aberrant *Macroderma*, they have preserved the small anterior upper premolar ( $p^2$ ). In the other group, represented by *Lavia* and *Cardioderma*, the frontal shield is largely developed, giving the skull a quite peculiar aspect, the median external cusp of the upper  $m^1$  is of normal (or almost normal) size and  $p^2$  has completely disappeared. The former group is Oriental, Malayan, and Australian, the latter Ethiopian.

*Megaderma* and *Eucheira*, from the Malay Archipelago and S. Asia, are very closely related, differing in no other important respects than the *degree* of modification of the cusps of the upper molars, the size of the prenasal notch, and the size and shape of the tragus. In having cusp 2 of  $m^1$  still more reduced in size, cusp 3 still more posterior in position, and the prenasal notch still deeper, the strictly continental *Eucheira* is clearly on a higher level of development than the Malayan and continental *Megaderma*.

The Australian *Macroderma* is undoubtedly an offshoot of the *Megaderma-Eucheira* branch; broadly speaking, it accords with these latter genera in the general shape of the frontal shield, the strong reduction of cusp 2 of  $m^1$ , and the posterior position of cusp 3 of  $m^1$ , but it has completely lost  $p^2$ , and the prenasal notch is unusually deep and different in shape.

The two Ethiopian genera *Lavia* and *Cardioderma*, forming the second section of the family, are closely related *inter se*.



*Lavia* is the more primitive: the frontal shield is not so profoundly modified as in *Cardioderma*,  $m^1$  is quite normal in structure. In *Cardioderma* the frontal shield attains its highest degree of modification, the posterior of the external cusps (cusp 3) of  $m^1$  is moved somewhat backward, and the antero-internal basal cusp of the upper canines, present in all other genera, has quite disappeared.

*Summary.*—Selecting the most primitive of the cranial and dental characters preserved in the five living genera of Megadermatidæ, we are able to draw up a rough sketch of the skull and teeth of the unknown prototype of the family. It was a bat with the frontal shield not very considerably different from that of *Megaderma* and *Eucheira*, with the five primary cusps of  $m^1$  practically of equal size, as in the typical molar of an insectivorous bat, and with a small  $p^2$ . From this type of bat originated, on the one side the Malayan and Oriental *Megaderma* and *Eucheira*: frontal shield not largely modified,  $p^2$  preserved, but cusp 2 of  $m^1$  more or less reduced, cusp 3 more or less moved backward; and the Australian *Macroderma*: essentially as *Megaderma* and *Eucheira*, but  $p^2$  lost; on the other side the Ethiopian *Lavia* and *Cardioderma*: molar cusps almost normal, but frontal shield profoundly modified, and  $p^2$  lost.

The subjoined diagram gives a view of probable inter-relations and phylogeny of the genera:—



XV.—*Note on the Crab Hymenosoma depressum, Jacquinot and Lucas.* By CHARLES CHILTON, M.A., D.Sc., F.L.S., Professor of Biology, Canterbury College, New Zealand.

[Plate V.]

THE little crab *Hymenosoma depressum*, Jacquinot and Lucas, was described many years ago\*, but does not appear to have been recognized since, and some confusion and doubt has therefore arisen with regard to it. As I happen to have seen some specimens which, in my opinion, undoubtedly belong to the species intended by Jacquinot and Lucas, it is only just to their memory that I should endeavour to establish the validity of the species in question; at the same time I can add one or two facts which are, perhaps, not without interest.

White, in 1846, established *Halicarcinus* as a subgenus of *Hymenosoma*, and the second of the two species placed under it by him was *Hymenosoma depressum*, Jacquinot, a species which was transferred to *Hymenicus* by Dana in 1852. According to Miers, however, the specimens referred to Jacquinot's species by White were distinct from it, and he, in 1876, named them *Elamena Whitei*†. Miers had not seen any specimens really referable to *Hymenosoma depressum*, Jacquinot and Lucas, and in the 'Catalogue of the N. Z. Crustacea,' p. 51, gives this species under the name "*Hymenicus depressus*?" quoting Jacquinot and Lucas's description, and adding:—

"The carapace is represented as nearly circular, the front very narrow, not longer than the eyes, and of equal width throughout. There is apparently a small tooth outside the eyes. Third joint of the external maxillipeds much the largest. I have not seen specimens of this species."

Here the story of this species appears to end so far as printed records are concerned. The new facts that I am able to add are as follows:—

In April 1888, in the collection of Mr. R. Helms, of Greymouth, which was submitted to me for examination, I found a dried crab which, by its yellow colour, flat depressed carapace, and long legs evidently belonged to the species described and figured by Jacquinot and Lucas. In 1893, in the collection of the late Mr. S. H. Drew, of Wanganui, I found two specimens of the same kind which were labelled as

\* Voy. Pôle Sud, Zool. iii. Crustacés, p. 62, pl. v. figs. 34-39.

† See Stebbing, P. Z. S. 1900, p. 522.

having been dredged on the Greymouth bar in 20 fathoms; very probably they had been collected by Mr. Helms at the same time as the specimen in his own collection.

I have notes on these specimens, made at the time, stating that they appear to agree well with the original description and figures by Jacquinet and Lucas, with which I had compared them, and that Miers's remarks as to the figure are not altogether correct, but that the front is really "dentiform," *i. e.* tooth-like, and narrowing to its extremity, instead of being "of equal width throughout," and that there could scarcely be said to be "a small tooth outside the eyes" either in the figure or in the specimens. In my MS. notes I also mentioned the fact that the terminal joints of the last four pairs of legs were fringed with hairs and looked as if they were used as swimming-organs, like the legs of the water-boatmen (Notonectidæ).

I saw no further specimens of this species till December 1905, when Mr. Marriner brought me a dried specimen found at Sumner, Canterbury, precisely like those already referred to.

This specimen is a male, while the original description and figure were drawn up from a female specimen, so that I can add to it the few points in which the male differs from the female.

The well-marked fringe of long hairs on the distal joints of the last four pairs of legs is worthy of notice, for this, combined with the flat depressed carapace and the very long legs, shows, I think, that the crab is capable of swimming. Jacquinet's specimen is said to have been taken under stones at low tide on the shores of the Auckland Islands; the two in Mr. Drew's collection were dredged on Greymouth bar at 20 fathoms; I have no definite information as to the circumstances under which the other two specimens which I have seen were taken, but there is nothing in these records inconsistent with the power of swimming. Most of the ordinary swimming-crabs have the last pair of legs specially flattened for the purpose, but probably many other crabs possess some power of progression by swimming even without special modification of the legs; this is certainly the case with the young of *Petrolisthes elongatus*, Milne-Edwards, just hatched out from the last Zoæa-form, as I know from personal observation that it can swim with considerable agility.

The whole of the Hymenosomidæ of New Zealand require careful revision, and until that is done the generic position of this species must remain an open question; in the meantime, however, I give a new description of the species, which, with

the figures, will, I hope, facilitate its identification in the future.

*Hymenosoma depressum*, Jacquinet and Lucas.  
(Pl. V. figs. 1-4.)

*Hymenosoma depressum*, Jacquinet and Lucas, Voy. Pôle Sud, Zool. iii. Crustacés, p. 62, pl. v. figs. 34-39.

*Male*.—Carapace nearly circular, very slightly longer than broad; flat, depressed, lateral margins without teeth; the slightly raised margin of carapace continued over the base of the rostrum. Rostrum short, not longer than the eyes, narrowing to the subacute extremity; orbits not interrupting the margin of the carapace, the lateral portion of the orbit separated by a slight cleft from the upper portion, so that the lateral portion in dorsal view gives almost the appearance of a small tooth outside the eyes\*.

Anterior legs (chelæ) rather short, only moderately enlarged; meros and carpus with inner surface supplied with a few short scattered hairs, outer surface smooth; propod with inner surface nearly flat, with short scattered hairs which extend along the lower border of the fixed finger, outer surface strongly convex, smooth; fingers slender, their inner surfaces with short setæ, fixed finger with a small tooth near the base, movable finger with a larger tooth placed a little more distally, the rest of the opposing margins with small irregular teeth, that of the movable finger also bearing small tufts of setæ.

The succeeding four pairs of legs of approximately equal length, greatly elongated, fully two and a half times as long as the carapace, slender, without spines; the meros considerably longer than any of the other joints except the propod; the carpus about half as long as the propod; dactyl slender and acute, slightly longer than the propod; in all the legs the proximal joints bear a few scattered setæ, while a continuous row of closely-packed setæ fringes the hinder margin of the three or four distal joints, the setæ being longer than the joint is wide.

Abdomen of male short, triangular, only slightly longer than its breadth at the base, and reaching only to the posterior margin of the sternum corresponding to the fourth pair of legs.

Length of carapace (without rostrum) 12.5 mm., breadth

\* These points are not well shown in fig. 1; an attempt has been made to show them more accurately in fig. 2.

12 mm., length of each of last four pairs of legs about 33 mm.

According to Jacquinet's figure, the female differs from the male in having the chelæ shorter and more slender, the opposing margins of the fingers with tufts of short setæ but without teeth.

*Colour.* Yellowish.

*Habitat.* New Zealand (Greymouth and Sumner) and Auckland Islands.\*

#### EXPLANATION OF PLATE V.

*Hymenosoma depressum*, Jacq. & Luc.

*Fig. 1.* Male, dorsal view,  $\times 2$ .

*Fig. 2.* Front, showing rostrum, eyes, &c.,  $\times$  about 8 times.

*Fig. 3.* Chela, outer side,  $\times$  about 8 times.

*Fig. 4.* Second and third legs,  $\times$  nearly 4 times.

XVI.—*Descriptions of new Species of Trochomorpha, Cochlostyla, Amphidromus, Bulimulus, Drymæus, Placostylus, Stenogyra, Leptopoma, Cyclophorus, Cyclotus, and Alycæus.* By HUGH C. FULTON.

[Plates IX. & X.]

*Trochomorpha modesta*, sp. n. (Pl. IX. fig. 1.)

Shell rather widely umbilicated, depressed, uniform brown colour; spire conic, apex smooth, rest of shell with fine oblique striæ crossed on the underside by microscopic spirals; whorls 6, convex, somewhat depressed near the suture, last sharply carinate and compressed at the margin; aperture very oblique; peristome rather thin, margins slightly thickened.

Mag. diam.  $10\frac{1}{2}$ , alt. 5 mm.

*Hab.* Sinkip Island, Straits of Malacca.

This form is allied to *T. billeana*, Mörch, but is smaller, has a slightly higher spire, broader umbilicus, and half a whorl more. *T. modesta* can also be distinguished from *T. billeana* by the slight depression just above the suture and keel of last whorl.

Readily separated from *T. castra*, Bens., by its wider umbilicus and uniform coloration.

\* [There are specimens of this species in the British Museum collection from Sumner and from Akareea Heads. The legs are rather more slender than in Prof. Chilton's figures.—W. T. CALMAN.]

*Trochomorpha crassicarinata*, sp. n. (Pl. IX. fig. 2.)

Shell moderately solid, widely umbilicated, apex yellowish, remainder of shell of a uniform dark brown colour; whorls  $6\frac{1}{2}$ , slightly convex above, the last decidedly so below, first two smooth, others with rather conspicuous and irregular oblique striae, last whorl compressed and rounded at the keel; aperture very oblique, dark within; peristome simple, slightly thickened at basal and columellar portion.

Maj. diam. 20, alt. 8 mm.

*Hab.* Nias Island, N.W. Sumatra.

Chiefly characterized by its dark coloration and thickened keel.

*Trochomorpha niasensis*, sp. n. (Pl. IX. fig. 3.)

Shell rather thin, subtransparent, moderately umbilicated, light yellowish brown, suture of lower whorls and keel of last edged with dark brown; whorls 6, very slightly convex above, first one and a half smooth, others with oblique striae or growth-lines; aperture whitish within, oblique; peristome thin, somewhat thickened at columellar portion.

Maj. diam. 21, alt. 8 mm.

*Hab.* Nias Island, Sumatra.

This species differs from *T. crassicarinata* by its thinner substance, lighter coloration, narrower umbilicus, and its more rapidly increasing whorls, more especially noticeable on a comparison of the last whorl.

*Cochlostyla (Anixa) propitia*, sp. n.

(Pl. IX. figs. 4-6.)

Shell imperforate, solid, subglobose depressed, upper part light reddish, the lower dark, covered with a lighter yellowish-brown epidermis, which consists of oblique narrow streaks crossed on the last whorl by more or less distinct, narrow, interrupted bands of arrow-like markings; this coloration is continued to a point just below periphery of last whorl, the remainder of the underside being of a blackish-brown colour; whorls nearly 5, moderately convex, suture of lower whorls narrowly impressed, last whorl subangular and descending slightly at its termination; aperture suboval, bluish white within; peristome thickened and expanded, slightly reflexed, blackish brown, except the upper expanded columellar portion, which is whitish; columella oblique, thickened; margins of peristome connected by a slightly raised transparent callus.

Maj. diam. 40, alt. 30 mm.

Var. A (fig. 5).—Sharply keeled at the periphery. Maj. diam. 40, alt. 26 mm.

Var. B (fig. 6).—Globose. Maj. diam. 30, alt. 28 mm.

*Hab.* Cebu Island, Philippines.

(= *Moreleti*, Mlldff., non Pf., Bericht d. Senck. natur. Gesellsch. 1890, p. 238.)

This shell has been distributed by Möllendorff and others as *Cochlostyla (Aniva) Moreleti*, Pf., but that species is (judging from the figure and description and specimens in the British Museum) but a specimen of *C. (Aniva) Montfortiana*, Pf., that has lost its epidermis.

*C. propitia* is closely allied to *C. carbonaria*, the chief difference being that the former is a thicker shell with a much lighter-coloured epidermis than the latter. *C. propitia* is also much larger generally and broader in proportion to height, and its peristome is more expanded; but these characters are not constant in the large series under examination.

The great variation in the form of *C. propitia* is shown by the three shells selected for description.

*Amphidromus cognatus*, sp. n. (Pl. IX. fig. 7.)

Shell sinistral, moderately solid, minutely perforate, smooth, shining, whitish ground, covered on lower whorls by a bright yellow periostracum; whorls nearly 6, slightly convex, first two dark reddish brown, remainder with dark bluish-grey, narrow, spiral bands, one at the suture and one above the middle, three on the last whorl, one about 2 mm. wide at the periphery, a similar one encircling the umbilicus, and a narrow one about 2 mm. below the suture, lines of growth rather conspicuous; aperture subovate, white, with the outer band showing clearly through; peristome white, moderately expanded.

Maj. diam. 17, alt. 31 mm.

*Hab.* —?

In the position of the colour-bands and their showing clearly through the aperture this species greatly resembles *A. hemicyclus*, Rochebrune, but the latter is much narrower—so narrow that one almost doubts the correctness of the dimensions given, viz.: long. 30, lat. 10 mm.

*Amphidromus niasensis*, sp. n. (Pl. IX. fig. 9.)

Shell sinistral, moderately thin, finely obliquely striated, nucleus of a semitransparent waxy colour, rest of shell with light reddish ground ornamented by rather broad oblique

stripes which are intersected in the middle by a narrow spiral band of lighter colour; the under part of last whorl has a rather broad dark brown band situated just below the periphery and a narrower one lower down, between which is a yellow one, umbilical area reddish; whorls 6, convex, rather slowly increasing; aperture with outer markings showing through; peristome slightly expanded, flesh-colour; columella vertical, flesh-coloured, rounded and slightly expanded at point of insertion.

Maj. diam. 17, alt. 30 mm.

*Hab.* Nias Island, Sumatra.

Although totally distinct in coloration, the details of this species agree very closely with *A. Sowerbyi*; but the whorls of *niasensis* are slightly more convex and increase a little slower in size than those of *A. Sowerbyi*.

It is also similar to *pæcilochroa*, Fult., in form and markings, but is thinner and its whorls are more convex.

*Amphidromus Sowerbyi*, sp. n. (Pl. IX. fig. 10.)

Shell sinistral, thin, umbilicus almost closed, nucleus dirty white with a brown spot at the apex; lower whorls yellow, with six narrow dark brown spiral bands on the middle whorls, the last whorl having two broader bands in front, one situated just below the periphery and the other a little lower, umbilical area yellow, finely obliquely striated; whorls  $6\frac{1}{2}$ , moderately convex, rather slowly increasing; aperture with the outer bands showing through; peristome very narrowly expanded, waxy colour; columella vertical, narrowly expanded at point of insertion.

Maj. diam. 17, alt. 31 mm.

*Hab.* Nias Island, Sumatra.

This new form bears a great resemblance in coloration and markings to some of the varieties of *Helix nemoralis*, Linn. The number of bands varies, one specimen before me having only a single narrow peripheral band.

Named in honour of my esteemed and genial colleague, G. B. Sowerby, Esq., F.L.S.

*Amphidromus Webbi*, sp. n. (Pl. IX. fig. 8.)

Shell sinistral, moderately solid, earlier whorls yellow, fading to cream on lower whorls, with a broad lightish chestnut band about 14 mm. wide encircling the last whorl and continued as a narrow ever-diminishing band at suture of penultimate whorl; whorls  $6\frac{1}{4}$ , moderately convex, with inconspicuous oblique growth-lines, last ascending slightly at

its termination ; aperture subovate, white within ; peristome rather broadly expanded and slightly reflected ; columella vertical, expanded above.

Maj. diam. 31, alt. 51 mm.

*Hab.* Nias Island, Sumatra.

A handsome and distinct new form, which can be readily separated from *A. enganoensis*, Fult., by its much less convex whorls and less broadly dilated columella.

Named in honour of Walter F. Webb, Esq., of Rochester, New York.

*Bulimulus (Protoglyptus) dejectus*, sp. n.  
(Pl. X. fig. 1.)

Shell very narrowly umbilicated, acuminate elongate, rather thin, covered with yellowish-brown epidermis, white beneath, apical structure consisting of oblique, microscopic, wrinkled or granular striæ, lower part with inconspicuous oblique striæ or lines of growth crossed by close-set spiral rows of minute hairs ; whorls 8, slightly convex, regularly increasing, the last not deflected ; suture rather deep, simple ; aperture suboval, white within ; peristome very slightly expanded, broader at point of insertion of columellar portion, margins joined by a thin transparent callus.

Maj. diam. 10, alt. 29 mm.

*Hab.* Santa Catharina (*vide* Linnæa Institute label).

The nearest species to this known to me is *crepundia*, Orb., but that is readily separated by its less cylindrical form.

*Drymæus volsus*, sp. n. (Pl. X. fig. 2.)

Shell elongately fusiform, minutely rimate, rather thin, almost smooth to the eye, but under the lens the usual *Drymæus* sculpture on nuclear whorls, while the lower whorls have oblique blunt costæ or lines of growth crossed by microscopic close-set spiral striæ ; whorls  $6\frac{1}{4}$ , slightly convex, first three and a half dirty white, lower with cream ground ornamented by irregular, oblique, somewhat zigzag, dark brown stripes which are broken by narrow white lines and dots ; aperture oblong-oval, dark brown markings within ; peristome rather broadly expanded, especially at the basal portion, pale yellow ; columella narrow and cord-like, entering spirally.

Maj. diam.  $12\frac{1}{2}$ , alt.  $30\frac{1}{2}$  mm.

*Hab.* Ecuador.

I know of no other species with which to make a helpful comparison.

Mr. S. I. Da Costa, who has made a special study of this genus, is unable to identify it with any species known to him.

*Placostylus (Euplacostylus) cylindricus*, sp. n.  
(Pl. X. fig. 3.)

Shell elongate, almost imperforate, solid; spire reddish, lower part covered by a greenish-brown cuticle; whorls  $6\frac{1}{2}$ , slightly convex, rather rapidly increasing, last two with longitudinal growth-lines, crossed on middle whorls by obscure spiral lines, giving the appearance under the lens of a somewhat reticulated surface, last whorl indistinctly malleated in parts; aperture ear-shaped, dirty white within; peristome thickened, expanded inwardly, white, outer edge yellowish, margins connected by a thin callus, columella with a white, thick, spirally entering fold.

Maj. diam. 23, alt. 71 mm.

Peristome: maj. diam. 27, alt. 33 mm.

*Hab.* Isabel Island, Solomons (*Meek*).

Separated from *Seemani*, Dohrn, by its narrow cylindrical form, more rapidly increasing whorls, and much shorter peristome.

From *koroensis*, Garrett, to which it has some resemblance in form, it can be easily distinguished by its larger size and dark-coloured epidermis. Of the three specimens before me none appear to have the punctures found on the spiral whorls of the two above-mentioned species; but that character may have been worn off.

*Stenogyra (Euonyma) Beckeri*, sp. n.  
(Pl. X. fig. 7.)

Shell elongately fusiform, moderately thin, polished, sub-transparent, nucleus whitish, lower whorls of a pale olive-greenish colour; apex obtuse, rounded; whorls 12, slightly convex, first three smooth, slowly and regularly increasing, lower whorls with indistinct lines of growth, slightly crenulated at the suture; aperture oblong-oval; columella slightly curved, white, slightly expanded; peristome continuous with columella, thin.

Maj. diam. 10, length 44 mm.

Length of aperture 9, width 5 mm.

*Hab.* Pondoland (*Dr. H. Becker*).

Differs from *S. Purcelli*, Melv. & Pons.\* (the type of

\* Ann. & Mag. Nat. Hist. 1901, vol. viii. p. 317, pl. ii. fig. 6.

which is a young shell), by its broader form and more rapidly increasing whorls. In *Beckeri* the first two whorls are smooth, whereas in *Purcelli* they are distinctly crenulated at the suture.

This comparison was made with the type of *Purcelli*, now in the British Museum, and a young specimen of *S. Beckeri*. In the description of *S. Purcelli* the species is characterized as having *no sculpture*, but that is not correct; the figure also gives one the idea of a broader form than that of the actual type.

*Leptopomia niasense*, sp. n. (Pl. X. fig. 6.)

Shell globose conic, narrowly umbilicated, thin, sub-transparent, very light brownish ground with darker-coloured raised spiral striæ, about 6 on middle whorls; between these are close-set microscopic spirals, a patch of darker brown at umbilical area; whorls 5, moderately convex, last subcarinate in front; aperture circular, rather dark within; peristome expanded, whitish both front and back, margins approximating and joined by a thin callus; operculum corneous, thin, 8 whorls.

Maj. diam. 14, alt. 13½ mm.

*Hab.* Nias Island, N.W. Sumatra.

Similar to *L. pellucidum*, Grat., but can be readily separated by its slightly broader peristome and dark-coloured umbilical area.

The species varies somewhat in coloration, some specimens having patches of a smoke-colour and others being banded.

*Cyclophorus (Theobaldius) Dautzenbergi*, sp. n.  
(Pl. X. fig. 8.)

Shell depressed, spire plane, moderately solid, widely umbilicated, dark brown, with rather distant oblique streaks of lighter colour; whorls 4¾, convex, closely obliquely striated, upper part of last whorl with five or six more or less distinct spiral striæ, which stop short on the penultimate whorl, third of last whorl slightly and gradually descending; aperture circular, bluish white within; peristome with yellowish-white edge, surrounded by a dark-coloured flange, giving the peristome a duplex appearance; operculum corneous, fairly solid, about 12 whorls.

Maj. diam. 25, alt. 10 mm.

*Hab.* Nias Island, N.W. Sumatra.

Bearing a likeness to the Ceylon species *C. Layardi*, Ad.,

but easily distinguished by its flatter form and smaller aperture.

Some specimens are almost a uniform brown, whilst others are strikingly marked with yellowish-white, narrow, oblique streaks.

Named after Mons. Ph. Dautzenberg, one of our most esteemed conchologists.

*Cyclophorus (Cyclohelix) Kibleri*, sp. n.  
(Pl. X. fig. 4.)

Shell turbinate, very narrowly umbilicated, very solid, nucleus consisting of  $2\frac{1}{2}$  whorls, first one and a half smooth, the next with rather distant curved striae, remainder of shell with fine oblique striae, crossed by close-set microscopic spirals which are waved on the underside of body-whorl, rich dark brown colour, with numerous irregularly shaped spots and streaks of lighter colour; on the underside of shell the markings take a more regular spiral pattern; whorls  $5\frac{1}{2}$ , convex, the last a little flattened below; aperture orange-coloured within, very oblique, subirregularly oval; peristome orange, well thickened, margins approaching and connected by a transparent callus, columellar portion sloping towards the right, with a blunt tooth-like projection about the middle; operculum corneous, thin, about 8 whorls.

Maj. diam.  $31\frac{1}{2}$ , alt. 27 mm.

*Hab.* Nias Island, N.W. Sumatra.

This shell is of a similar form to *C. turbo*, Chem., from the Nicobar Islands, but cannot possibly be confused with that or any other species of the genus known to me.

*Cyclotus niasensis*, sp. n. (Pl. X. fig. 9.)

Shell depressed, spire almost plane, apex dark coloured, somewhat roughened and slightly exerted, rather thin, covered with a somewhat thick closely striated epidermis; whorls  $4\frac{1}{2}$ , moderately convex, last shortly and slightly descending, suture deep; aperture circular, bluish white within; peristome with narrow outer flange; operculum calcareous, whorls 9.

Maj. diam. 15, alt. 6 mm.

*Hab.* Nias Island, Sumatra.

The nearest to this known to me is *C. discoideus*, but *C. niasensis* is smaller, the peristome does not descend so far, and the epidermis appears to be thicker.

*Alyceus (Chamalyceus) Smithi*, sp. n.  
(Pl. X. fig. 5.)

Shell depressed-turbinata, dirty white, rather widely umbilicated; whorls 4, first smooth, remainder with oblique striæ which are rather widely spaced on first half of last whorl, then suddenly become very close, widening out again immediately before the strangulated portion, which is situated about one third of a whorl from the peristome, last whorl shortly descending; aperture circular; peristome rather thick, duplex; sutural tube rather long; operculum thin, whitish, concave, with 9 or 10 whorls.

Maj. diam. 4, alt. 2 mm.

*Hab.* Mengtzu, Yunnan (*vide* Carl Böck).

Very like *A. plicilabris*, Mölldff., but has no plicæ on the peristome, the striæ immediately behind the strangulation are similar, but the striæ on the earlier part of the whorl are closer than in Möllendorff's species.

From *A. rathousianus*, Heude, it differs by being smaller, has a more strongly produced duplex peristome, and its sculpture on the last whorl is finer.

Named in honour of Edgar A. Smith, Esq., I.S.O.

EXPLANATION OF THE PLATES.

PLATE IX.

- Fig.* 1. *Trochomorpha modesta*.  
*Fig.* 2. — *crassicarinata*.  
*Fig.* 3. — *niasensis*.  
*Fig.* 4. *Cochlostyla propitia*.  
*Fig.* 5. — —, var. A.  
*Fig.* 6. — —, var. B.  
*Fig.* 7. *Amphidromus cognatus*.  
*Fig.* 8. — *Webbi*.  
*Fig.* 9. — *niasensis*.  
*Fig.* 10. — *Sowerbyi*.

PLATE X.

- Fig.* 1. *Bulinulus dejectus*.  
*Fig.* 2. *Drymaeus volsus*.  
*Fig.* 3. *Placostylus cylindricus*.  
*Fig.* 4. *Cyclophorus Kibleri*.  
*Fig.* 5. *Alyceus Smithi*.  
*Fig.* 6. *Leptopoma niasense*.  
*Fig.* 7. *Stenogyra Beckeri*.  
*Fig.* 8. *Cyclophorus Dautzenbergi*.  
*Fig.* 9. *Cyclotus niasensis*.

XVII.—Notes on *Papuina* and *Pupina*.

By HUGH C. FULTON.

*On the Identity of Papuina (Dendrotrochus) pumila, Fult., with Dendrotrochus mentum, Hedley.*

Since the publication of *P. pumila* in the 'Journal of Malacology,' 1905, vol. xii. p. 22, pl. 6. figs. 5 & 6, Mr. Chas. Hedley has written me that it is probably his *Dendrotrochus mentum*, described in the 'Records Australian Museum,' 1899, p. 153, fig.

Unfortunately I had omitted to look up the subgenus *Dendrotrochus* in the Record, only having looked for *Papuina*.

To make certain of the matter, I recently sent a co-type of *P. pumila* to Mr. Hedley, who now informs me that it is identical with his *D. mentum*; my species therefore becomes a synonym.

*On Papuina Sellersi, Cox, and P. migratoria, Pfr.*

Dr. Cox described *P. Sellersi* in the P. Z. S. 1876, p. 646, pl. 52. fig. 9, and appears to have fixed no particular specimen as the type, but to have based the species on a number of specimens; the measurements of one specimen are given—viz.: "diameter, greatest 0·78, least 0·56, height 0·60 of an inch,"—but they do not agree with the figure given.

After examination of a number of specimens bearing a label in Dr. Cox's handwriting "Typical *P. Sellersi*," I cannot separate it from Pfeiffer's *P. migratoria*, a species most variable in form and coloration.

The two forms described as *migratoria*, Pfr., and *Sellersi*, Cox, are linked closely together by specimens before me, which show them to be one species having great variation in form and coloration: some specimens are sharply carinated, whilst others have the last whorl rounded; a few are quite imperforate, whilst others are slightly perforate.

Coloration varies from specimens all white, except for a narrow dark brown sutural band, to specimens of yellowish ground with broad spiral bands.

All the varieties have inconspicuous oblique striae, crossed on the lower whorls by oblique, forward descending wrinkles, which vary in strength and are almost absent in the var. *leucophaea*, Cox.

*On Pupina Thomsoni, Forbes, and P. bidentata, C. E. Beal.*

After comparison of typical specimens of the above-mentioned species, I am forced to the conclusion that *P. bi-*

*dentata* is simply *Thomsoni* with the callus-folds situated at the anterior area of the back of the shell more strongly developed.

In a series of co-types from the collection of the late Mr. C. E. Beddome there are some specimens *entirely without these folds*, and a selected series seems to demonstrate that these folds are only fully developed in the last stage of growth.

It is significant that in the description of *P. bidentata* there was no comparison made with the obviously closely allied *P. Thomsoni*.

XVIII.—*Description of a new Cyprinoïd Fish, Acheilognathus signifer, from Korea, with a Synopsis of all the known Rhodeinæ.* By L. S. BERG (St. Petersburg).

*Acheilognathus signifer.*

Closely allied to *A. cyanostigma*, Jordan & Fowler, 1903, from Japan (Lake Biwa), differing chiefly in coloration and longer barbels.

No dark shoulder-spot above gill-opening, no longitudinal band on body, neither on tail. *Dorsal deep brown, with a broad marginal whitish band. Anal with several darker longitudinal cross-bars.* Ventral blackish.

D. II 8. A. II 8. L. I. 36  $\frac{6}{4}$ .

Teeth 5—5, not serrated. No spines in dorsal and anal. Barbels present, rather long, somewhat more than half the length of the eye, reaching to the vertical from the anterior third of eye. Mouth small, subinferior. Maxillary reaching to the nostrils. Depth of body  $2\frac{3}{4}$  in its length (without caudal), length of head 4; diameter of eye  $\frac{1}{3}$  length of head, slightly less than interorbital space, equal to snout,  $1\frac{1}{2}$  in postorbital space. Caudal peduncle  $3\frac{1}{2}$  in body, twice as long as deep, its depth  $2\frac{1}{2}$  in that of body. Origin of dorsal somewhat behind the root of ventrals, midway between end of snout and root of caudal; its end opposite to the third branched ray of anal. Base of dorsal  $5\frac{1}{4}$  in body, height 6. Upper margin of dorsal straight. Origin of anal below the posterior dorsal rays; its base  $6\frac{7}{10}$  in body, its height  $6\frac{1}{4}$ . Pectorals not reaching ventrals,  $5\frac{2}{3}$  in body; ventrals 6, reaching origin of anal. Lateral line slightly decurved; 6 scales between

lateral line and middle of belly. Anus midway between origin of the ventrals and anal.

A single adult male (with two semicircular excrescences on snout), measuring about 57 mm. (47 without caudal), taken by the late O. Herz in Pungtung, Korea, in 1888. Type specimen N. 10265 in the Zool. Mus. of the Acad. of Sciences at St. Petersburg.

The following is a synopsis of all the species known to me of the group *Rhodeinae*\*:—

### I. RHODEUS, Agassiz, 1835.

Lateral line incomplete. No spine in dorsal and anal. Pharyngeal teeth 5—5, not serrated. More than 7 branched rays in anal.

a. No barbels; D. III 9—10, A. III 8—10,  
l. l. 34—40.

b. Third suborbital not more than half the length of the eye. (Central Europe, N.W. and S. Russia, Macedonia, Anatolia, Caucasus, basin of Amur, Manchuria †.)

*Rh. sericeus* (Pallas), 1776 (= *Rh. amarus*, Bloch, 1782).

bb. Third suborbital more than half the length of the eye. (Southern China.) . . . . . *Rh. sinensis*, Günther, 1868.

aa. Barbels present; D. III 8, A. III 9,  
l. l. 32, teeth 5—5 (not serrated?).  
(Japan, Kiu-siu.) . . . . . *Rh. (?) oryzae*, Jordan & Seale, 1906 †.

### II. PARARHODEUS, gen. nov.

Lateral line incomplete. No spine in dorsal and anal. Pharyngeal teeth 5—4, slightly serrated. D. II 7, A. III 6, l. l. 48—49.—A single species: *P. syriacus* (Lortet), 1883. (Syria, Damascus.)

### III. ACHEILOGNATHUS, Bleeker, 1860.

Lateral line complete. Pharyngeal teeth 5—5, not serrated. Barbels present or absent. Spine in dorsal and anal absent or present.

A. Barbels present. No spine in dorsal and anal.

a. Shoulder with a more or less distinct

\* Messrs. Jordan and Fowler (Proc. U.S. N. Mus. xxvi. 1903, pp. 812, 822) refer *Capoeta elongata*, Schl., and *C. gracilis*, Schl., to the group *Rhodeinae* ("teeth one-rowed"). Although Schlegel does not indicate the dentition of these species, Bleeker (Atlas ichth. iii. 1863, p. 117; Ned. Tijdsch. Dierk. ii. 1865, p. 138), who has had specimens from Japan, states that they are *three-rowed*, 1.3.5—5.3.1 ("dentes raptatori") as in *Barbinae*, which induced Dr. Günther (Cat. Fish. vii. 1868, p. 136) to refer the Bleekerian genus *Gnathopogon* to *Barbus*.

† A very remarkable instance of an interrupted distribution: not yet known from Siberia.

‡ Scarcely belonging to this genus.

- dark shoulder-spot above gill-opening.
- b.* Barbels short, about half the length of the eye; shoulder-spot and lateral band very distinct. D. III 10, A. III 10. (Japan.) . . . . . *A. limbatus* (Schlegel), 1846.
- bb.* Barbels more than half the length of the eye; shoulder-spot and lateral band indistinct or absent. D. III 9, A. III 9. (Japan.) . . . . . *A. lanceolatus* (Schlegel), 1846.
- aa.* Shoulder without dark spot above gill-opening.
- c.* Barbels short, not more than half the length of the eye.
- d.* A longitudinal dark band; dorsal with several darker longitudinal cross-bars; anal dark, with a broad marginal whitish band. Maxillary barbel very short. D. III 8, A. III 8, l. l. 39. (Japan.) . . . . . *A. cyanostigma*, Jordan & Fowler, 1903.
- d.l.* No longitudinal dark band; dorsal dark, with a broad marginal white band; anal with several darker longitudinal cross-bars. D. II 8, A. II 8, l. l. 36. Maxillary barbel about half the eye. (Korea.) . . . . . *A. signifer*, Berg, 1906.
- cc.* Barbels long, as long as eye. A longitudinal dark band along the middle of tail; lower half of dorsal with a series of blackish dots; D. II 9, A. II 11-12, l. l. 34. (Formosa.) . . . . . *A. himantegus*, Günther, 1868.
- AA.* Barbels present. Spine in dorsal and anal present.
- e.* D. II 11, A. II 9, l. l. 36; depth  $2\frac{1}{2}$  in length of body, snout shorter than eye. (Shanghai.) . . . . . *A. barbatulus*, Günther, 1873.
- ee.* D. III 11-13, A. III 11, l. l. 35-36; depth  $2\frac{1}{2}$ - $2\frac{1}{3}$  in length of body; snout as long as eye; a dark blue spot above gill-opening. (Korea, Seoul.) . . . . . *A. coreanus*, Steindachner, 1892.
- AAA.* Barbels absent\*.
- f.* Dorsal and anal without spine. D. II 14-15, A. II 14-15, l. l. 35-38. (Japan, L. Biwa.) . . . . . *A. longipinnis*, Regan, 1905.
- ff.* Dorsal and anal with spines. D. III 12-13, A. III 10, l. l. 35-36. (Basin of Amur, L. Khanka or Hanka.) . . . . . *A. chankaënsis* (Dybowski) (= *Devario chankaënsis*, [Dyb.], 1872).

\* *Acheilognathus mesembrinum*, Jordan & Evermann (Proc. U.S. N. M. xxv. 1902, p. 323, fig. 6), from Formosa, apparently does not belong to the Rhodoinæ.

## IV. PARACHEILOGNATHUS, Bleeker, 1863.

Lateral line complete. Pharyngeal teeth 5—5, deeply serrated. No spine in dorsal and anal.

- a. Barbels (very minute) present; mouth inferior; D. II 14, A. III 10, l. l. 37-38. Head  $4\frac{1}{2}$  in length of body, depth  $2\frac{1}{4}$ , eye 4 in head. (Japan.) . . . . . *P. rhombus* (Schlegel), 1846.
- aa. No barbels; mouth oblique.
- b. D. II 10, A. II 12, l. l. 35. Head 4 in length of body, depth 3, eye 3 in head. (China.) [berbis, Gthr.).  
*P. imberbis* (Günther), 1868 (= *Achilognathus im-*
- bb. D. III 13-14, A. III 10-11, l. l. 35. Head 4 in length of body, depth  $2\frac{1}{2}$ , eye  $2\frac{2}{3}$  in head. (Yang-tse-kiang, Tien-tsin.) . . . . *P. bleekeri*, n. n. (= *P. imberbis*, Bleeker, 1871, [non *Achilognathus imberbis*, Günther\*]).

## V. PSEUDOPERILAMPUS, Bleeker, 1863.

Lateral line incomplete. Pharyngeal teeth 5—5, deeply serrated. No spine in dorsal and anal. No barbels.

- a. D. III 10-11, A. III 10-11, l. l. 55-65. (Japan.) . . . . . *P. typus*, Bleeker, 1863.
- aa. D. III 11-12, A. III 10-11, l. l. 33-34. (Shanghai, Yang-tse-kiang.) . . . . . *P. ocellatus*, Kner, 1865-67.

## VI. ACANTHORHODEUS, Bleeker, 1871.

Lateral line complete. Teeth deeply serrated. Spine in dorsal and anal present. Barbels present or absent.

- a. Barbels present.
- D. III 17-18, A. III 12-13, l. l. 35; head 5 in length of body, depth  $2\frac{1}{2}$ . (Yang-tse-kiang.) . . . . . *A. macropterus*, Bleeker, 1871.
- D. III 17-18, A. III 13-14, l. l. 36-40; head  $4\frac{1}{4}$ - $4\frac{1}{2}$  in length of body, depth  $2-2\frac{1}{3}$ . (Yang-tse-kiang; Shanghai.) . . . . . *A. Guichenoti*, Bleeker, 1871.
- D. III 17, A. III 13-14, l. l.  $34\frac{6}{5}$ ; head  $4\frac{2}{3}$  in length of body, depth  $2\frac{1}{2}$ . (China; Swatow.) . . . . . *A. dicæus*, Rutter, 1898.
- D. III 15, A. III 11, l. l. 36; head 4 in length of body, depth 2. (Upper Tonkin.) *A. tonkinensis*, Vaillant, 1892.
- aa. Barbels absent.
- D. III 14-15, A. III 12-13, l. l. 30. (Yang-tse-kiang.) . . . . . *A. hypselonotus*, Bleeker, 1871.
- D. II 12-13, A. II 10-11, l. l. 35. (Shanghai.) . . . . . *A. atranalis*, Günther, 1873.
- D. II 16-17, A. II 13-14, l. l. 35-36; second suborbital twice as long as deep; dorsal

\* Cf. Günther, Zool. Record, 1871, p. 107.

- and anal twice as long as high. (Shanghai.) ..... *A. tænianalis*, Günther, 1873.  
 D. III. 16-18, A. III 12-14, l. l. 36-39; second  
 suborbital about as long as deep; dorsal  
 and anal less than twice as long as high.  
 (Lower Amur, Ussuri.) ..... *A. Asmussi* (Dybowski), 1872  
 [(=*Devario Asmussi*, Dyb.).

XIX.—Description of a new Cyprinoid Fish, *Paraleucogobio notacanthus*, from N. China. By L. S. BERG (St. Petersburg).

PARALEUCOFOBIO, gen. nov.

Allied to *Leucogobio*, Günther, from which it differs in having the dorsal provided with a spine and inserted behind ventrals.

Body compressed, deep; scales large, about 35 in lateral line; lateral line in the middle of body, anteriorly slightly decurved, posteriorly straight. Dorsal short, with 7 branched rays and with a strong, but flexible at the top, spine, inserted a little behind origin of ventrals, nearer to end of snout than base of caudal. Anal short, with 6 branched rays, without spine, its origin beyond the end of dorsal, nearer to base of ventrals than to caudal. Anus a little before origin of anal. Breast scaled. Belly not keeled. Mouth small, anterior: jaws of equal length; lower without tubercle, its edge somewhat trenchant, semilunar. Hind margin of maxillary reaching the vertical of the middle between nostrils. Tip of snout about on the level of the lower margin of eye. Lips thin, the lower interrupted at the symphysis. A minute barbel at the angle of mouth, equal to  $\frac{1}{3}$  of the diameter of eye, not reaching the vertical of front margin of eye. Preorbital reaching the eye. Suborbitals long, narrow. Gill-membranes attached to isthmus below the hind margin of eye. Peritoneum silvery, with some black points. Pharyngeal teeth two-rowed, 2 . 4—5 . 3, compressed, subuncinate; upper teeth of the longer series conical.

*Paraleucogobio notacanthus*, sp. n.

D. II 7. A. III 6. Lin. lat.  $34 \frac{5}{3}$  37.

Snout blunt; interorbital space convex. Back behind nape flattened. Pectorals not reaching ventrals, ventrals not

reaching anus. Upper margin of dorsal and anal straight. First unarticulated ray of dorsal about  $\frac{2}{3}$  of second (the longest). Scales with radial striæ. 5 longitudinal series of scales between lateral line and middle of belly. Depth of body  $3\frac{3}{4}$  in length (without caudal); length of head  $4\frac{1}{4}$ . Depth of head  $1\frac{1}{4}$  in its length, width  $1\frac{3}{4}$ ; eye 3.8 in length of head, 1.4 in interorbital space, 1.2 in length of snout, 1.8 in postorbital part of head. Caudal peduncle 4.8 in body, 1.6 as long as deep, its depth 2.3 in that of body. Length of dorsal 7 in body, height 5.2; length of anal 10.1, height 7.0; length of pectoral 5.4, of ventral 5.8. Pectoral  $1\frac{1}{2}$  in distance from its base to origin of ventral; ventral  $1\frac{1}{2}$  in distance from its base to origin of anal. Antedorsal space 2 in body, postdorsal  $2\frac{3}{5}$ .

Total length of a single specimen (mature female) about 95 mm. (without caudal 81 mm.).

In general shape resembles *Leucogobio tæniatus*, Günther, in colour *Leuc. Herzensteini*, Günther. Many longitudinal dark bands along the sides of body; a rather broad blue band above the lateral line. Each scale of the lateral line with two dark spots (as in *Alburnus bipunctatus*). Dorsal with two series of dark spots.

Taken in a rivulet, Je-hol, at Cheng-tu-fu (or Je-hol), tributary of Lu-ang-ho (N.E. of Peking), by Colonel D. Putiata in May 1901. Type specimen N. 9873 in the Zool. Mus. of the Acad. of Sciences at St. Petersburg.

XX.—*Description of a new Species of Eulota from Formosa.*  
By G. K. GUDE, F.Z.S.

*Eulota (Euhadra) Warburgi*, sp. n.  
(Figs. 1 & 2.)

Shell narrowly umbilicated, conoid, shining, finely irregularly striated, with obsolete shallow spiral furrows here and there; chalky white, with one distinct, narrow, yellowish-brown band at the periphery and a fainter one above and below, the upper one very indistinct. Spire depressed-conoid, suture deep, apex prominent. Whorls nearly 6, increasing slowly and regularly, convex above and at the periphery, slightly flattened below; last whorl scarcely descending in front. Aperture little oblique, subovate; peristome thickened and expanded, but slightly reflexed; margins distant,

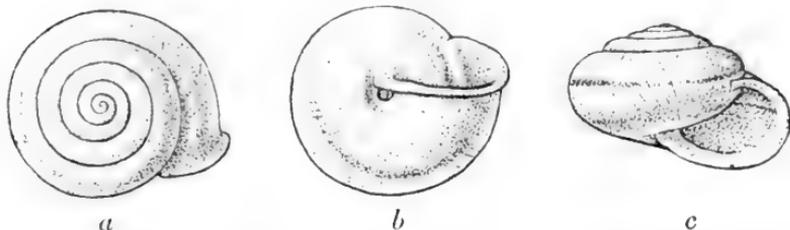
columellar margin strongly thickened and reflexed, slightly receding over the narrow deep umbilicus.

Diam. maj. 27, min. 23; alt. 18 mm.

*Hab.* Dunes at Long-Krau, South Formosa (*Warburg leg.*, Feb. 1888).

Type in my collection.

Fig. 1.



Professor G. Pfeffer, of the Naturhistorisches Museum, Hamburg, kindly placed at my disposal three specimens of an undescribed *Eulota*. All the shells appear to be sand-blown, being denuded of cuticle. The second specimen has the bands much fainter and is smaller, measuring:—diam. maj. 24, min. 20; alt. 15.5 mm. The third specimen (fig. 2) is still

Fig. 2.



smaller, but has a more elevated spire than the type; it measures:—diam. maj. 21, min. 18.5; alt. 15.5 mm.

The new species is related to *Eulota irrediviva*, Pils. & Hir., from Okino-erabu-shima, N.E. Loo-Choo, which it resembles in the banding; but that species is much larger, measuring 36 mm., although possessing only 5 whorls; in *E. Warburgi* the whorls are more convex, the suture is deeper, and the peristome is less reflexed.

Another near ally is *E. okinoerabuensis*, Pils. & Hir.; but the new species differs from that shell in being more depressed, smoother, and with weaker striae, in not being spirally striated, and in having a wider umbilicus.

XXI.—On some undescribed *Phytophagous and Parasitic Hymenoptera from the Oriental Zoological Region.* By P. CAMERON.

FOR the species described in this paper I am indebted to Col. C. T. Bingham.

**Tenthredinidæ.**

*Tenthredo lepcha*, sp. n.

Luteous; the antennal scape in the middle above, the flagellum, the sixth to eighth and the sides of the ninth abdominal segment broadly laterally, and the hind legs, except the coxæ and trochanters, black. Wings yellowish hyaline, the apex from the end of the stigma fuscous, tinged with violaceous; the apex of the hinder with a narrower fuscous cloud. ♀.

Length 16 mm.

Sikkim.

Smooth, shining; the face, clypeus, labrum, mandibles, lower outer orbits, and base of legs pale yellow. The vertex in the centre with a short black pile, the face, clypeus, labrum, and base of mandibles sparsely covered with long pale hair; the thorax above thickly covered with short fuscous pubescence. Apex of clypeus broadly, roundly incised; the labrum punctured at the root of the hairs. Apex of mandibles black. Upper half of the front with a wide shallow depression, which is sparsely haired; the lower with a deeper, smooth, bare depression, the two parts being clearly separated; they are bordered by a broad keel. Centre of vertex (including the ocelli) bordered by a narrow, but distinct, furrow. Head large, wider than the thorax, the temples wide, rounded; occiput sharply margined. The third and fourth joints of the antennæ are almost of equal length; the antennæ are densely covered with short stiff black pubescence. Scutellum prominent, obliquely sloped at the base and apex.

This species comes close to *T. xanthoptera*, Cam.; the two may be separated thus:—

Hind femora, base of hind tibiæ, and apex of abdomen luteous; the third joint of antennæ distinctly longer than the fourth; the upper part of the frontal area roundly curved outwardly, the sides distinct, reaching to the outer ocelli, the apex of the lower part distinctly obliquely narrowed. . . . . *xanthoptera*.

Hind legs, except the coxæ and trochanters, and the apical segments of the abdomen black; the third joint of the antennæ not distinctly longer than the fourth; the upper part of the frontal area not curved outwardly, the sides not distinctly keeled, not reaching to the hind ocelli, the lower part not distinctly obliquely narrowed..... *lepcha*.

*Siobla rufo-balteata*, sp. n.

Black, the head and mesonotum tinged with blue; the labrum, a line round the pronotum, narrowest in the middle, the anterior tibiæ in front and the outer side of the posterior, white; the second to sixth abdominal segments rufous. Wings hyaline to the first transverse cubital nervure, smoky violaceous beyond; the nervures and stigma black. Head, upper part of thorax, and legs densely covered with white pubescence, the antennæ thickly with stiff black pubescence. ♀.

Length 8 mm.

Yunzalin Valley, Upper Tenasserim; November (*C. T. Bingham*).

Front and vertex closely, finely punctured, shining; above each antenna is a wide, deep furrow, roundly dilated above and reaching halfway to the ocelli; in the middle below is a deep, slightly longer than wide, fovea; there is a wide, deep furrow between the ocelli in the middle. Scutellum minutely punctured. Cenchri large, white. The black on the apex of the abdomen has a violaceous tint; below it extends on to the sides of the sixth segment. Middle lobe of mesonotum furrowed, the furrow wide at the base, gradually narrowed towards the apex. The middle of the vertex is not bordered by furrows, the part behind the ocelli forming one piece. Temples narrow; occiput not quite transverse, being slightly curved inwardly. The clypeus is more strongly punctured than the rest of the head and becomes gradually narrowed to a point. The third joint of the antennæ is distinctly longer than the fourth; it is also thinner, becoming slightly dilated towards the apex; the apical four joints are thicker than the others, they become gradually narrowed towards the apex.

*Selandria basilineata*, sp. n.

Black, slightly tinged with blue; the clypeus, a narrow line on the edge of the pronotum, a broader one on the apex of the first abdominal segment, the apex of the middle coxæ

narrowly, of the hinder broadly, the apical joint of the middle trochanters slightly, the greater part of the posterior, the anterior tibiæ in front and the basal half of the four posterior above, white. Fore wings hyaline to near the stigma, the rest fuscous; the stigma, costa, and nervures black; the hind wings hyaline. ♂.

Length 9 mm.

Sikkim.

Antennæ stout, densely covered with black, stiff pubescence; tapering towards the apex, thickened towards the middle. Head slightly broader than the thorax; the temples broad, rounded behind; the front and vertex forming one piece; the ocellar region not bounded by furrows; there is a deep, small, clearly defined, semicircular fovea in the middle of the front below; on each side, above it, is a smaller, less distinct one, the three forming a triangle. Apex of clypeus broadly rounded; the pubescence on the front long, dense, pale. Upper part of thorax almost bare, the sides and breast bearing white pubescence. The second and following abdominal segments, at the apex, are narrowly, obscurely lined with white. The first transverse cubital nervure is faint in the middle.

Allied to *S. fuscinervis*, Cam., and *S. cæruleiceps*, Cam.; it may be known from both by the white clypeus and by the white band bordering the basal segment of the abdomen. It is a broader species than either.

#### Chalcididæ.

##### *Oncochalcis marginiscutis*, sp. n.

Black, densely covered with silvery pubescence, the apex of all the femora, the four anterior tibiæ, except the front pair (which are marked with black broadly in the centre behind) and the middle pair (which are similarly marked in front and behind), the hinder broadly at the base and apex behind (about one third), the tarsi and the tegulæ, bright lemon-yellow; wings hyaline, the nervures black. ♀.

Length 6 mm.

Haundraw Valley, Middle Tenasserim; August (*C. T. Bingham*).

Sides of front longitudinally reticulated; the vertex covered with round, interlacing punctures. Face irregularly rugosely punctured, with an aciculated space in the middle; the space wide in the middle, obliquely narrowed above and below. Clypeus punctured somewhat strongly in the middle.

Labrum large, aciculated, depressed in the middle, almost semicircular, the sides margined. Pro- and mesonotum and scutellum closely, somewhat strongly punctured; the base of pronotum slightly projecting in the middle, the sides broadly curved. Apex of scutellum broadly rounded, with a raised margin, behind which is a crenulated furrow. Metanotum coarsely reticulated, the areola longer than wide, the apical half abruptly widened, its apex almost transverse. In the centre of the propleuræ is a semicircular closely striated space, projecting into the punctured upper part, the sides irregularly marked with stout keels; at the bottom are two irregular depressions. On the lower part of the smooth, flat base of the metapleuræ are three irregular, but distinct foveæ, one below the other, the upper longer than wide, ovoid, the lower two wider than long; the part below them coarsely, rugosely punctured, more or less reticulated; the middle stoutly striated, the striæ distinctly separated and becoming weaker below; the apex projects and bears weak indications of striæ. Metapleuræ closely, rugosely reticulated. Basal three segments of abdomen bare, shining; the fourth and fifth are punctured and covered with white pubescence at the apex; the sixth is large, strongly punctured and covered with white pubescence. There are twelve teeth on the hind femora, the apical stronger than the basal; the apex of the hind tibiæ has a distinct projection, which is curved and becomes gradually narrowed.

#### Evaniidæ.

##### *Evania Binghami*, sp. n.

Black, the antennal scape and the basal three joints of the flagellum, mandibles, the fore legs, the middle except the tarsi and the hind trochanters and femora, red; the head and thorax closely covered with white hair, the thorax also more densely with white pubescence; the legs thickly with longer hair, which is white on the coxæ and trochanters, fuscous on the rest. Wings hyaline, clouded in the discoidal cellule; the costa, stigma, and nervures black, the apical nervures pale. ♀.

Length 7 mm.

Haundraw Valley, Middle Tenasserim; August (*C. T. Bingham*).

Face strongly striated, the striæ clearly separated, converging towards the centre below and with a stouter central longitudinal keel. Sides of front strongly striated, the wider

central part smooth, with a stout keel down the middle; the malar space strongly, obliquely striated and with some punctures. Eyes prominent, very slightly converging above, separated from the mandibles by their own length. Temples short, oblique; the occiput margined, transverse. Base of thorax transverse, the sides of pronotum oblique. Pro- and mesonotum coarsely, rugosely punctured; the apex of the latter with widely separated keels enclosing depressions. Scutellum stoutly reticulated-punctured. Median segment with large, round, deep reticulations; the apical slope depressed in the middle at the apex, thickly covered with white pubescence. Propleuræ with longitudinal keels, with a large fovea between them at the apex; the meso- and metapleuræ closely reticulated, the upper basal half of the former smooth, bare, and shining, and having the top bordered by an area with four stout keels, of which the anterior pair are closer to each other and converge below. Metasternal process stout, the basal part long, broad, the apical forks roundly diverging. Abdomen shining, the petiole irregularly striated at the base, the middle with deep punctures. Hind coxæ, except at the enlarged base, stoutly punctured; the trochanters and femora with scattered punctures; the tibiæ more strongly, closely, rugosely punctured, their calcaria rufo-fulvous, the long spur not reaching to the middle, more than one third of the length of the metatarsus; the tarsal joints with rufous spines at the apex; the metatarsus sparsely spinose. The transverse median nervure is interstitial. The antennæ are shorter and thicker than usual, especially beyond the middle of the flagellum. The ocelli are almost in a line, the anterior hardly projecting beyond the posterior; these are separated from each other by a distinctly greater distance than they are from the eyes.

The legs and antennæ are shorter and stouter than usual.

#### Braconidæ.

##### *Iphiaulax domdamiensis*, sp. n.

Luteous, the antennæ and ocellar region black. Wings yellowish hyaline to the parastigma, the yellow forming a triangular cloud in the lower basal part of the first discoidal cellule; the first cubital cellule for the greater part hyaline, slightly tinged with yellow; the basal two thirds of the hind wings yellowish hyaline. Basal four segments of abdomen as long as the head and thorax united, hardly wider than the thorax, smooth, except the second segment, which is strongly

striated to the lateral depressions, and the third, which is finely closely striated to the beginning of the lateral furrows, the striæ extending to near the middle. There is a distinct keel down the middle of the second segment, with a small, smooth, triangular plate at the base. Sutureform articulation closely crenulated, the apical lateral branch smooth; there is a smooth curved furrow at the base of the fourth segment in the middle; there are no lateral apical furrows. The hind tarsi are black from near the middle of the basal joint. Temples broad, rounded, slightly narrowed; the occiput transverse. The ocellar black spot is rounded behind; in front it is gradually narrowed and reaches close to the antennæ; there is a distinct furrow down the front. Ocelli brown, the anterior lighter coloured than the posterior. ♀.

Length 13, terebra 9 mm.

Domdami Valley, Middle Tenasserim; September (*C. T. Bingham*).

The apex of metanotum and the second and third abdominal segments are suffused with fuscous. Face smooth, with sparse black longish hairs. Tips of mandibles black. Second cubital cellule about two and a quarter times longer than wide; the recurrent nervure is received shortly behind the cubital.

*Iphiaulax haundrawensis*, sp. n.

Luteous; occiput, vertex, upper half of front, a line leading from this black part to each antenna, antennæ, three broad lines on the mesonotum (the central shorter and broader than the lateral, which extend from near the base to the scutellum), the third and following segments of the abdomen and large spots on the ventral, the apical two thirds of the hind tibiæ, their calcaria, and the tarsi, black. Wings yellowish hyaline to near the base of the stigma, the yellow extending beyond the lower part of the transverse basal and the transverse median nervure and the basal half of the hind wings; the rest fuscous, except the usual hyaline spots below the stigma; the costa, except at the apex, and the stigma to shortly beyond the middle, pale luteous. ♀.

Length 11, terebra 3 mm.

Haundraw Valley, Middle Tenasserim; August (*C. T. Bingham*).

Abdomen as long as the head and thorax united and broader than them; longish oval; the first segment stoutly keeled in the middle, the sides with a few irregular stout

striae; the second segment clearly wider than long, its centre stoutly longitudinally striated, without a smooth basal area and keel; the suturiform articulation irregularly striated, the sides smooth and triangularly dilated; there is a distinct crenulated furrow on the base of the fourth and fifth segments and a smooth one on their apices; the pubescence on the basal two segments is pale fulvous, on the others black, on the apical dense; the apices of the sixth and seventh have a narrow pale border. Wings ample; the recurrent nervure is interstitial; the second cubital cellule is three times longer than wide.

*Iphiaulax stramineus*, sp. n.

Pale yellow, the lobes of the mesonotum broadly pale brown; the antennæ, centre of front broadly, the vertex broadly in front, entirely behind to near the middle of the outer orbits, and the occiput, black; the face and orbits pale yellow. Wings yellowish hyaline to the lower part of the transverse basal nervure; beyond fuscous violaceous, with the usual hyaline spots below the base of stigma; the fuscous cloud in the hind wings is broadest behind; the stigma is yellow to the commencement of the radius. The middle of the first abdominal segment, the second entirely, and the basal two thirds of the third are closely longitudinally striated; there is no area on the base of the second segment, it being there striated like the rest of the segment. ♀.

Length 13, terebra 4 mm.

Haundraw Valley, Middle Tenasserim; August.

Abdomen elongate-oval, the basal three segments as long as the thorax; suturiform articulation wide, deep, crenulated; there is a narrower but distinct crenulated furrow on the base of the fourth; there are no apical furrows. Metanotum thickly covered with longish white pubescence. The second cubital cellule fully three times longer than wide.

This species is related to *I. spilocephalus*, Cam., but is much paler in colour, the abdomen longer and narrower, and the second cubital cellule much longer.

*Iphiaulax burmaensis*, sp. n.

Rufo-luteous, the flagellum of antennæ black. The wings yellowish hyaline, the apex with a narrow pale fuscous border; the base of first cubital cellule with a small black square cloud, reaching to the base of the stigma; the costa, stigma, and nervures bright luteous. The raised middle of

first abdominal segment closely, strongly, longitudinally striated, with a distinct keel down the centre; the basal two thirds of the second closely, somewhat strongly, irregularly, more or less obliquely striated, and without a basal defined area. ♀.

Length 17, terebra 9 mm.

Shwegyin, Lower Burma; November (*C. T. Bingham*).

This species is remarkable for the asymmetry of the furrows on the second abdominal segment; they are not placed opposite each other, that on the left side, looking from the head, being near the middle and straight, oblique; the other is near the apex and is roundly curved, the part beyond it is closely striated, that on the opposite side to it at the apex is smooth; beyond it is a narrow, deep, closely striated furrow, from which the following segments become gradually narrowed. Parapsidal furrows indicated on basal slope only; the apex of mesonotum flat. Temples roundly narrowed; the occiput slightly roundly incised. Face sparsely punctured laterally, each puncture with a longish black hair. Pubescence moderately dense, fulvous. Wings longer than the body, the second cubital cellule as long as the third, the transverse median nervure not quite interstitial, the recurrent nervure received near the apex of the first cubital cellule.

*Iphiaulax lineaticarinatus*, sp. n.

Luteous, the flagellum of antennæ black. The wings yellowish hyaline, the costa, stigma, and nervures luteous; the parastigma and apex of stigma black; a black cloud at the base of the stigma, oblique, slightly narrowed in front, extending to the recurrent nervure, which it covers; a broad lighter-coloured band on the apex, commencing near the base of the radial and second cubital cellules, broader and deeper tinted behind; there is a similar apical cloud in the hind wings. Smooth, shining; a distinct narrow keel of equal width down the middle of the first and second segments and a less distinct one down the third; there is a broad depression down the sides of the second segment, curved, narrowed and oblique on the inner side of the base; there is a distinctly defined smooth furrow on the basal half of the third; the suturiform articulation wide, crenulated. Temples wide, obliquely narrowed; the occiput rounded inwardly, the sides broadly rounded. Face covered with long black hair. Clypeus clearly separated, forming a distinct semicircle. First abdominal segment twice longer than it is wide at the

apex, the second longer than wide, the others wider than long; the transverse median nervure not quite interstitial. ♂.

Length 15 mm.

Sikkim.

This species is closely related to *I. bhutanensis*, Cam.; that may be known, *inter alia*, by the absence of a middle keel on the third segment, by the much weaker keel on the first, and by the keel on the second being triangularly dilated at the base.

Also to *I. pauperatus*, Cam.; that has the keel on the second abdominal segment dilated at the base, and it does not reach to the apex of the segment; the space on either side of it is obliquely striated, not perfectly smooth as in the present species.

*Iphiaulax sikkimensis*, sp. n.

Luteous, the abdomen darker coloured, the antennæ black. The wings yellowish hyaline to near the top of the transverse basal nervure, dark fuscous beyond, the base of the discoidal cellules being yellowish; the basal half of the stigma yellow; the area on base of second abdominal segment narrow, longish, gradually narrowed, running into the keel, stoutly longitudinally striated. Abdomen longish oval, broader than the thorax; the basal three segments stoutly longitudinally striated, the striæ strongest on the first. Temples broad, roundly narrowed, the occiput transverse. ♀.

Length 12, terebra 4 mm.

Sikkim.

Face sparsely punctured, covered with long bright fulvous hair. Front and vertex smooth, sparsely haired. Basal half of mandibles luteous, the apical black. The depression on the base of the second segment is closely obliquely striated; the striæ on the middle of the segment are strong and intertwine. The basal two abscissæ united are as long as the third; the second cubital cellule is fully three times longer than wide along the cubitus.

Comes near to *I. spilopterus*, Cam.

*Iphiaulax Hookeri*, sp. n.

Luteous, the head paler, more yellowish in tint; a large broad mark on the front, extending backwards to shortly behind the ocelli, where it is narrowed and rounded; the third and following segments of the abdomen, the hind tibiæ from near the base, the hind tarsi, the hind spurs, and the antennæ black. Wings yellowish hyaline to the top of the

transverse basal nervure, blackish fuscous beyond; the stigma black. Abdomen smooth; the apex of first segment finely striated in the middle, the second much more strongly and irregularly striated; the keel large, the basal half roundly narrowed, smooth, the apex gradually narrowed to a point, followed by a keel nearly as long as the dilated basal part, and which does not quite reach to the apex of the segment; it is bordered in the middle by five or six stout oblique striæ, the parts surrounding the base and apex being smooth. Sutureform articulation deep, closely stoutly crenulated; there is a curved lateral branch, which is not quite so strongly crenulated; the sides of the segment irregularly roughened. ♀.

Length of body and ovipositor 13 mm.

Sikkim.

Head large, cubital; the temples longer than the eyes, slightly rounded, not narrowed; the occiput transverse. Face distinctly sparsely punctured; the clypeus is separated from it by a distinct curved furrow, laterally by a depression in which is a round distinct fovea. Mandibles black, except at the base. Palpi testaceous, covered with white hair. Antennal scape slightly more than twice longer than wide, slightly dilated at the apex below. Recurrent nervure interstitial. First abdominal segment clearly longer than the second, about one fourth longer than it is wide at the apex. Malar space about one fourth shorter than the length of the eyes.

*Iphiaulax Campbellei*, sp. n.

Black; the head, the prothorax, the mesonotum laterally at the base, a line bordering the middle lobe, the centre broadly from behind the middle to the apex, and a large oblique mark below the fore wings testaceous; a mark bordering the sides of the scutellum and a broad line on the lower part of the mesopleuræ rufous; the first abdominal segment, except for a mark, longer than broad, in the centre at the apex and the ventral surface, pale testaceous. Legs black; the anterior apical joint of middle trochanters, the apical half of middle femora, a streak in their middle above, and the base of middle tibiæ testaceous. Wings almost hyaline; the stigma black, testaceous in front and at the base behind, the costa and nervures black; the recurrent nervure received shortly before the first transverse cubital. ♀.

Length 8, terebra 3 mm.

Sikkim.

Abdomen longish ovate, in the middle clearly wider than the thorax, which is equal to it in length; its first segment a little longer than it is wide at the apex; the central part gradually roundly narrowed from the apex to the base, longer than wide; the apical half with a central keel, widest at the base; from it stout striæ radiate towards the apex. The central part of the second segment is irregularly longitudinally reticulated-striated, the sides finely rugose, intermixed with striæ and punctures; the suturiform articulation deep, closely crenulated, without an apical lateral branch; the other segments opaque, alutaceous. The sixth and apical segments are whitish testaceous. Antennal scape fully three times longer than wide. The base of the cubitus is straight and runs parallel with the costa before curving down towards the first transverse cubital nervure.

*Iphiaulax? tenasserimensis*, sp. n.

Luteous, the flagellum of the antennæ black. The wings yellowish hyaline, the nervures and stigma luteous; the apex of the fore wing from the radius with a narrow smoky border, the hind wings with the apical third smoky; there is a square blackish cloud between the transverse basal nervure and the base of the stigma, the costa at its apex being also black. The first abdominal segment, except the basal slope, the second entirely, and the third to near the middle, closely, finely, longitudinally striated. ♀.

Length 13, terebra 7 mm.

Domdami Valley, Middle Tenasserim; October (*Bingham*).

Smooth, except on the basal abdominal segments, densely covered with fulvous pubescence, except on the face, where it is long, sparse, and blackish. Abdomen nearly twice the length of the thorax, not dilated in the middle, as wide as the thorax; the suturiform articulation wide, deep, striated; the other furrows narrow, smooth, indistinct. The third abscissa of radius is nearly as long as the basal two united. Temples broad, roundly narrowed; the occiput transverse. Mesonotum flat behind, the furrows distinct in front. There is no depression on the sides of the second segment; there is a short, broad, curved furrow on the sides of the third.

**Ichneumonidæ.**

*TRYPHONINÆ.*

*Cultrarius purpureotinctus*, sp. n.

Black, the apical three segments of the abdomen purple; the edges of the facial shield (the top more narrowly), the

upper eye-orbits below, and the underside of the antennal scape yellow; the flagellum of antennæ brownish below; the underside of the four anterior tibiæ and tarsi, the hind femora, a mark on the sides of the first abdominal segment, a broader continuous band on the apices of the second and third, and one on the lateral fourth of the fourth dark red; the genital armature large, rufo-testaceous. Wings hyaline, very iridescent, the radial cellule and the apical half of the third cellule smoky. ♂.

Length 14 mm.

Takvar, Darjiling, 4000 feet; April (*C. T. Bingham*).

Head somewhat strongly but not very closely punctured; the lower part of the face, outside the shield, and the clypeus fully more strongly and more closely punctured; the occiput and temples smooth, densely covered with white pubescence. Pro- and mesothorax strongly closely punctured, the pleuræ more strongly than the top; the scutellum still more strongly punctured, its basal depression wide, deep, with five stout keels; the end of the apical slope striated. Postscutellum densely covered with long white hair. Areola 6-angled, clearly longer than it is wide at the base, the apical half narrowed, the apex half the width of the base: it has a raised smooth line in the centre; the rest irregularly wrinkled; there is a large lateral area, wider than long, its apex broadly rounded, the centre with some large punctures, the apex with a few striæ, the apical slope closely rugosely punctured. Metapleuræ more strongly punctured than the rest, the punctures larger and more widely separated than on the mesopleuræ. Abdomen closely strongly punctured; the first segment raised in the middle, the raised part bordered by keels, which are higher and rounded at the base and depressed in the middle; the second and fifth segments are indistinctly keeled in the middle, the third and fourth have a more distinctly defined central keel which projects on the apex of the third; the apical two segments are densely covered with short black hair. Mesopleural furrow wide, deep. Areolet large, the nervures not uniting in front; the recurrent nervure received in the middle. Scutellum uniformly punctured; the lateral teeth large, triangular. Fore calcaria testaceous, the others white.

*Cultrarius areolatus*, sp. n.

Length 10 mm. ♂.

Sikkim.

This species resembles closely *C. purpureotinctus* in coloration. *Ann. & Mag. N. Hist.* Ser. 7. Vol. xix. 12

tion; the differences between them may be expressed thus:—

- Areola clearly longer than wide, 6-angled, the apical half obliquely narrowed, the apex transverse, the lateral area strongly punctured; scutellum without a deep furrow in the middle; the keels on the centre of the first abdominal segment not uniting at the apex, straight; areolet not appendiculated; the hind femora rufous ..... *purpureotinctus*.
- Areola as long as wide, not angled, its apex broadly rounded, the lateral area smooth; scutellum with a deep furrow in the middle; the keels on first abdominal segment roundly curved and uniting at the apex; the areolet shortly appendiculated; the hind femora black ..... *areolatus*.

The coloration is the same otherwise, except that the purple tint on the abdomen commences on the second segment, that the scutellar keels are yellow, and that the lines on the second to fifth abdominal segments are narrower, of more uniform thickness, and more yellowish in colour. The puncturation is pretty much the same; on the second segment of the abdomen it is stronger and more irregular, that segment, too, being shorter compared with the width; the keels on the second to fourth segments are narrow, but distinct. The calcaria are all whitish. The abdomen is shorter, too, compared with the thorax.

#### OPHIONINÆ.

##### *Eniscospilus xanthocephalus*, sp. n.

Luteous; the head pale yellow. The wings hyaline, the nervures black, the stigma testaceous: there are two horny points, the basal large, broad and transverse at the base; the base above narrow, transverse; from there it becomes gradually roundly narrowed to a fine point at the apex; the second point is close to the middle of the basal abscissa of the radius; it is longish, narrow, roundly curved towards the radius. Scutellum distinctly keeled laterally from the base to the apex; the basal half smooth, the apical finely, closely, longitudinally striated. Base of metanotum smooth; the depression with some stout striæ; the rest is stoutly striated, the striæ clearly separated; in the centre of the base is a short straight stria; the striæ at the sides of this are longitudinal and straight at the base, then curving out obliquely to the sides; the striæ on the apical slope are roundly curved from side to side. The centre of propleuræ finely obliquely striated; the lower half of the mesopleuræ longitudinally

striated, the striæ weaker above and all clearly separated. Base of radius broadly curved downwards; the discocubital nervure broadly roundly curved, but not much, at the apex, its apex widely distant from the commencement of the apical abscissa of the radius. ♀.

May be known from *E. reticulatus*, Cam., and *E. striatus*, Cam., from the Khasias, by the wings having two horny points in addition to the other differences.

Length 27 mm.

Haundraw Valley, Middle Tenasserim; August (*C. T. Bingham*).

#### CRYPTINÆ.

##### *Melcha ornatipennis*, sp. n.

Black; the scutellum, median segment entirely, the apex of mesopleuræ, base of first abdominal segment to shortly beyond the middle, all the femora, and the four hinder coxæ red; the four anterior tibiæ and the fore tarsi of a paler red, the middle tarsi fuscous, the anterior coxæ and trochanters black; the hind tibiæ and the basal and apical joints of the tarsi black, the middle joints white; the basal half of pronotum, apex of postpetiole broadly, the apex of the second segment slightly more narrowly and more irregularly, the apex of the sixth and the apical entirely, white. Wings hyaline, a cloud in the fore wings extending from the base of the stigma to the areolet and the recurrent nervure; the stigma and nervures black. ♂.

Length 9 mm.

Salween Valley, Middle Tenasserim; July (*C. T. Bingham*).

Thorax and head thickly covered with white pubescence. Base of metanotum smooth; there are two short keels in the middle at the transverse keel; the rest of the metanotum rather strongly reticulated, almost smooth in the middle at the base; the metapleuræ strongly but more closely reticulated. Propleuræ at the apex from shortly above the middle covered with close, stout, curved, longitudinal striæ. Areolet not quite square, being slightly longer along the radius than along the transverse cubital nervures; it is of equal width.

Allied to *M. maculipennis*, Cam., from Borneo; that species has the femora black and the scutellum white.

##### *Silsila spilonota*, sp. n.

Black; the face, clypeus, a line on the inner orbits, one on the lower third of the outer, the malar space, mandibles

(except the teeth), palpi, the dilated base of the pronotum, tegulae, an elongated conical mark at the apex of the middle lobe of the mesonotum, the broad end at the base and transverse, scutellums, scutellar keels, a large curved mark behind the hind wings, the apical slope of the metanotum (the mark continued backwards in the middle, this line becoming gradually narrowed), the apex in the centre with a black line, the lower edge of the propleuræ, the line narrowed in front, tubercles, a large mark on the lower part of the mesopleuræ, the top broadly incised, the apex above smaller than the base, a curved mark at the apical half of the sternal furrow, a large elongated conical mark on the metapleuræ and broad bands on the apices of the abdominal segments, yellow. Four front legs pale yellow, infuscated above; hind coxæ black, broadly yellow in the middle above, the trochanters black; the femora fulvous, their base narrowly and the apex from near the middle black; the tibiæ yellow, tinged with fulvous, the base narrowly and the apical fourth black; the tarsi white, the apex of last joint black. Wings hyaline, the stigma and nervures black. Antennæ broadly ringed with white. ♂.

Length 13-14 mm.

Haundraw Valley, Middle Tenasserim (*C. T. Bingham*).

Face strongly but not closely punctured; the clypeus with a few punctures above. Front and vertex smooth, a short keel and a few striæ on the front below. Mesonotum smooth, the inner half of the outer lobe irregularly reticulated at the apex. The space at the sides of the scutellums irregularly stoutly striated. Basal depression of metanotum stoutly crenulated; the base at the sides stoutly irregularly punctured; the rest stoutly transversely reticulated. Pro- and mesopleuræ stoutly longitudinally striated, the striæ roundly curved, the lower part of the latter strongly punctured. Metapleuræ strongly punctured above, the punctures distinctly separated, the puncturation below coarser, the punctures running into reticulations. Pro- and mesonotum sparsely haired, the metanotum much more densely pilose and with the hair longer.

May be known from the two described Himalayan species of *Silsila* (*fulvipes*, Cam., and *bilineata*, Cam.) by the large conical mark on the mesonotum.

*Buodias rugifrons*, sp. n.

Black; the face, clypeus, basal half of mandibles, palpi, a line on the upper inner orbits and on the lower half of the

outer, a line on the base of propleuræ extending broadly on to the pronotum, a line on the sides of pronotum, a small conical spot on the apex of the middle lobe of pronotum, scutellum, base of metanotum (the lines narrowed on the inner, dilated on the outer side), a square mark in the centre behind the keel (the middle part narrowed at the base, the line becoming gradually dilated to a triangle), the apical slope, a spot below the hind wings, and the apical three fourths of the metapleuræ, the apex of the second abdominal segment, the apical and the ventral segments, pale yellow. Four front legs pale yellow, the femora slightly tinged with fulvous; the hind legs rufo-fulvous; the trochanters, apical half of femora, and the tibiæ from near the middle black; the tarsi white, narrowly black at the base. Antennæ broadly ringed with white. Wings hyaline, the nervures and stigma black. ♂.

Length 10 mm.

Sikkim.

Face closely and strongly punctured, the clypeus smooth. Front closely rugosely reticulated, keeled down the middle, the lower part with a smooth transverse line, clearly separating the rough part; vertex closely punctured. Mesonotum closely distinctly punctured, except at the sides; the scutellum smooth. Base of metanotum with scattered punctures; inside the spiracles is a keel reaching from the base to the apex; there is a keel on the apical half of the white central mark; the rest is stoutly longitudinally reticulated, mixed with some punctures; the lateral teeth are small. Areolet of almost equal width, longer along the radius than along the transverse cubital nervures, the recurrent nervure received near the middle.

This species is smaller than the others; the areolet is larger and the metanotal spines smaller than usual.

*Cryptus Binghami*, sp. n.

Black; a narrow line on the inner orbits, a similar one on the lower two thirds of the outer, and the tubercles yellowish testaceous; the legs red; the coxæ, trochanters, and the underside of the four anterior femora to shortly beyond the middle, and a short line on the apex of posterior femora, black; the apical joints of the four anterior tarsi infuscated, joints 2-4 of the posterior yellow. Wings hyaline, the nervures and stigma black. ♀.

Length 13, terebra 4 mm.

Darjeeling, 5000 feet (*C. T. Bingham*).

Postscutellum smooth, the sides aciculated-striated. Propleuræ rugose above, the rest stoutly obliquely striated, the striæ intermixing more or less; the meso- and meta-pleuræ closely coarsely reticulated-punctured. Tibiæ sparsely, the tarsi closely spinose. Palpi and mandibles black, the former covered with white pubescence. Head, thorax, and legs densely covered with white pubescence. The front is deeply depressed from the eyes and is strongly, closely, transversely striated.

This species is not unlike *C. luculentus*, Cam.; the two may be separated thus:—

Apical keel on metanotum interrupted in the middle; four anterior femora not lined with black; the three middle joints of hind tarsi not yellow . . . .	<i>luculentus</i> , Cam.
Apical keel on metanotum complete; the four anterior femora broadly lined with black; the three middle joints of hind tarsi yellow . . . . .	<i>Binghami</i> .

*C. Binghami* is a more slenderly built species than *luculentus*; the front is more deeply depressed and is more distinctly transversely striated; the scutellum is more prominent and has the sculpture rougher and more irregular.

The male of *Binghami* has the inner orbits more broadly yellow than in the female; it differs further in the face having in the middle of the top above a yellow mark, longer than wide and narrowly projecting at the sides above; the clypeus and mandibles are for the greater part yellow, as are also the greater part of the anterior coxæ and trochanters; the middle coxæ and trochanters are yellow on the outer side.

*C. luculentus* has been taken by Col. Bingham at Darjiling, 7000 feet, in March.

### ICHNEUMONINÆ.

#### ICHNEUMONINI.

##### LAGARISTA, gen. nov.

Scutellum not much raised, quadrate, stoutly keeled laterally to the top of the apical slope. Metanotum regularly areolated; the areola about two and a half times longer than wide, rounded and slightly narrowed at the base, rounded inwardly at the apex; the lateral basal areæ confluent, the petiolar area absent. Antennæ distinctly dilated towards the apex. Apex of clypeus broad, transverse. Apical tooth of mandibles long, narrowed gradually towards the apex; the subapical tooth short, turned inwardly. Base of petiole broader at the base than it is thick dorso-ventrally—broader

than in *Ichneumon*, but not so broad as in *Platyglabis*. There are seven abdominal segments; the last broad at the apex, two thirds of the length of the penultimate; the ventral fold extends to the apex of the fourth segment. Areolet 5-angled; the discocubital nervure unbroken; the transverse median nervure interstitial. Tarsi closely spinose. The ovipositor is long, distinctly projecting, as long as the apical two segments united.

The head is as wide as the thorax; it is large, but not behind, the temples being short, the occiput rounded inwardly, the cheeks sharply margined. Labrum hidden. The antennæ are longer than the body, slender, except at the dilated apical part; the basal joints of the flagellum elongate, the first slightly longer than the second. Postpetiole striate.

The systematic position of this genus is not clear. The form of the metanotum is as in the *Ichneumonini*, and it cannot therefore be referred to the *Joppini*. For the present I refer it to the former tribe. It is clearly related to the Ceylonese *Aluina*, Cam.; that genus may be known by the areola being much wider compared with the length, by the much wider temples, and by the discocubital nervure being broken by a stump. The form of the metanotal areola separates the Ceylonese *Deniya* from it; that genus may be further known by the almost obsolete temples, transverse occiput, and by the apex of the clypeus being rounded.

*Lagarista maculiscutis*, sp. n.

Black; the head except the centre of the vertex (covering the ocelli), the front, and the occiput except the outer edges, a line on the top and bottom of prothorax, two narrow longish lines in the middle of the mesonotum, scutellar keels, scutellum except for a conspicuous black conical mark in the centre, postscutellum, an irregular mark in the centre of the lateral basal area of the metanotum, the apical lateral areas, the yellow extending slightly below them, the greater part of the lower half of the mesopleuræ, a large spot behind the hind wings, the metapleuræ from behind the middle, and the apices of the abdominal segments (the lines on the basal three broad and dilated laterally—that on the fifth narrow and interrupted in the middle, that on the sixth in the centre only, and the last entirely), pale yellow. Legs fulvous; the four anterior coxæ and trochanters pale yellow, the hinder femora more reddish in tint; the hind coxæ yellow, fulvous on the outer side and blackish at the apex above; the apex of the hind femora, of the hind tibiæ more broadly, and of the

basal half of the metatarsus black; the hind tarsi white. Wings hyaline, the stigma testaceous, the nervures blackish. Flagellum of antennæ broadly ringed with white. ♀.

Length 11 mm.

Sikkim.

Face distinctly but not closely punctured, the clypeus with a few scattered punctures above; front below the ocelli finely closely striated. Mesonotum closely, regularly, somewhat strongly punctured; the scutellum with a few large punctures in the centre. Posterior median area furrowed round the edges except at the apex; it is smooth, as are also the parts at its base; the rest of the segment closely strongly punctured except the posterior median area, which is strongly irregularly striated. Meso- and metapleuræ closely strongly punctured; the propleuræ smooth, striated at the apex. Abdomen closely punctured, the centre of postscutellum finely striated.

### JOPPINI.

#### LISSOPHADNUS, gen. nov.

Scutellum rather flat, distinctly keeled laterally to the commencement of the apical slope. Areola represented by a small, smooth, flat, curved tubercle, widely distant from the base of the metanotum. Posterior median area with the apical half narrower than the basal; the apical lateral area commences at the end of the basal part, it is narrow, sharply pointed at the top, becoming gradually widened towards the apex; the basal lateral areæ are large, square, confluent, there being no petiolar area; the apical large, wide at the base, gradually narrowed towards the apex; the spiracular area distinct. Clypeus not separated, its apex transverse. Labrum projecting. Occiput deeply incised, margined. Areolet large, 5-angled; transverse median nervure received distinctly beyond the transverse basal. Petiole long, narrow, the postpetiole gradually widened. Mandibles unequally dentate.

Body uniformly rufo-testaceous; the wings hyaline. Discocubital nervure broken by a stump, as is also the recurrent nervure. The second and following segments of the abdomen closely punctured, the first smooth and shining.

The form of the metanotum and its areola is as in *Dimætha*, which genus may be known from the present by the scutellum not being flat and not keeled, by the areolet being narrowed in front, 4-angled, by the discocubital and recurrent nervures being unbroken, by the wings being clouded at the apex, and by the postpetiole being strongly punctured.

*Lissophadnus testaceus*, sp. n.

Testaceous, tending to rufous-ferruginous; the antennæ beyond the sixteenth joint black, the middle joints tinged with yellow. Wings clear hyaline, highly iridescent, slightly violaceous towards the apex. ♀.

Length 22 mm.

Runjit Valley, 1500 feet, Sikkim; April (*C. T. Bingham*).

Base of metanotum at the sides sparsely but strongly punctured; the lateral middle area rugosely punctured at the base, transversely reticulated-punctured at the apex; the posterior median area irregularly transversely striated; more or less reticulated at the apex; the lateral apical areas are coarsely reticulated; the segment is thickly covered with pale pubescence. Pleuræ closely punctured; the lower apical part of propleuræ striated. Clypeus somewhat strongly but not closely punctured in the middle; the sides and face smooth, almost bare. Labrum fringed with long golden hair. Front depressed; the inner orbits margined. Tips of mandibles black. Tarsi closely spinose.

*Acanthojoppa flavo-orbitalis*, sp. n.

Luteous; the sides of the face, clypeus broadly, the orbits broadly, and the pleuræ tinged with yellow; the middle of antennæ tinged with yellow; the eighteenth and following joints black. Wings hyaline, the basal half tinged with fulvous; the stigma and costa rufo-testaceous, the nervures black. ♀.

Length 14 mm.

Domdami Valley; October (*C. T. Bingham*).

Face strongly closely punctured, the upper part of the clypeus as strongly but not so closely punctured. Front and vertex smooth, the upper part of the front raised, surrounded at the sides and below by a smooth, bare, shining depression. Mesonotum closely finely punctured, depressed on either side laterally at the base; the scutellum more strongly punctured and thickly covered with long pale fuscous pubescence; the apical incision broad, rounded, not deep. Base of metanotum irregularly punctured; the areola round the sides and base reticulated, the apex in the middle closely, strongly, longitudinally striated; the second lateral area closely reticulated; the apical slope strongly transversely striated. Propleuræ on the upper half perpendicularly striated, below irregularly, more strongly reticulated-striated.

Mesopleuræ closely, strongly, irregularly punctured, more or less striated in the middle and at the apex below. Metapleuræ coarsely rugosely punctured, more or less coarsely striated below. Petiole smooth; the second segment is more strongly punctured than the others. The transverse cubital nervures meet in front; the recurrent nervure is received shortly beyond the middle.

The areola is large, longer than wide, rounded at the base, transverse at the apex, the sides bulging out where the transverse keel joins them; the pubescence on the apical slope long, dense, fuscous; the spines broad, rounded; its centre raised.

Comes near to *A. tinctipennis*, Cam.

*Xanthojoppa latibalteata*, sp. n.

Pale yellow; a line covering the ocelli and extended down to near the antennæ, three broad lines on the mesonotum (a transverse one uniting them at the apex), the scutellar depression, a line round the base of the metanotum, the greater part of the areola, the posterior median area, a broad band across the pronotum, a line on the top of the mesopleuræ, one down the base of the metapleuræ, one behind the hind coxæ, a mark (longer than wide) commencing near the middle and extending on to the postpetiole, a band on the second segment extending from the base to shortly beyond the middle, one on the basal half of the third with the apex transverse, and semi-circular ones on the basal half of the fourth, fifth, and sixth, the underside of the hind coxæ except at the base, the mark continued above obliquely to the upper inner edge, the hind femora except below, the apical two thirds of the hind tibiæ, and the hind tarsi, black. Wings hyaline, iridescent, the stigma testaceous, the nervures black. ♂.

Length 12 mm.

Domdami Valley, Middle Tenasserim; October (*C. T. Bingham*).

Areola reticulated; the upper third of the posterior median area longitudinally, the rest transversely, reticulated, the rest of the segment closely rugosely punctured, the apical slope thickly covered with fuscous pubescence. Pro- and mesothorax distinctly punctured, closely on the mesonotum; the scutellum more strongly punctured and thickly covered with longish fuscous pubescence. Scape and pedicel of antennæ rufo-testaceous, the rest black, the basal joints testaceous below. Petiole smooth; the second and third segments are closely distinctly punctured; the gastrocœli small, transverse,

smooth, testaceous; behind them are two long keels, with a shorter keel on the outer and inner side. Areolet 4-angled, distinctly narrowed in front; the recurrent nervure is received shortly beyond the middle; the discocubital nervure unbroken, the transverse median received beyond the transverse basal.

Allied to *X. 3-lineata*, Cam., which may be known by the absence of black on the hind legs, by the black line on occiput, and by the narrower abdominal black bands.

*Amblyjoppa Binghami*, sp. n.

Black; the basal three segments of abdomen red; the face (except for an anchor-shaped black mark down its centre), the clypeus (except for a small conical mark on its apex in the middle), the upper inner orbits (the line not reaching to the ocelli), a line on the lower two thirds of the outer (the line becoming gradually wider below, extending obliquely to the outer side of the mandibles), a broad line on the pronotum, tegulæ, tubercles, a squarish mark on the lower side of the mesopleuræ extending on to the sternum, two lines in the centre of mesonotum, scutellar keels, scutellum from shortly behind the middle, postscutellum, a mark almost filling the apical lateral area of metanotum, and the broad apical part of the sides of postpetiole, yellow. Legs yellow, densely covered with white pubescence; the hind femora red; the outer apical half of the fore femora, the middle femora (except the apical half below), the hind coxæ (except for a large mark above), the base and apex of hind femora narrowly, the apex of the hind tibiæ more broadly, and the hind tarsi, black. Wings hyaline to the base of stigma, smoky violaceous beyond, the nervures and stigma black. Antennal scape yellow below, the flagellum with a narrow yellowish band. ♀.

Length 20 mm.

Sikkim, Runjit Valley, 1000 feet; April (*C. T. Bingham*).

Head and thorax closely strongly punctured and thickly covered with white pubescence. The areola small, roundly narrowed to a point behind; the point dilated, the bordering keels smooth, shining, the apical narrower, less distinct, broadly rounded inwardly; the inner sides furrowed, the centre shining, irregularly wrinkled. The basal areae aciculated at the base, the rest irregularly punctured; the other areae strongly punctured, the posterior median stoutly transversely striated. Scutellum slightly roundly raised, the sides keeled to the middle. Pleuræ closely punctured, the lower half of propleuræ irregularly striated. Petiole keeled laterally,

and with a less distinct keel down the middle; the post-petiole closely strongly striated in the middle, the sides almost smooth; the second to sixth segments closely punctured, the puncturation becoming gradually weaker; the second and third striated down the middle. Gastrocœli deep, smooth.

This species is not unlike *A. rufocincta*, Cam., in coloration; it differs in the scutellum being longer compared with the width, more raised at the base, and with the lateral keels longer and more distinct, and the areola is smaller and more narrowed—more sharp-pointed—at the base.

*Amblyjoppa iridipennis*, sp. n.

Dark rufo-testaceous; the apical two thirds of the mesopleuræ above, the apical half below, the metapleuræ, metanotum, the basal segment of abdomen, and the second to shortly beyond the middle, the mesosternum (except for a triangular space on either side at the base), the hind coxæ, and the base of the trochanters above, black. The basal sixteen joints of antennæ yellow, tinged with red, the rest black. Wings uniformly fuscous violaceous, the nervures and stigma black. ♀.

Length 18 mm.

Sikkim.

Head and thorax somewhat strongly closely punctured; the eye-orbits are tinged with yellow, the yellow tinge broader on the lower outer orbits. The apex of mesonotum lighter-coloured in the middle. Base of metanotum strongly punctured (except for a smooth space bordering the areola); the latter is gradually narrowed from the apex to the base, which is rounded, narrow; the apex is rounded inwardly, the keel narrow, irregular; the outer edge of the inner side is irregularly narrowly depressed; in the centre is an irregular depression, and there are two smaller ones at the apex; the apical slope is irregularly strongly reticulated, the posterior median area more strongly than the lateral. Abdomen closely punctured, strongly at the base, weaker towards the apex; the second segment depressed at the base, between the gastrocœli, closely striated; the latter has four stout clearly separated keels on the inner half and one near the outer side.

*Amblyjoppa? maculicollis*, sp. n.

Black; the face, clypeus, mandibles, and the orbits narrowly, yellow; the front and vertex yellow, suffused with

rufous; the occiput and temples rufous, the mesonotum and scutellum of a deeper rufous colour, the scutellum darker coloured; a yellowish-rufous line, dilated behind, on the pronotum; the anterior legs reddish testaceous; the middle tibiæ in front testaceous, the middle femora fuscous in front. Wings fuscous violaceous, the nervures and stigma black; the areolet 4-angled, the nervures meeting in front. Areola moderately large, horseshoe-shaped; the apex rounded inwardly. ♂.

Length 15 mm.

Middle Tenasserim, Salween Valley; July (*C. T. Bingham*).

Basal half of areola smooth, bordered laterally by a deep furrow; the apical half coarsely rugosely punctured. Head closely punctured, the apex of clypeus with only a few scattered punctures. Front furrowed down the centre, the furrow narrowed towards the apex. Thorax closely distinctly punctured, the scutellum more strongly than the mesonotum and thickly covered with blackish-fuscous hair. The metanotum at the base strongly punctured, the punctures distinctly separated; on the rest the puncturation is closer, more rugose, and more or less running into reticulations, on the posterior median area transversely reticulated. The mesonotum is densely covered with short fulvous pubescence; on the median segment the pubescence is longer and black, on it also the black is suffused with brown. Abdomen strongly closely punctured, the puncturation becoming weaker towards the apex; gastrocæli strongly regularly striated, the space between them being also striated. The malar space is black; a black spot connects the ocelli to the eyes.

This species differs from the typical form in the transverse cubital nervures being united in front. This may not, however, be a constant difference.

*Amblyjoppa ruficeps*, sp. n.

Black; the head reddish, the face and clypeus more yellowish in tint; a squarish black mark joins the ocelli to the eyes; the fore legs testaceous, darker above; the antennal scape reddish testaceous, the flagellum brownish below at the base. Wings uniformly fuscous violaceous, the nervures and stigma black. ♂.

Length 14 mm.

Middle Tenasserim, Salween Valley; July (*C. T. Bingham*).

Areola longer than wide, transverse at the base, becoming

gradually obliquely widened to beyond the middle; the sides at the apex not quite straight; the apex not clearly margined, broadly rounded inwardly; the segment is closely rugosely punctured, more closely rugosely on the apical slope; there is a longish narrow triangular area bordering the apical half of the posterior median; it is coarsely transversely striated. The pro- and mesothorax are closely strongly punctured, the metapleuræ more strongly than the rest; below the middle is a stout curved keel. The scutellum is more strongly but not so closely punctured as the mesonotum and is thickly covered with black pubescence. Abdomen closely punctured, the postpetiole more coarsely than the rest, the apical segments more weakly. Gastrocœli deep, bearing stout curved striæ. Tegulæ testaceous. Tubercles dark rufous. The black on the upper part of the body is slightly tinged with brown, especially on the metanotum; the middle coxæ are fuscous. There is a short but distinct stump on the discocubital nervure.

Apart from the difference in coloration and in the form of the areola, this species differs from *A. maculiceps* in having a stout curved keel on the lower part of the metapleuræ.

*Amblyjoppa maculiceps*, sp. n.

Black; the face, clypeus, labrum, and base of mandibles yellow; the front, vertex, outer orbits, and occiput yellow, largely suffused with rufous; a line on the pronotum, dilated at the apex, red, tinged with yellow; the mesonotum (except at the sides and base) narrowly rufous; the fore legs (except the coxæ, trochanters, and base of femora) black; the middle tibiæ tinged with testaceous at the base and in front. Wings uniformly dark fuscous violaceous, the nervures and stigma black. Areola semicircular. Antennal scape yellow, the flagellum brownish below. ♂.

Length 17 mm.

Middle Tenasserim, Salween Valley; July (*C. T. Bingham*).

Face and clypeus strongly, closely, regularly punctured; the labrum as closely but not so strongly punctured; the vertex distinctly but not so closely or so strongly punctured as the face; a smooth space at the sides of the ocelli, which are joined to the eyes by a broad black spot; there is a deep clearly defined furrow in the centre of the front, bordered by a raised distinctly punctured part; it extends to the middle; the part below is very smooth and shining, bare; the sides are smooth except near the eyes, where they are punctured.

Pro- and mesothorax distinctly regularly punctured; the scutellum is more strongly punctured and is thickly covered with black pubescence. The metanotum is much more strongly and closely, almost rugosely punctured; the areola wider than long, broadly rounded at the base, semicircular; the apex irregular and slightly turned inwardly; inside it is irregularly rugosely punctured, depressed on either side at the base, and with a smooth transverse space at the base; the segment is thickly covered with black pubescence. The basal four segments of the abdomen are closely punctured, the puncturation becoming gradually weaker; the base of the petiole is smooth in the middle; the postpetiole closely rugosely punctured.

The antennæ are as long as the abdomen, serrate, distinctly tapering towards the apex.

*Amblyjoppa ruficauda*, sp. n.

Black; the head, prothorax, mesonotum, the fourth and following segments of the abdomen, the anterior legs, the apex of the middle femora broadly, of the hinder more narrowly, and the four posterior tibiæ and tarsi, rufo-testaceous; the nineteen to twenty basal joints of antennæ reddish yellow, the rest black. Wings uniformly dark fuscous violaceous, the nervures and stigma black. ♂ ♀.

Length 14-19 mm.

Salween Valley, Middle Tenasserim; July (*C. T. Bingham*).

Face and clypeus closely, somewhat strongly and uniformly punctured; the front and vertex are not so closely, regularly, nor so strongly punctured. Pro- and mesothorax closely distinctly punctured; the mesonotum densely covered with fulvous pubescence; the scutellum and metanotum (except at the base) densely covered with longer black pubescence. The metanotum is more strongly rugosely punctured; the posterior median area is more or less transversely striated, the striæ running into reticulations; the outer apical area coarsely reticulated, the apex of the spiracular area is more coarsely punctured and more or less striated-reticulated than the rest. The lower part of the propleuræ is irregularly, stoutly, obliquely striated. Abdomen closely punctured, strongly at the base, becoming weaker towards the apex; the apical segments are densely covered with fulvous pubescence. Gastrocæli deep, large, the base and inner side with curved striæ, the rest more strongly longitudinally striated. The areola is broader at the apex than it is long, the base

broadly rounded, half the width of the apex, which is slightly rounded inwardly; the bordering keel is shining, flat, smooth, broad at the base; the apex is broadly depressed, finely rugosely punctured, the rest irregularly punctured and aciculated.

XXII.—*On the Black-and-tan Pattern of Domestic Dogs* (*Canis familiaris*). By R. I. POCKOCK, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

IN 'The Variation of Animals and Plants under Domestication,' pp. 33-35 (ed. 1905), the black-and-tan pattern of domestic dogs is discussed at some length. Darwin was led to investigate the question somewhat fully in the hope that he might thereby discover a clue to the origin of our breeds amongst wild species; but failing to find the tan-coloured spots over the eyes either depicted in any drawings of wolves, jackals, and other species of *Canis*, or visible on any skins in the collection of the British Museum, he came to the conclusion that the coexistence of these spots with tan-coloured paws is probably a case of correlated variation.

Apart from suggesting that a now extinct species involved in the pedigree of domestic dogs may have possessed these spots, he offered no other explanation of the "highly remarkable" fact of the occurrence of these spots in "extremely different breeds, living in various parts of the world."

The phenomenon, however, appears to me to be susceptible of a quite simple explanation.

In a typical black-and-tan dog, whatever the breed, the tan is distributed as follows:—on the sides of the muzzle and lips, the lower half of the cheeks, and the throat; a spot over the inner corner of the eye, very frequently on the inside of the ear, and as a large patch on each side of the chest above the base of the fore legs; on the paws of the fore legs and on the hind legs below the hock; to a somewhat variable degree on the inner sides of the legs, but extending over the front of the hind leg up to the body; on the circumanal area and on the underside of the tail, at least in its proximal portion. The rest of the animal is black. If a dog thus coloured be compared with many of the common wild species of *Canidæ*, it will be seen that the tan occurs over areas which in the wild species are paler than the rest of the body, owing to the fading or absence of the black annuli which prevail in the

hair elsewhere, and that the black corresponds to the darker portions of the body, where the hair is richly pigmented, in the wild animals. This statement only needs qualification with respect to the tan spots over the eyes, the homologues of which are by no means always visible in wild dogs, or, at all events, are not sufficiently evident to carry absolute conviction as to their presence. This is the case with examples of the following species now living in the Zoological Gardens:—*Canis latrans*, *anthus*, *lupaster*, *aureus*, and *mesomelas*\*; *Cuon dukhunensis* and *alpinus*. On the other hand they are detectable, though minute, in some examples of *Vulpes vulpes*, and visible, though not conspicuous, in two Dingos which I have reason to think have a mongrel strain of domestic dog. In the case, however, of the wolves now or lately living in the Gardens, namely in a Siberian example of *C. lupus*, in three specimens of *C. lupus occidentalis*, and in one of *C. pallipes*, there is no possibility of overlooking them. Although not emphasized by a setting of jet-black hair, they nevertheless show up as pale spots relatively as large as the corresponding tan spots in dogs. Their conspicuousness in these species suggests, though it does not prove, a preponderance of the wolf strain over that of jackals in our breeds of domestic dogs.

Black-and-tan dogs may be termed melanescant, or, preferably, nigrescent sports. Were they completely melanistic or perfect "melanos" they would be black all over, as many dogs are. It is evident that the tan stands in the same relation to the pale areas as the black does to the more heavily pigmented areas of the wild species; and it is a highly interesting fact that the nigrescent sport throws back to the type of pattern characteristic of a parent form. Tan is merely one of the shades of that class of colour which is commonly called "erythristic"; and, assuming the truth of the above-given explanation of the occurrence of tan in dogs, it appears that albinism, erythrism, and melanism are three consecutive stages in colour-variation, erythrism being the incipient stage either of albinism or melanism, according as the organism is albescent or nigrescent—that is to say, assuming or tending to assume the albino or melano livery.

I believe this "law" of colour-change will prove to be capable of wide application in the Mammalia and probably outside the limits of that class. For example, there are in the Zoological Gardens at the present time some black-and-tan mouflon (*Ovis musimon*). In these animals the white portions of the typical wild sheep are tan and the rest of the coat

\* This is not strictly true of all examples of this species.

heavily suffused with black, exactly as in the case of black-and-tan dogs. They are intermediate in colour between a typical mouflon and a completely melanistic sport of that species; and, be it noted, they commonly produce perfectly black lambs. They furnish an instance of the tan being the halfway stage between white and black in organisms assuming a black pelage.

Conversely, as examples of the tan or red being the intermediate stage between the normal and the albino sport, may be cited yellow or "ginger" varieties of domestic cats, which frequently at all events, and perhaps always, have the pads of the feet pink instead of black; and also red-haired blue-eyed types of some Jews, whose colour Prof. Haddon speaks of as a kind of minor albinism. In support of this I may add that in the 'Sketch' for Nov. 14th, 1906, there was a photograph of a Kaffir reported to have had a white skin, pale blue eyes, and short, woolly, yellow hair. It is well known that some wholly white, or partially white cats like Siamese have blue eyes. Hence the blueness of the iris appears to be a sign of albescence both in the human and the feline species.

XXIII.—*Seminula*: a Note by  
ARTHUR VAUGHAN, B.A., D.Sc., F.G.S.

In the Ann. & Mag. Nat. Hist. ser. 7, vol. xviii., Nov. 1906, pp. 321-327, Mr. S. S. Buckman, F.G.S. questions the accepted use of certain Carboniferous generic names and suggests somewhat drastic alterations.

He has, in the case of *Seminula*, drawn attention to as pretty a tangle as palæontologists have ever made, and I have to acknowledge his very courteous aid in my attempt to unravel it.

I shall content myself with the statement of the results which I have obtained from a careful examination of specimens and figures at the British Museum, and, in this work, I am under a pleasant sense of obligation to Dr. F. A. Bather and Mr. C. D. Sherborn. The question of priority in names must be left to experts in nomenclature.

SEMINULA.

The genotype is stated by Mr. Buckman to be *Terebratula pentaëdra*, Phill., and in this opinion he has the support of Hall & Clarke and Schuchert. It is only necessary, therefore, to discover to what genus this species belongs.

The figure of the species given in the 'Geology of Yorkshire,' pt. 2, pl. xii, fig. 3, is a good and truthful representation of a specimen in the Gilbertson Collection (Brit. Mus.) which has been type-labelled without any expression of doubt. The figure is very slightly enlarged, as is usual with all Phillips's drawings, but there cannot be any reasonable doubt that this specimen is the holotype of the species, and no such doubt has been previously suggested.

Description of the Holotype of *Terebratula pentaëdra*, Phill.  
(the Genotype of *Seminula*).

The type specimen has lost the greater part of its test, and consequently the characters of the external ornament are not so obvious as could be desired.

*Form.*—The size and outline of the shell agree closely with those of the holotype of *Spirifer ambiguus*, Sow., with which I have carefully compared Phillips's specimen; the two shells have the same pentagonal outline, the same position of maximum width, and the beak is "produced" in the same manner in each. Whereas, however, *Spir. ambiguus* is strongly convex, *Ter. pentaëdra* is rather strikingly flattened (a character reminiscent of *Ter. hastata*, Sow.).

*Hinge-line and Fold.*—The valve-intersection is continuously curved in the beak-region; it lies completely in one plane, except for the shallow lobe which marks the extremity of the mesial fold.

The mesial fold is marked out on the cast by two strong radial ridges, separated by a broad shallow depression, and the whole fold is raised but little above the level of the flanks.

In *Spir. ambiguus*, Sow., the mesial fold is formed on the same pattern, but is prominently raised above the flanks of the shell.

*Pedicle-valve.*—The test being partly removed from the beak-region, the cast of the pedicle-cavity is satisfactorily exposed; it exhibits a narrow flattened area, bounded on either side by a precipitous drop, indicating the presence of strong dental plates. These characters are possessed in common by all Athyrids.

There is no evidence as to the size of the aperture.

*Structure of Test.*—The test, where preserved, is minutely fibrous and impunctate, but it is doubtful whether the outermost layer of the test is anywhere present.

*Surface-ornament.*—(a) Concentric. Two or three concentric ridges on the cast indicate marked growth-halts.

(b) Radial. There is no clear indication, either on the cast or on the remnant of the test, of the impressed glabristriation which characterizes the Athyrids provided with fringed or ribbed flounces (*Cleiothyris* and *Actinoconchus*).

[On the same tablet with the type specimen of *Ter. pentaëdra* in the Gilbertson Collection are nine other specimens. Eight of these have well-preserved double-valves, and can be assigned with certainty to an Athyrid provided with fringed or ribbed flounces, by reason of the radial impressed ornament and the low beak. It was probably on the evidence of these specimens that Phillips accredited a minute perforation to his species *Ter. pentaëdra*. These specimens differ completely from the type specimen in form, beak, ornament, and nature of fold.

The remaining specimen on the tablet (a cast) approaches more closely to the type specimen both in form and beak, but differs in exhibiting conspicuous glabristriation. Where broken it exhibits part of a spire.]

#### Discrimination of the Genotype of *Seminula* from other Genera.

The holotype of *Terebratula pentaëdra*, Phillips, differs from the following genera in the characters subjoined.

From *Camarophoria* [genotype: *Terebratula Schlottheimi*, von Buch] in the fact that the dental plates do not unite, absence of mesial septum, absence of angular plaits, low mesial fold, &c.

From *Martinia* [genotype: *Spirifer glaber* (Martin)] in presence of dental plates, absence of area, excavated mesial fold, &c.

From *Dielasma* [genotype: *Terebratula elongatus* (Schlottheim)] in impunctate test and the nature of fold.

From the Athyrids with fringed or ribbed flounces [*Cleiothyris* (King), genotype: *Atrypa pectinifera*, J. de C. Sow.] in the outline, the nature of the fold, the absence of glabristriation, and the produced beak.

From *Actinoconchus* [genotype: *Actinoconchus paradoxus*, McCoy (which is united with *Spirifer planosulcatus*, Phill., by Davidson)] in the deflection of the valve-intersection and the presence of a mesial fold, the absence of a mesial septum in the pedicle-valve, and the absence of glabristriation.

On the other hand, the type specimen of *Seminula* agrees in all its generic characters with *Spirifer ambiguus*, Sow., from which it only differs specifically in the lower fold and more flattened shell [as was pointed out by Davidson (Pal.

Soc., Carb. Brach. p. 78) in explanation of the fact that he queried his own assertion that *Ter. pentædra*, Phill. was a synonym of *Spirifer ambiguus*, Sow.].

*Terebratula seminula*, Phillips, Geology of Yorkshire, pt. 2, pl. xii. figs. 21, 22, 23.

Since McCoy himself, in his 'Palæozoic Fossils' (1855), subsequently stated that this species was the type of *Seminula*, I also examined the specimens which are assigned to this species in the Gilbertson Collection.

From the catalogue of the collection it appears that there were originally fifteen specimens; there are now only ten, and one of these is a small *Spiriferid*. The remaining nine all obviously belong to the same species and are closely related to *Camarophoria globulina*, at least generically. (Davidson † very justly draws attention to the presence of a strong mesial septum in the pedicle-valve, visible through the test.)

It cannot be reasonably doubted that the specimen actually figured by Phillips (fig. 21. *loc. cit.*) had the same general characters, although none of the actual nine specimens can be definitely considered to agree with his figure.

Hence, in all probability, and as Davidson stated, the type of *Terebratula seminula*, Phill., is a *Camarophoria* (so long only as that genus continues to include *Terebratula globulina*, Phillips).

#### COMPOSITA, Brown.

As Mr. Buckman has pointed out, Brown states very definitely that "the genus [i. e. *Composita*] is founded upon the *Spirifer ambiguus* of Sowerby." Unfortunately it is equally clear that Brown had an erroneous conception of Sowerby's species, for his figures of *Composita ambigua* ('Fossil Conchology' (1845), pl. liv.\* figs. 4 & 5) represent *Spirifer (Martinia) glaber* (Martin), and not Sowerby's species, *Spirifer ambiguus*.

Brown's figure exhibits the following differences from the holotype ‡ of *Spirifer ambiguus*, Sow. :—

- (1) Large size: the figure measures  $1''\cdot2 \times 1''$ , very unusual dimensions for a *Seminula*.

† *Loc. cit.* p. 116.

‡ This holotype, which is represented in the two uppermost figures on pl. cccclxxvi. *Min. Conch.*, is a small double-valved specimen, preserved in the Sowerby Collection in the British Museum. The other two figures of the plate depict a very imperfect pedicle-valve and a mere fragment of a brachial valve, neither of which can be accepted as adequate definition of a species.

- (2) Marked transverseness: *Spirifer ambiguus* is typically an elongated shell.
- (3) The sides of the shell have a continuously uniform curvature: in *Spirifer ambiguus* the curvature is strong at the point of maximum width, but the outline becomes rapidly straight above and below that point.
- (4) The fold is uniformly convex in transverse section: in *S. ambiguus* the section is flattened and usually excavated on the top of the fold.
- (5) The fold is strongly semiconical and extends to the beak: a character very common in the Spiriferids, but almost unknown in the Athyrids.
- (6) A short straight hinge-line, extending the width of the beak of the brachial valve (as indicated by the approximation of the valve-intersection to a horizontal direction on either side).
- (7) The absence of any concentric growth-halts and complete smoothness: *Seminula* usually exhibits strong concentric growth-halts.

The depiction of a perforated beak is quite negligible, for the perforation, as drawn, is much too large to be the unbroken aperture of *S. ambiguus*, and, unfortunately, specimens of *Martinia glabra* with the beak perforated in this way are sadly common.

As a matter of mere personal experience, many specimens of *Martinia glabra* may be collected which agree with Brown's figure of *Composita ambigua*, but I have never seen a specimen of *S. ambiguus* which has any right to be identified with it.

Hence it seems clear that, though undoubtedly Brown thought that his conception of *Composita* included *Spirifer ambiguus*, Sow., he did so in error.

Here is another problem for the expert in nomenclature! Luckily, *Martinia* has precedence over *Composita*, and consequently escapes the danger of rejection in favour of Brown's genus.

I should like to tender my thanks to Dr. Ivor Thomas, of H.M. Geol. Survey, for assistance in examining the Gilbertson specimens, and also for pointing out to me, several months ago, that *Seminula* was sickening for a serious illness. As Dr. Thomas will probably explain his own views, I need say no more beyond expressing the hope that my old and trusted friend *Seminula* will "pull through."

## BIBLIOGRAPHICAL NOTICE.

*Illustrations of British Blood-sucking Flies, with Notes* by ERNEST EDWARD AUSTEN. London: Printed by Order of the Trustees of the British Museum, 1906.

THE student of British Diptera has many difficulties to contend with, and not the least of these is the absence of any good descriptive handbook, especially one that is illustrated. The Lepidoptera, Coleoptera, Aculeate Hymenoptera, Hemiptera, the Dragonflies and the Sawflies have all been monographed and well illustrated by British authors, but with the exception of Walker's work, published in the "fifties" and now scarce and out of print (containing a few plain lithographic plates), and the few plates in Curtis's 'British Entomology,' there is nothing to help the collector of two-winged flies. A book like the one now under consideration will therefore be eagerly welcomed by the small but rapidly growing band of British dipterists. Although the scope of the work, as indicated by its title, does not admit of a purely scientific arrangement, yet the volume gives us what is practically a pictorial monograph of the Culicidæ, Tabanidæ, and Hippoboscidæ, while a few members of the Chironomidæ, Simuliidæ, and Muscidæ are necessarily included. Of the thirty-four plates it is impossible to speak too highly. Executed by the three-colour process, on paper which is reputed to be permanent, they are superb specimens of this comparatively new art, and far surpass anything which has been attempted before in illustration of this order of insects, either in this country or abroad, save, of course, the splendid Monograph on the Tsetse Flies by the same author and issued under the same auspices. No one attempting to name examples in the three families more fully represented need have any difficulty with the present work before him, and yet in the past even the large and handsome Tabanidæ were far from easy to determine. Take, for example, the two species of Cleg, *Hæmatopota pluvialis* and *H. crassicornis*, both of fairly wide distribution. It is impossible to imagine more beautiful and accurate figures of these two species than those given on plates xi. and xii., while the specific distinctions (*e. g.* the basal joint of the antenna, the black spots on the frons, the light lines on the thorax, and the mottled pattern on the wings) are strikingly shown.

The text is short but useful. It might have been *more* useful if attention had been paid to the published records of the flies in question, instead of limiting the notes on distribution to a list of specimens actually in the British Museum collection. Thus, for example, *Atylotus fulvus* has been recorded from Scotland, but there is no mention of the fact on the page devoted to this species. But it is easy to be too critical, and in spite of this slight sin of omission (which can easily be rectified in a new edition) the volume is a great boon to the collector of the Diptera of the British Islands. And not only does it appeal to the entomologist in this country, but also to those going

abroad who, being interested in blood-sucking insects and their connection with tropical diseases, will find in this handy and beautiful book as perfect illustrations as they could wish for of typical examples of all the families of Diptera possessed of such pernicious habits.

P. H. G.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

November 21st, 1906.—Sir Archibald Geikie, D.C.L., Sc.D., Sec.R.S.,  
President, in the Chair.

The following communication was read :—

‘On the Skull and greater portion of the Skeleton of *Goniopholis crassidens* from the Wealden Shales of Atherfield (Isle of Wight).’ By Reginald Walter Hooley, F.G.S.

In the late autumn of 1904, at a place locally called ‘Tie Pits,’ near Atherfield Point, a huge mass of the cliff, comprising many thousand tons of the Wealden Shales, subsided, pushing its foot across the beach until below low-water line. As the sea washed away the base, the mass continued to sink, and fresh horizons were denuded. In 1905 a series of heavy ‘ground-seas’ cast up blocks of limestone and ironstone, containing crocodile-bones, which were discovered on the sand between high- and low-water marks. The skull came ashore in six pieces. Fragments of bones, and scutes were constantly picked up; and the Author is indebted to Prof. T. McK. Hughes for the block which had been picked up and sent to the Sedgwick Museum at Cambridge. The specimens were derived from a horizon 80 to 90 feet below the top of the Wealden Shales. A history of the British Goniopholidae from the foundation of the genus by Owen in 1841 is given, and it is noted that the frame in the Mantell Collection, now in the British Museum, not only contains the two type-blocks, but a smaller one with the impression of the orbital region of the skull, a fragment of the frontal bone, and the impression and fragments of a moiety of the right ramus. The skull and bones of the new specimen are next described, and a detailed comparison is instituted between *G. simus* and *G. crassidens*, with the result that the specimen is referred to the latter species, differing in several important particulars from the former. Comparisons are also made with other species of *Goniopholis*, with *Nannosuchus* and *Oweniasuchus*. In conclusion, the Author notes that, while in certain features the species comes nearer to the Teleosaurs than *G. simus*, it is farther removed than the latter from them in the position of the posterior nares.

THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 111. MARCH 1907.

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XXIV.—*New Species of Eastern and African Heterocera.*  
By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family Syntomidæ.

*Syntomis symphona*, nov.

♀. Antennæ black, with white tips; palpi black; frons ochreous, with the centre black; head and body black, an ochreous band behind the head; an ochreous spot on each shoulder; a longitudinal ochreous streak on each side of the thorax; abdomen with an ochreous band at the base and another on the fifth segment, and some small ochreous marks on the other segments: fore wings hyaline; veins thickly black, broadly so on the interior vein, which is joined to the median vein by a broad black bar, the interspace below ochreous, the discoidal vein broadly black, the black running up the interspace between veins 5 and 6 for two thirds its length; costa broadly black, the outer marginal band narrower, but broad at the tip: hind wings with the costa black, the outer margin with a black band which runs up in the middle in a circular form to the centre of the wing, and then curves back to the anal angle, all the interior portion of the wing being ochreous.

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

Tenom, British North Borneo; one example.

Family **Arctiidæ**.*Utethesia kallima*, nov.

♂. Palpi white, with black tips; frons and head white, a large black spot on lower part of the frons; collar and shoulders yellow, with black spots; thorax and abdomen white, two black spots on the middle of the thorax: fore wings bright dark crimson; six transverse bands of black spots encircled with white, two spots close to the base, the other bands at nearly equal distances apart, the sixth is marginal, the fourth throws out a branch from the middle and curves close to the fifth, the space between them here being white: the hind wings are white, a short black band covering the discoidal vein and a broad black band on the outer margin slightly narrowing hindwards, but fairly broad all round, with its inner edge somewhat sinuous; cilia of both wings ochreous white, with grey spots. Underside: body and legs white, with black spots; tarsi black; abdomen with lateral black spots: fore wings with the spots confluent, forming rather broad and prominent bands: hind wings with two black costal spots, and in the outer marginal black band are three white spots—a large one at the apex, a small one in the middle, and another near the anal angle.

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

Angola; one example.

Family **Agaristidæ**.*Pseudospiris jucunda*.

*Pseudospiris jucunda*, Jordan, Nov. Zool. xi. p. 444 (1904).

♀. Similar to the male, except that the hind wings are yellower, there is a large black and rather thick lunular mark at the end of the cell, and a fairly broad blackish-brown border on the outer margin, with large ochreous spots on the margin.

Angola; four males, two females.

Dr. Jordan described this species from eight males from the same locality; the sexes differ much as they do in the type of the genus (*P. paidiformis*, Butler, P. Z. S. 1895, p. 267, pl. xv. figs. 8, 9).

Family **Eupterotidæ**.*Hypsoides cleotis*, nov.

♂. Antennæ black; palpi, head, and body above and

below ochreous: wings white, some ochreous hairs at base of fore wings and abdominal margin of hind wings; fore wings with the veins, a band on the costa, and the apical space blackish, this colour running narrowly down the outer margin and is diffuse inwardly; cilia blackish: hind wings without markings, upper half of cilia blackish: the abdomen has grey segmental bands; legs ochreous, with black stripes; tarsi black.

Expanse of wings  $2\frac{5}{10}$  inches.

Madagascar; one example.

Allied to *H. bipars*, Butler, also from Madagascar, but the outer third of the fore wings of that species is black, with a sharply defined inner margin to that colour.

### Family Lymantriidæ.

#### *Euproctis Butleri*, nom. nov.

*Aroa immaculata*, Butler, Ann. & Mag. Nat. Hist. (5) x. p. 227 (1882).

Duke of York Island (type in B. M.).

I have it in both sexes from New Guinea and Borneo. I must rename it, because *immaculata* is twice preoccupied in the genus *Euproctis*, and this insect is a true *Euproctis*. I overlooked the species in my memoir on the Lymantriidæ in Trans. Ent. Soc. 1903.

#### *Aroa niasana*, nov.

♂. Palpi and frons ochreous; antennæ purplish black; body and wings of a uniform dark black, tinged slightly with pink; a pale longitudinal streak below the cell on each wing; a pale lunular mark at the end of the cell of the fore wings; the wings coloured similarly above and below; the abdomen below and the legs are ochreous.

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

Nias; two examples.

#### *Dasychira Dudgeoni*, nov.

♂ ♀. Antennæ, palpi, head, thorax, and fore wings dark brown; the fore wings variegated in parts with pinkish grey, two brown ringed spots of that colour near the base; an oblique indistinct band of lunular marks from middle of hinder margin to costa at one third from the apex; a double row of similar pale markings near outer margin; cilia variegated, with a pale line at the base: abdomen and hind

wings pale brownish grey, without any markings. Underside whitish grey, with indications of a transverse, discal, darker grey band across both wings.

Expanse of wings, ♂  $1\frac{1}{2}$ , ♀  $1\frac{7}{10}$  inch.

Sikkim (*Dudgeon*) (♂ type in B. M.).

Khasia Hills, ♂ ♀ (type ♀).

Abdomen without dorsal crests.

*Dasychira cymata*, nov.

♂. Antennæ, palpi above, head, thorax, and fore wings dark olive-brown, the last with subbasal, medial, discal, and submarginal erect lunular black lines, finely marked with white in places, the second line containing two rather large dentations; a rather large lunular ochreous stigma, ringed with black, at the end of the cell: hind wings pale greyish brown without markings: abdomen grey, with a thin brown dorsal stripe. Underside pale whitish grey, tinged with ochreous; the fore wings with pale brown suffusion.

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

Darjiling (Moore Coll.) (type in B. M.).

Family **Notodontidæ**.

*Tarsolepis javana*, nov.

♂. Antennæ brown; palpi, frons, and head ochreous chestnut-colour; fore part of the thorax grey, with a thin black line in front; rest of thorax brown; patagia pinkish grey, nearly white; abdomen ochreous grey, with pale brown segmental bands, abdominal tuft ochreous: fore wings with broad costal and outer marginal pale pinkish-grey bands; the inner portion of the wing dark chestnut-brown, with pale streaks and a pale space at the base; two hyaline elongated spots as in *T. Sommeri*, Hübner, but proportionately shorter, and the upper spot with its outer margin curved inwards; the outer marginal band contains two or three indistinct grey lines; the outer margin is slightly crenulated and has long black lunules; the cilia are ochreous, interlined with grey: hind wings white, tinged with pale pinkish, the veins prominent, the outer margin with indistinct grey lunular marks. On the underside the wings are whitish; a minute black dot at the end of the cell of the fore wings and a large black spot on the hind wings.

Expanse of wings 2 inches.

East Java; one example.

*Dudusa nobilis*.

*Dudusa nobilis*, Walker, xxxii. 447 (1865).

*Crinodes Vethi*, Snellen, Veth's Mid.-Sum., Lep. p. 40, pl. iv. figs. 1, 2 (1880).

The type from N. China is in the B. M.

Snellen's types were from Sumatra. I have a female from Ichang, a female from Makassar, Celebes, and a male from the Khasia Hills. There is an example in Mus. Oxon. from Singapore, and Hampson records it from the Khasia Hills, Malacca, and Celebes. They appear to me to be identical.

*Dudusa synopla*, nov.

♀. Antennæ black; palpi dark brown at the outer sides, the inner sides, frons, head, and thorax ochreous brown; crest in the front of the thorax large and upstanding; abdomen pale ochreous brown, the sides with broad blackish-brown segmental bands, the first band crossing the abdomen above; anal tuft ochreous grey, with black feathery tips: fore wings pale ochreous fawn-colour, the veins somewhat prominent; a short subbasal blackish band and a broad oblique blackish band from the costa a little before the middle, where it is more or less obsolescent, to the outer margin one fourth from the hinder angle, much as in *D. nobilis*; a narrow greyish band from the outer margin below the apex, running in a slightly waved form to the hinder margin near the base, where it broadens and becomes diffuse; indications of antemedial, double, transverse grey lines and two similar lines from the costa one third from the apex, where it bends inwards, to the middle of the hinder margin, these lines somewhat crenulate; submarginal pale lunular marks, with a short brown lunular line in each and marginal brown lunular marks: hind wings dark brown, with duplex marginal brown lunules. Underside greyish ochreous; a blackish-brown spot at the end of each cell, and a crenulated brown discal line across both wings, bent inwards below the middle on the fore wings, evenly curved outwards on the hind wings; marginal lunules as above; thorax dark brown, tarsi black; abdomen greyish ochreous.

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

Khasia Hills; three examples.

The antennæ are as deeply bipectinate as in the male of *D. nobilis*, of which I have both sexes; the wings are much broader.

*Pydna brunnea*, nov.

♂. Antennæ, palpi, head, body, and fore wings ochreous brown: fore wings with some pale shades, some costal blackish-brown dots, a spot one third from apex, a spot below the middle of the cell, and an outwardly curved discal row of black dots: hind wings blackish brown, much darker than the fore wings, no markings. Underside: body and both wings pale greyish ochreous; the fore wings with the interior portions suffused with blackish brown and some marginal black dots on the upper half; hind wings with a brown spot at the end of the cell and a thin discal band, its upper half crenulated.

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

Khasia Hills; one example.

There is a worn example of a male from Ceylon in the B. M. unnamed.

*Notodonta nodyna*, nov.

♂. Antennæ, palpi, and thorax brown; a broad band behind the head blackish brown; abdomen paler than the thorax, with a broad dorsal dark brown band: fore wings dark brown, with a pink tinge, with three indistinct longitudinal dark brown stripes from near the base to the apex and a blackish submarginal stripe from the outer margin above the middle to the hinder margin one third from the angle, accompanied by a similar stripe on the margin, which extends along the margin and stops at one third from the base; between these stripes the colour of the wing is paler: hind wings white, semihyaline, the veins prominent; some grey suffusion towards the costa and abdominal margins; a grey thin band near the outer margin, its lower portion dark and brownish; a marginal brown band and brown interlined cilia.

Expanse of wings  $3\frac{1}{10}$  inches.

Khasia Hills; one example.

Very similar in shape to *N. gigantea*, Elwes, of which I have several examples from the same locality, but the outer margin, especially of the fore wings, is highly crenulate.

*Hyperæschra plana*, nov.

♀. Head, thorax, and fore wings dark olive-brown, the latter with a black longitudinal basal streak and many indistinct thinner streaks on the outer portions of the wings; indications of an angulated discal transverse line; a sub-

marginal brown thin band, sinuous and dentated in parts: hind wings pale grey, with a dark greyish-brown broad marginal band, the entire wing suffused with pinkish; marginal line of both wings blackish brown; cilia pinkish grey, with brown patches on the fore wings; with a brownish middle band and white tips on the hind wings. Underside pale uniform grey, with an indistinct pale discal band across the hind wings; hind tarsi with brown spots.

Expanse of wings  $1\frac{2}{5}$  inch.

Omei-shan, W. China (type in B. M.).

*Hyperæschra tusa*, nov.

♂. Dark grey: fore wings with more than the basal half much darker than the outer portions, limited by a thick black line from the costa at two thirds to vein 4, then curved inwards to vein 1, then obliquely inwards to the production at the middle of the hinder margin, where it is very thick; a black mark just inside this on the margin, and two black angles between them, forming the commencement of a transverse line; an indistinct, grey, transverse, sinuous band in the disc: hind wings grey, without markings; cilia of fore wings ochreous grey, of hind wings pale grey, both with darker patches: antennæ, body, legs, and wings on the underside pale grey, uniform in colour, a slightly darker medial band across both wings.

Expanse of wings 2 inches.

Japan (*Schaus*) (type in B. M.).

Allied to *H. basalis*, Moore.

*Hyperæschra curvilinea*, nov.

♀. Palpi blackish brown, white beneath; head and body ochreous grey: fore wings with nearly the basal half pinkish ochreous grey, with some longitudinal black streaks in it, bounded by an outwardly deeply curved, thick, black, sinuous line, much retracted a little above the hinder margin, then straight to the margin at the middle; the remainder of the wing dark grey, containing a prominent black, outwardly curved, highly sinuous line not far from the first line; two or three indistinct grey lines; a submarginal row of black spear-shaped marks and a black, longitudinal, subapical line: hind wings grey, with a large black patch on the outer margin near the anal angle; cilia of both wings grey, with small darker patches with a white dot in each patch. Underside pale greyish brown, the hinder marginal space of the

fore wings and all but the costal space of the hind wings whitish; costa of both wings suffused with ochreous, with some black marks on the outer half of the costa of the fore wings and indications of a discal line; a curious angular mark beyond the middle, below the costa of the hind wings; body and legs whitish.

Expanse of wings 2 inches.

Durban, August 1900 (type in B. M.).

*Lophopteryx uniformis*, nov.

♀. Antennæ with the shafts brown, plumes ochreous; head, thorax, and fore wings dark chestnut-brown, with a pink tinge; antemedial and postmedial indistinct bands of pale lunular marks, straight and slightly oblique; cilia concolorous, with a pale basal band: hind wings grey, pale on the basal half; cilia grey, with a whitish basal band: abdomen whitish, tinged with pink, with thin grey segmental bands. Underside: fore wings uniform dull purplish brown, hind wings grey, no markings; body and legs grey.

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

Mashonaland (*Dobbie*) (type in B. M.).

XXV.—*Notes on Scorpions, with Descriptions of Two new Species.* By A. S. HIRST.

Family *Buthidæ*.

*Babycurus somalicus*, sp. n.

*Colour* brownish yellow or yellow; vesicle, hand, and lower surface of body paler; fingers of hand light brown; aculeus black, the basal portion excepted.

*Carapace* slightly trapezoidal, the frontal edge weakly concave; ocular tubercle granular, the groove between the eyes smooth. Distribution of granules apparently much as in *zambonelli*, the surface being covered with numerous granules, unequal in size and leaving several small spaces (devoid of granules), which are especially noticeable in the median part. Median eyes bordered on each side by an area furnished with minute granules. Median area of frontal region with an aggregation of large granules.

*Abdomen.* Tergites minutely granular in their anterior parts, posteriorly provided with large shining granules in

addition to the minute ones. Keels granular, incomplete anteriorly. Third and fourth sternites with sparse granules laterally; fifth sternite granular and provided with four granular keels.

*Tail.* Keels distinct and granular in all segments. First segment with ten keels, segments 2-4 with eight, fifth segment with five. Dorsal surfaces concave in segments 1-4; fifth caudal segment slightly convex dorsally and provided with a narrow and shallow median groove; posterior portion of this last segment narrowed, but exceeding the vesicle in breadth. Intercarinal spaces minutely granular; the granules very sparse on the dorsal surfaces of the first four segments; fifth caudal segment more strongly granular. Vesicle hairy, granules absent; spine under aculeus laterally compressed and terminating in a little knob.

*Palp.* Hand with scattered granules on the inner edge, outer and inner keels of the dorsal surface minutely but distinctly granular; finger-keel granular only in that portion which is situated on the hand itself. Movable finger provided with eight series of granules exclusive of the short apical series, six series ending on the outer side in two large granules, the last pair of granules situated at the base of the prebasal series. Upper surface of the femur of the palp minutely and densely granular.

*Pectinal teeth* 19-20 in number.

*Measurements in mm.* Length of cephalothorax 5.5, of tail (vesicle excl.) 23, of movable finger 6, of hand-back 3.6; breadth of hand 2.25, of tibia 1.75; total length 47.

*Hab.* A ♀ specimen (the type) labelled "Berbera and Durbar, Somaliland, sea-level to 400 ft.," and a second from the Wagar Mountains behind Berbera, 3000-4000 ft. The specimens were collected by Mr. G. W. Bury.

*Remarks.* This species is closely allied to *zambonelli*, Borelli, from which it apparently differs in the granular keels of the manus; the little knob terminating the spine under the aculeus, the distinct keels of the last caudal segment, the minute granules of the upper surface of the femur of the palp, and in the fact that the movable finger is provided externally with two large granules situated at the base of the prebasal series of granules.

#### Genus ISOMETROIDES, Keys.

There are two species of this genus in the collection of the British Museum and each is represented by a single specimen. I believe them to be the two described species

*I. angusticaudus*, Keys., and *I. vescus*, Karsch; I have not seen the typical specimens of these species, however. The more important differences are given below.

*Isometroides angusticaudus*, Keys.

*Isometroides angusticaudus*, Keyserling, Arach. Austral. vol. ii. p. 19 (1884-89); Kraepelin, Das Tierreich, "Scorpiones et Pedipalpi," p. 40 (1899).

Fourth caudal segment with eight granular and well-marked keels; surface granular, the granules larger than in the preceding segments, with few punctures. Surface of fifth caudal segment with numerous punctures, rugulose. Pectinal teeth twenty-three in number. Measurements in mm.: length of tail (vesicle excl.) 23, of fifth caudal segment 6.5; breadth of fifth caudal segment 3.5; total length 41.

*Hab.* A single example from Port Lincoln, Australia.

*Isometroides vescus*, Karsch.

*Isometrus vescus*, Karsch, SB. Ges. naturf. Berlin, p. 56 (1880).  
*Isometroides vescus*, Keyserling, Arach. Austral. vol. ii. p. 17 (1884-89);  
Kraepelin, Das Tierreich, "Scorpiones et Pedipalpi," p. 40 (1899).

Fourth caudal segment provided with eight indistinct keels; devoid of granules and with distinct punctures. Fifth caudal segment smooth and shiny, with numerous punctures. Pectinal teeth 24-25 in number. Measurements in mm.: length of tail (vesicle excl.) 21.5, of last caudal segment 6; total length 39; breadth of last caudal segment 2.5.

*Hab.* Kalgoolie near Coolgardie, W. Australia.

*Tityus Kraepelini*, Pocock,

*Tityus Kraepelini*, Pocock, Ann. & Mag. Nat. Hist. (7) x. p. 379 (1902).

The name *Kraepelini* being preoccupied\*, I propose that of *Pococki* for this species.

*Hab.* Abundant at Merida, also found at Chama, Venezuela.

Family Scorpionidæ.

*Diplocentrus nitidus*, sp. n.

*Colour.* A very dark brown, manus paler, legs and under surface of a much paler colour.

\* Borelli, Boll. Mus. Torino, xiv. no. 345 (1899).

*Carapace* minutely punctured, more sparsely so on the raised portions; surface smooth and polished, devoid of granules. Median groove present in front of the eyes. Anterior border with a deep bay.

*Abdomen.* Tergites smooth and polished, minutely punctured; provided on their hinder edges with a row of granules, which is incomplete in the median line. Last tergite with large isolated granules laterally. Sternites smooth and polished, minutely punctured; the punctures more distinct on the last sternite, which is furnished with four smooth keels.

*Tail* stout; superior dorsal keels of the first four segments formed by a few fairly large granules, the posterior granule of each series enlarged. Ventral keels much as in *antillanus*, smooth, and each bearing a few setiferous depressions. Accessory lateral keels ill-defined. Vesicle very stout, its surface minutely punctured and devoid of granules.

*Pectines* with nine teeth.

*Feet* with minute punctures, tarsi angular and with but few punctures; tarsi of third and fourth legs provided with six spines on the inner edge and with a proximal crescent of four granules, externally with 6-7 spines.

*Manus* narrow, lobe reduced; dorsal surface smooth and keelless, less densely punctured than is the case in *antillanus* and with frequent unpunctured spaces which give it a reticulate appearance.

*Measurements in mm.* Length of carapace 5, of tail (including vesicle) 20, of first two segments of tail 5.5, of last segment of tail 4.75, of movable digit of hand 5.5; total length 36; breadth of last segment of tail 2.6, of tibia of palp 2.25, of vesicle 3; greatest breadth of hand 4; length of vesicle (aculeus excl.) about 4.

*Hab.* San Ramon, Rio Wanks, about 185 miles above Cape Gracias, Nicaragua. A single specimen collected by Mr. G. Palmer in the month of July 1905.

*Remarks.* Allied to *antillanus*, Pocock, from which it may be distinguished by the weakly lobed, keelless hands, the dorsal surfaces of which are punctured in a reticulate fashion, and also by the stout tail and vesicle, the coarse and less numerous granules of the superior dorsal keels of the tail, and the deep bay of the anterior margin of the cephalothorax.

XXVI.—*Descriptions of Three new Lizards and a new Frog, discovered by Dr. W. J. Ansorge in Angola.* By G. A. BOULENGER, F.R.S.

*Phyllodactylus Ansorgii.*

Head rather small, oviform, much longer than broad; snout not longer than the distance between the eye and the ear-opening, which is small and oval. Body very elongate; limbs moderate. Digits moderately depressed, with large, subtrapezoid terminal expansions; eight lamellæ under the fourth toe. Head and body covered with uniform, smooth, flattened granules, which are larger on the snout and on the belly. Rostral twice as broad as deep, without cleft above; symphyseal small, a little longer than broad; ten upper and as many lower labials; rostral and first upper labial entering the nostril; no chin-shields. Tail cylindrical, tapering, covered with uniform, small, quadrangular, smooth scales. A curved transverse series of 8 or 9 enlarged præanal scales (indicating præanal pores in the male?). Pale greyish brown above, with a series of large whitish spots along each side of the back; a dark streak on each side of the head and neck, passing through the eye; upper lip and lower parts white, with small brown spots.

	mm.
Total length.....	75
Head.....	10
Width of head.....	6
Body.....	35
Fore limb.....	12
Hind limb.....	15
Tail.....	30

Two female specimens from Maconjo, Benguella.

The more slender form and the enlarged præanal scales well distinguish this species from *P. porphyreus*, Daud.

*Mabuia levis.*

Head and body much depressed. Snout short, pointed. Lower eyelid with a very large undivided transparent disk. Nostril behind the vertical of the suture between the rostral and the first labial; a postnasal; anterior loreal in contact with the first labial; supranasals narrow and widely separated by the fronto-nasal, which forms a suture with the rostral and with the frontal; frontal as long as fronto-parietals and interparietal together, in contact with the first, second, and third

supraoculars; four supraoculars; six supraoculars; six supraoculars; parietals in contact behind the interparietal, followed by a pair of large nuchals; five upper labials anterior to the subocular, which is large and not much narrowed inferiorly. Ear-opening large, suboval, with projecting granules on its anterior border. Scales perfectly smooth, dorsals largest, 32 round the middle of the body. The hind limb reaches the elbow of the adpressed fore limb. Toes moderately long, slender; subdigital lamellæ with a tubercular keel. Tail depressed, with a series of transversely enlarged scales above and beneath. Head red, body and tail bluish grey; a broad black vertebral band, bifurcating on the nape; a black lateral band, passing through the eye, confluent with large spots below it on the neck and body; limbs bluish grey, with the scales black-edged.

	mm.
Total length .....	130
Head .....	13
Width of head .....	7
Body .....	39
Fore limb .....	15
Hind limb .....	22
Tail .....	78

A single specimen, rather damaged, from Maconjo, Benguella.

#### *Mabuia Ansorgii.*

Snout short, obtuse. Lower eyelid with a large undivided transparent disk. Nostril anterior to the vertical of the suture between the rostral and the first labial; a postnasal; anterior loreal not in contact with the first labial; supranasals in contact behind the rostral; fronto-nasal broader than long, forming a very narrow suture with the frontal; frontal as long as the fronto-parietals and the interparietal together, in contact with the second and third supraoculars; four supraoculars, second largest; five supraoculars, second largest; fronto-parietals distinct, a little smaller than the interparietal; parietals just meeting behind the interparietal; a pair of nuchals; five or six labials anterior to the subocular, which is much narrowed inferiorly. Ear-opening oval, as large as the transparent palpebral disk, with four short pointed lobules anteriorly. Dorsal and nuchal scales strongly quinquecarinate; 42 scales round the middle of the body, dorsals largest. The hind limb reaches the elbow of the adpressed fore limb. Scales on the soles sharply keeled, spinose; subdigital lamellæ sharply tricarinate, spinose.

Yellowish brown above, with two pairs of broad black longitudinal bands on the back and one on each side from the eye to the tail; each pair of dorsal bands separated by a narrow light line and confluent into a single band on the tail; lips and border of the ear pink; lower parts whitish, chin spotted with brown.

Total length (tail reproduced) .....	mm. 142
Head .....	17
Width of head .....	12
Body .....	69
Fore limb .....	27
Hind limb .....	37

A single, somewhat damaged specimen from Caconda, Benguella.

Closely allied to *M. Bocagii*, Blgr.

#### *Rana bunoderma*.

Vomerine teeth in two short oblique series commencing from the inner front edge of the choanæ. Head moderate; snout pointed, as long as the orbit; canthus rostralis obtuse; loreal region deeply concave; interorbital space much narrower than the upper eyelid; tympanum distinct, two thirds the diameter of the eye. Fingers moderate, blunt, first not extending beyond second; toes moderate, one-third webbed; subarticular tubercles small but very prominent; a small, oval, inner metatarsal tubercle, no outer tubercle. Tibio-tarsal articulation reaching a little beyond the tip of the snout. Back with very prominent, tectiform, large warts, forming irregular longitudinal series; no lateral fold. Olive-grey above, with large roundish black spots on the body and cross-bars on the limbs; a fine light vertebral streak; a light cross-bar between the eyes and a light spot on the tympanum; lips black; hinder side of thighs reddish brown, dotted with white; lower parts white.

From snout to vent 35 mm.

A single female specimen from Caconda, Benguella.

Intermediate between *R. mascareniensis*, D. & B., and *R. Grayi*, Smith.

XXVII.—*Diagnoses of new Species of Corbula and Bithinella from Lower Bengal.* By H. B. PRESTON, F.Z.S.

THE species described in the present paper form part of a small collection recently sent to me for identification by the authorities of the Indian Museum, Calcutta. All were collected in the brackish pools near Port Canning, at the northern extremity of the district known as the Sandarbans in the Ganges Delta, and are the property of the Indian Museum.

*Corbula abbreviata*, sp. n. (Fig. 1.)

Shell nearly equivalve, roundly ovate, inflated, thin, greyish white, posteriorly obliquely rounded, anteriorly sharply abbreviated, sculptured with rather coarse concentric lines of growth; umboes small, situated somewhat anteriorly.

Alt. 3·5, length 4·25 mm.

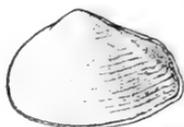
*Hab.* Port Canning, Lower Bengal; in brackish pools. Type in Indian Museum, Calcutta.

Fig. 1.



*Corbula abbreviata.*

Fig. 2.



*Corbula Alcocki.*

Fig. 3.



*Corbula calcaria.*

Fig. 4.



*Corbula gracilis.*

Fig. 5.



*Corbula Pfefferi.*

Fig. 6.



*Bithinella canningensis.*

*Corbula Alcocki*, sp. n. (Fig. 2.)

Shell irregularly rhomboidal, rather ventricose, thin, whitish, posteriorly rounded, anteriorly produced, angled

from the umboes, sculptured with fine concentric lines of growth; umboes small, nearly central.

Alt. 3.25, length 5 mm.

*Hab.* Port Canning, Lower Bengal; in brackish pools.  
Type in Indian Museum, Calcutta.

*Corbula calcaria*, sp. n. (Fig. 3.)

Shell elongately oval, depressed, thin, chalky white, posteriorly sharply rounded, anteriorly truncate; umboes small.

Alt. 3, length 5 mm.

*Hab.* Port Canning, Lower Bengal; in brackish pools.  
Type in Indian Museum, Calcutta.

*Corbula gracilis*, sp. n. (Fig. 4.)

Shell oblong-ovate, thin, whitish, rather ventricose, obsolete concentrically ribbed, posteriorly rounded, anteriorly elongately produced, truncate; umboes small, situated somewhat posteriorly.

Alt. 4, length 6 mm.

*Hab.* Port Canning, Lower Bengal; in brackish pools.  
Type in Indian Museum, Calcutta.

*Corbula Pfefferi*, sp. n. (Fig. 5.)

Shell ovate, somewhat triangular, moderately ventricose, thin, white, posteriorly obliquely rounded, anteriorly bluntly beaked, sculptured with rather coarse, smooth, concentric ribs and very fine transverse striæ or scratches, these last being especially noticeable on the right valve; umboes small, central.

Alt. 3.5, length 5 mm.

*Hab.* Port Canning, Lower Bengal; in brackish pools.  
Type in Indian Museum, Calcutta.

*Bithinella canningensis*, sp. n. (Fig. 6.)

Shell subperforate, pyramidal, dull yellowish-brown horn-colour; remaining whorls 3, somewhat convex; sutures well impressed; aperture oval; peristome simple, continuous; operculum horny, paucispiral.

Alt. 1.75, diam. maj. 1 mm.

*Hab.* Port Canning, Lower Bengal; in brackish pools.  
Type in Indian Museum, Calcutta.

XXVIII.—*Descriptions of Nine new Species of Land-Shell<sup>s</sup> from New Caledonia.* By H. B. PRESTON, F.Z.S.

WHEN recently working through a quantity of New Caledonian land-shells I found a number of forms which seemed to be difficult of determination; these I submitted to Mr. G. K. Gude, who, with his unflinching courtesy, assisted me in identifying a certain number. There were, however, several species which Mr. Gude suggested might be new, and having compared these carefully with all available material, I now venture to describe them as follows:—

*Charopa athena*, sp. n. (Fig. 1.)

Shell depressed, subdiscoidal, thin, bronze-coloured; whorls 3-4, sculptured with moderately fine arcuate ribs; sutures presenting an almost channelled appearance; umbilicus rather wide; aperture lunate; peristome simple.

Alt. 2, diam. maj. 4·5 mm.

Aperture: alt. 1·25, diam. 1 mm.

*Hab.* New Caledonia.

This form shows some affinity with *C. dispersa*, Gass. \*, the chief characters which separate it from that species being its more depressed spire, rather coarser sculpture, and shallower and narrower umbilicus; it has also one whorl less than *C. dispersa*.

*Charopa Margueritæ*, sp. n. (Fig. 2.)

Shell depressed, rather thin, yellowish-brown, blotched, streaked, and spotted with chestnut; whorls 4-5, sculptured with fine arcuate ribs; spire slightly sunken; sutures deeply impressed; umbilicus wide; peristome simple; columella descending very obliquely; aperture obliquely lunate; interior of shell bearing a callus on the parietal whorl.

Alt. 2·25, diam. maj. 6·25 mm.

Aperture: alt. 2·25, diam. maj. 1 mm.

*Hab.* New Caledonia.

In some respects allied to *C. vetula*, Gass. †. It is, however, much larger and more depressed; it is not so closely coiled,

\* Gassies, "Faune Conchyliologique Terrestre et Fluvio-lacustre de la Nouvelle Calédonie," pt. i., Actes Soc. Linn. Bordeaux, xxiv. 1861, p. 233.

† Gassies, *ibid.* pp. 233-234.

and the chestnut painting readily separates it from that species.

Fig. 1.

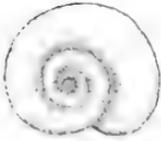
*Charopa albaea.*

Fig. 2.

*Charopa Marquerita.*

Fig. 3.

*Charopa Gwendolina.*

Fig. 4.

*Charopa Mariona.*

Fig. 5.

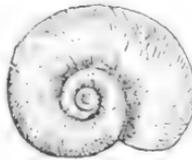
*Charopa vicina.*

Fig. 6.

*Charopa Gassiesiana.*

Fig. 7.

*Charopa (Tr.) Gudei.*

Fig. 8.

*Ostodes vitreus.*

Fig. 9.

*Acemella (Sol.) turbinata.*

*Charopa Gwendolina*, sp. n. (Fig. 3.)

Shell orbicular, bearing traces of having been covered with a rich brown periostracum; spire concave; whorls 5-6, rather closely coiled, sculptured with fine, closely-set, arcuate ribs, the last whorl descending somewhat abruptly near the peristome; sutures impressed; umbilicus deep, moderately wide; peristome simple; aperture lunate.

Alt. 3, diam. maj. 6 mm.

Aperture: alt. 3, diam. 1 mm.

*Hab.* New Caledonia.

Easily separated from the other *Charopæ* described from this region by its sunken spire and closely coiled whorls.

*Charopa Marionæ*, sp. n. (Fig. 4.)

Shell depressed, subcarinate, somewhat pellucid, pale yellowish horn-colour, indistinctly blotched and streaked with light chestnut; whorls 3, sculptured with closely set arcuate ribs, the last whorl flattened obliquely; sutures impressed; umbilicus very wide; peristome simple; aperture ovate.

Alt. 2, diam. maj. 6.25 mm.

Aperture: alt. 2, diam. 2.25 mm.

*Hab.* New Caledonia.

Chiefly remarkable for the excessively wide umbilicus, which easily distinguishes it from any other species hitherto described from New Caledonia.

*Charopa vicina*, sp. n. (Fig. 5.)

Resembling *C. Marionæ* in general outline; it is, however, rather smaller, higher in the spire, more carinate, and of a uniform rich brown colour; the arcuate ribs are much finer, the sutures not so well impressed, and the umbilicus is deeper and rather narrower.

Alt. 2.75, diam. maj. 5.75 mm.

Aperture: alt. 2, diam. maj. 1.75 mm.

*Hab.* New Caledonia.

*Charopa Gassiesiana*, sp. n. (Fig. 6.)

Shell narrowly perforate, thin, somewhat transparent, yellowish horn-colour; whorls 3, regularly sculptured, with rather distant broad and rounded ribs; sutures impressed; peristome simple; columella descending obliquely and slightly reflexed outwards; aperture roundly lunate, a callosity appearing inside the shell upon the parietal whorl.

Alt. 2.5, diam. maj. 5 mm.

Aperture: alt. 2, diam. maj. 1.5 mm.

*Hab.* New Caledonia.

Mr. Gude considers this species to be closely allied to *C. melitæ*, Gass.\*; it is, however, much smaller and more swollen, and shows no signs of carination; the umbilicus is also very much narrower and the sculpture is a great deal coarser than is the case with *C. melitæ*.

I have much pleasure in dedicating this pretty little species to the memory of the late Jean Baptiste Gassies, whose

\* Gassies, "Faune Conchyliologique Terrestre et Fluvio-lacustre de la Nouvelle Calédonie," pt. ii., Actes Soc. Linn. Bordeaux, xxviii. 1871, pp. 24-25.

Monograph of the Terrestrial and Fluvial Mollusca of New Caledonia is invaluable to the student of the conchological fauna of that island.

*Charopa (Tropidotropis\*) Gudei*, sp. n. (Fig. 7.)

Shell discoidal, sharply carinate, covered with a slightly lamellose periostracum; spire flat; whorls 3-4, painted with purple flame-markings, which appear as blotches near the sutures; sutures impressed; base of shell very convex; umbilicus moderately broad, deep; peristome simple; aperture securiform.

Alt. 2.75, diam. maj. 7.25 mm.

Aperture: alt. 2, diam. 3 mm.

*Hab.* New Caledonia.

Readily separable from its ally *T. trichocoma*, Crosse †, by its narrower umbilicus and by its less lamellose periostracum; moreover the spire is not quite so flat as is the case with *T. trichocoma*.

*Ostodes vitreus*, sp. n. (Fig. 8.)

Shell depressedly turbinate, transparent, pale horn-colour; whorls 4-5, the last three sculptured with spiral liræ, obsolete only on the base near the aperture; sutures well impressed; umbilicus rather wide and deep; peristome serrated by the termination of the spiral liræ; aperture subcircular; columella curved, a callosity joining it with the lip above; operculum paucispiral, horny, concave.

Alt. 5.25, diam. maj. 7.5 mm.

Aperture: diam. 2.5 mm.

*Hab.* New Caledonia.

The present species may be compared with *Ostodes upolensis*, Moussa, from Upolu; it is, however, more depressed, the sculpture is coarser and more regular, and there are no traces of crenulation; moreover it is much thinner and more transparent than is the case with *O. upolensis*.

*Acmella (Solenomphala) turbinata*, sp. n. (Fig. 9.)

Shell perforate, turbinate, smooth, polished, brownish horn-colour, indistinctly streaked with grey; whorls 5, the last three very convex; sutures deeply impressed; umbilicus moderately wide; peristome simple; columella descending

\* Ancey, Bull. Soc. Mal. Fr. v. p. 370.

† Journ. de Conchyl. vol. xvi. pp. 158-160.

in a curve and reflexed outwards over the umbilicus; aperture roundly ovate; operculum concave, horny, paucispiral.

Alt. 3.75, diam. maj. 3.25 mm.

Aperture: alt. 1.25, diam. 1 mm.

*Hab.* New Caledonia.

Somewhat closely allied to *Hydrocena caledonica*, Crosse\*; it is, however, smaller, has one whorl more, is not so globose, and is darker in colour; the sutures are not so deep and the base is less convex; moreover it is easily recognizable from *H. caledonica* by its much less variegated appearance, the grey streaks in *A. turbinata* being only visible in a strong light.

XXIX.—*Descriptions of new Genera and Species of Syntomidæ, Arctiadæ, Agaristidæ, and Noctuidæ.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

THE following paper forms a fourth supplement to the first six volumes of the 'Catalogue of Lepidoptera Phalænæ in the British Museum,' the former papers having appeared in the *Ann. & Mag. Nat. Hist.* ser. 7, vol. viii. pp. 165-186 (1901), vol. xi. pp. 337-351 (1903), and vol. xv. pp. 425-453 (1905).

The numbers before the species indicate their position in the classification adopted in those volumes. The types are in the British Museum.

**Syntomidæ.**

11 a. *Ceryx albipuncta*, sp. n.

♂. Head, thorax, and abdomen black-brown; frons white; tegulæ with lateral white patches; patagia with white streaks on outer edge; dorsum of thorax with white streak, metathorax with whitish patch; sides of pectus and coxæ with white patches; hind femora streaked with white; abdomen with dorsal series of small whitish spots except at extremity and complete ventral series of whitish bands. Fore wing black-brown; a wedge-shaped hyaline patch in cell; a patch in submedian interspace from base to near termen, its lower edge indented by a small dark tooth at middle; a spot above base of vein 2; a postmedial streak above vein 6 and slight streak above 7; elongate spots above veins 4, 3. Hind wing black-brown, with small hyaline

\* *Journ. de Conch.* xvii. 1869, pp. 24 & 25.

spot in lower extremity of cell and large patches in submedian interspace and above vein 2 extending nearly to termen.

*Hab.* PHILIPPINES, Luzon, Benguet Prov., Irisan (*McGregor*), 1 ♂ type. *Exp.* 30 mm.

45 a. *Myopsyche xanthosoma*, sp. n.

♀. Head black; palpi and proboscis orange; antennæ white at tips; thorax black, with some orange scales; the tegulæ and patagia orange; legs mostly orange; abdomen orange, the last three segments black at sides and below. Fore wing hyaline, the veins and margins black; the base with orange patch; a black discoidal patch, emitting a fascia between veins 5, 6 to the terminal band, which expands widely on apical area and into a bidentate patch below vein 2. Hind wing hyaline, the veins and margins black, the base, cell, and costal area to beyond middle orange; the terminal band expanding widely on apical area and below vein 2.

*Hab.* UGANDA, Entebbe (*E. A. Minchin*), 1 ♀ type. *Exp.* 30 mm.

100 a. *Syntomis philippinensis*, sp. n.

♂. Head, thorax, and abdomen black-brown; frons and vertex of head orange; antennæ white at tips; tegulæ orange; patagia orange, with black edges; metathorax with orange patch; pectus and coxæ mostly orange; abdomen with orange basal patch and bands on six following segments. Fore wing black-brown; an orange hyaline wedge-shaped patch in cell, a wedge-shaped spot below base of cell, an oblique wedge-shaped patch from below base of vein 2 to near termen, an elongate streak above vein 6 and slight streak above 7, and elongate spots above veins 4, 3. Hind wing black-brown, with orange patch in and below cell extending to near tornus, and a pair of spots above and below vein 3.

♀. Vertex of head black; abdomen with five bands beyond the basal patch. Fore wing with the patches above veins 4, 3 and below 2 more elongate.

*Hab.* PHILIPPINES, Luzon, Manila (*Fletcher*), 1 ♂, 2 ♀ type; Mindora (*McGregor*), 1 ♂; Mindanao, Cagayancillo (*McGregor*), 1 ♂. *Exp.* 22-26 mm.

100 b. *Syntomis ticaonis*, sp. n.

Black-brown; antennæ white at tips; frons and tegulæ orange; pectus with lateral orange patches; fore femora and tibiæ streaked with orange; abdomen with basal orange patch, followed by six bands in male, five in female. Fore wing with wedge-shaped orange-hyaline patch in end of cell, a triangular patch below base of cell, an oblique wedge-shaped patch from below base of vein 2 to near termen, an elongate streak above vein 6, sometimes with traces of a streak above 7, and elongate spots above veins 4, 3. Hind wing with orange patch in and below cell to near tornus and pair of spots above and below vein 3.

*Hab.* PHILIPPINES, Ticao (*McGregor*), 3 ♂, 1 ♀ type.  
*Exp.* 24-28 mm.

115 b. *Syntomis phæobasis*, sp. n.

♀. Head and thorax black shot with metallic green; antennæ white at tips; fore coxæ, first joint of fore and mid tarsi, and first three joints of hind tarsi white; abdomen metallic green, the three medial segments dorsally brilliant blue with scarlet bands. Fore wing black shot with blue, the base, basal half of cell, and costal area metallic green; a small quadrate hyaline antemedial spot below the cell, a large spot in end of cell, an oblique narrow spot below base of vein 2, and small elliptical postmedial spots above veins 6, 4, 3. Hind wing black shot with blue; a bar-shaped hyaline antemedial spot below the cell and a small round spot beyond lower angle.

*Hab.* UGANDA, Nsadzi I. (*E. A. Minchin*), 1 ♀ type.  
*Exp.* 32 mm.

132 b. *Syntomis Cholmleyi*, sp. n.

Black suffused with brilliant metallic blue; shoulders with orange spots; fore femora and tibiæ slightly streaked with orange; abdomen with dorsal orange patch on basal segment, lateral orange patches on second and third segments, and dorsal bands on fourth and fifth segments. Fore wing with oblong semihyaline orange subbasal patch below cell, an oblong patch in end of cell, an oblique wedge-shaped patch below base of vein 2, and postmedial patches above veins 6, 4, 3. Hind wing with almost basal semihyaline orange patch in and below cell and on inner area, and a rounded patch beyond the cell above and below vein 4.

*Hab.* BR. E. AFRICA, Mola (*Cholmley*), 3 ♂, 2 ♀ type.  
*Exp.* 28-30 mm.

200 a. *Syntomis lagosensis*, sp. n.

Black; frons yellowish white; antennæ white at tips; pectus and coxæ with some yellowish-white scales; abdomen with dorsal yellowish-white patch at base and band on fifth segment, the ventral surface with the segments fringed with yellowish white. Fore wing with wedge-shaped hyaline patch in cell, an elongate patch below the cell from near base to near termen, and elongate spots beyond the cell above veins 6, 4, 3. Hind wing with hyaline patch below the cell and spot above base of vein 2.

*Hab.* LAGOS, Ebute Meta (*Boag*), 1 ♂, 2 ♀ type. *Exp.* 26 mm.

## Genus PARALETHIA, nov.

Type, *P. subformicina*, Beth.-Baker.

Proboscis fully developed; palpi porrect, not extending beyond frons; antennæ of male ciliated; fore tibiæ and tarsi of male thickly fringed with scales on inner side; mid and hind tibiæ with the spurs short. Fore wing with veins 2, 3 from a point long before angle of cell; 4, 5 from angle; 6 from long below upper angle; 7, 8, 9, 10, 11 stalked. Hind wing with vein 2 from long before angle of cell; 3, 4 absent; 5 from angle; 6, 7 stalked, 6 curved downwards.

271 a. *Apisa metarctiodes*, sp. n.

♂. Head and thorax reddish fulvous; palpi, frons, branches of antennæ, and tips of tegulæ brown; pectus and fringes of hair on femora and tibiæ brown; abdomen fulvous, tinged with brown towards extremity, a slight whitish dorsal band at base, and subdorsal white spots on second segment; the ventral surface brown, with the first three segments fringed with whitish. Fore wing reddish fulvous, the medial area suffused with dark brown except at costa, narrowing below the cell and embracing all the spots, the veins of terminal area with dark streaks; a quadrate semihyaline white spot in middle of cell and an irregularly elliptical spot below middle of cell extending to below vein 1; a trifid spot beyond upper angle of cell from above vein 7 to below 6 and a bifid spot above and below vein 4; cilia dark brown. Hind wing whitish, the inner area tinged with flesh-yellow and the inner margin and terminal area suffused with brown; a small brown spot below end of cell above base of vein 2; cilia

yellowish; the underside flesh-yellow, the disk whitish; a curved brown discoidal band.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♂ type. *Exp.* 34 mm.

287 a. *Metarctia pulverea*, sp. n.

♀. Head and thorax rufous; abdomen greyish tinged with rufous. Fore wing rufous thickly irrorated with black; a small blackish spot above base of vein 2; a diffused blackish discoidal patch. Hind wing greyish tinged with rufous.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♀ type. *Exp.* 42 mm.

290 b. *Metarctia flaviciliata*, sp. n.

♂. Head and tegulæ scarlet; palpi, sides of frons, and antennæ fuscous; thorax fuscous, the patagia with scarlet edges towards base, the vertex with scarlet stripe; tibiæ and tarsi fuscous; abdomen scarlet, the last two segments and ventral surface with fuscous bands. Fore wing fuscous brown, the cilia ochreous yellow. Hind wing pale fuscous, the base whitish, the inner margin yellow, with some scarlet hair towards base; cilia ochreous yellow. Underside of fore wing yellowish, the costal and apical area to vein 2 suffused with fuscous brown, the cell clothed with scarlet hair; hind wing yellowish, with the costal area suffused with fuscous.

♀. Abdomen with narrow fuscous dorsal bands and broad band just before extremity; fore wing fuscous black, hind wing fuscous, the cilia of both wings yellow, the underside similar.

*Hab.* UGANDA, Beni Semliki (*Legge & Wollaston*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 48, ♀ 58 mm.

299. *Pseudapiconoma elegans*.

♀. Head and thorax blue-grey tinged with brown; palpi, sides of frons, basal joint of antennæ above, and back of head crimson; pectus (except in front), sides of coxæ, femora above, and tibiæ on inner side crimson; abdomen blue-grey tinged with brown, the first two segments with diffused subdorsal orange bands, slightly connected dorsally on second segment; the next five segments with subdorsal black bands, narrowing at middle; the lateral tufts of hair brown; the ventral surface with crimson subventral patches on first six segments and slight marks on anal segment. Fore wing pale

red-brown, the inner area and a faint bar across end of cell tinged with blue-grey. Hind wing orange. Underside of fore wing with the basal half of costal area, the cell, and area below it to termen at vein 2 orange; a crimson spot in upper end of cell.

*Hab.* UGANDA, Entebbe (*Minchin*). *Exp.* 62 mm.

637 b. *Eurota nigricincta*, sp. n.

♂. Head and thorax black-brown; tegulæ yellow at sides; metathorax with yellowish-white bar; pectus with yellow stripes below wings; abdomen orange, a dorsal black patch on first segment and dorsal bands on the other segments, the extremity black; a lateral series of black spots; the ventral surface yellowish white, with black bands. Fore wing black-brown; a basal yellow patch with irregular outer edge, angled inwards at vein 1; a wedge-shaped hyaline patch in end of cell and quadrate patch below the cell; a postmedial series of five hyaline spots between veins 7 and 2, the spots below veins 5, 4 extending to near termen, and the spot below 3 minute and near termen. Hind wing black-brown; a small yellow patch at base with irregular outer edge; a hyaline patch beyond the cell between veins 7 and 2, the spots above veins 6 and 2 small.

*Hab.* ARGENTINA (*O. W. Thomas*), 2 ♂ type. *Exp.* 28 mm.

892 a. *Pseudaclytia flavidorsia*, sp. n.

♂. Head black, the vertex orange; thorax orange, the outer edge of patagia, pectus, and legs black; fore coxæ with white patches; abdomen black. Fore wing greyish, the veins black, the inner area suffused with black; the interspaces of terminal area streaked with black. Hind wing hyaline; the veins black; the inner area black, with slight semihyaline streaks in submedian interspace; costal area greyish; termen black.

*Hab.* VENEZUELA, Caura Valley (*Klayes*), 2 ♂ type. *Exp.* 16 mm.

1073 a. *Eucereon phaeophlebia*, sp. n.

Hind wing of male with the inner area truncate towards tornus; a fold on underside containing a fringe of yellow hair.

♂. Head and thorax yellow-brown; palpi pink at base and fuscous at sides; coxæ pale pink; abdomen fuscous

brown, the ventral surface pale pink except at extremity. Fore wing yellow-brown, the veins darker. Hind wing fuscous brown.

*Hab.* ARGENTINA (*O. W. Thomas*), 1 ♂ type. *Exp.* 30 mm.

### Arctiadae.

#### *NOLINÆ.*

##### 13 a. *Celama leucoscopula*, sp. n.

Head, thorax, and abdomen white, slightly tinged with pale rufous; anal tuft pure white. Fore wing white, tinged in parts with pale brown; antemedial line black, strong, angled outwards in cell, then oblique, with brownish suffusion before it; medial and postmedial oblique elliptical patches from costa; postmedial line very ill-defined, bent outwards below costa, then oblique; traces of a sinuous subterminal line. Hind wing white slightly tinged with brown and with a faint discoidal spot.

*Hab.* CEYLON, Ambalangoda (*J. Pole*), 1 ♂ type; Peradeniya, 2 ♀; Matale, 1 ♀; Pattalam, 1 ♀; Hambantota, 2 ♀. *Exp.* 12 mm.

##### 61 a. *Nola ochrographa*, sp. n.

♂. Head and tegulae ochreous white mixed with some brown; palpi and sides of frons black-brown; thorax brown, mixed with black; abdomen greyish suffused with black-brown, the anal tuft tinged with ochreous. Fore wing greyish suffused and thickly irrorated with dark brown, the medial area suffused with red-brown below the cell and on inner side of postmedial line; antemedial line black, defined by ochreous white on inner side, acutely angled outwards in cell, then very oblique and ending at vein 1; the tuft of scales in cell blackish, the tuft at upper angle greyish, with a slight black line on its inner edge from costa, angled outwards below costa; postmedial line ochreous white, defined by black on inner side, very oblique and almost straight; subterminal line ochreous white, arising from costa just beyond postmedial line, excurved to vein 6, then straight; a fine dark terminal line; cilia fuscous, with a fine pale line at base. Hind wing ochreous white, the costal and terminal areas suffused with brown except towards tornus; the underside irrorated with dark brown; a dark discoidal lunule.

*Hab.* UGANDA, Entebbe (*Minchin*), 1 ♂ type. *Exp.* 22 mm.

72 a. *Nola biconica*, sp. n.

Head and thorax grey-white irrorated with fuscous; tarsi fuscous tinged with white; abdomen grey tinged with fuscous. Fore wing white irrorated with brown; a brown fascia on base of costa; antemedial line arising from a small triangular brown patch on costa, blackish, oblique below submedian fold, and not reaching inner margin; the tufts of scales at middle and end of cell brown, the latter placed at extremity of a small triangular costal patch, and with an oblique waved line from it to inner margin; postmedial line more or less punctiform, angled outwards below costa, incurved to vein 6 and below 4; subterminal line strongly angled outwards at vein 7 and excurved at middle; some fuscous on termen. Hind wing whitish tinged with fuscous; the underside white irrorated with brown; a black discoidal spot.

*Hab.* PANAMA, Cuna Mines (*Tyllecote*), 2 ♂; BR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂; BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♀ type; São Paulo (*Jones*), 1 ♀. *Exp.* 12-16 mm.

74 b. *Nola argyrolepis*, sp. n.

♀. Head and thorax ochreous white mixed with rufous scales; abdomen ochreous white tinged with rufous. Fore wing ochreous thickly irrorated with rufous and with a few black and silvery scales; subbasal line rufous, with a black point at costa, sinuous, from costa to submedian fold; antemedial line slight, irregularly waved, with black point at costa; medial line rather diffused, angled outwards at discal and submedian folds, a small black spot beyond it at upper angle of cell; postmedial line angled outwards below costa and inwards at vein 6, excurved to vein 3, then oblique and irregularly waved, with black point on it above vein 1; subterminal line indistinct, rufous, angled outwards at vein 7, excurved at middle, and ending at tornus; a terminal series of slight black points. Hind wing ochreous white, tinged with rufous.

*Hab.* MASHONALAND (*Dobbie*), 1 ♀ type. *Exp.* 22 mm.

75 a. *Nola poliotis*, sp. n.

♀. Head and thorax whitish mixed with fuscous, the head whiter; abdomen white suffused with grey. Fore wing grey-white irrorated with fuscous; an indistinct dark antemedial line, very oblique from discal fold to inner margin; tufts of dark scales in upper part of cell towards extremity

and at upper angle; an indistinct, oblique, dentate, postmedial line with blackish points on the veins, somewhat excurved at middle and incurved in submedian interspace; a faint dentate subterminal line, angled outwards at vein 7 and excurved at middle; a terminal series of minute dark points. Hind wing white faintly tinged with brown; the underside with the costal area slightly irrorated with brown.

*Hab.* TRANSVAAL (*Chobmley*), 3 ♀ type. *Exp.* 26 mm.

76 a. *Nola leucalea*, sp. n.

♀. Head and thorax white, sometimes tinged with pale brown; palpi brownish at sides; abdomen white tinged with brown. Fore wing white irrorated with brown and sometimes tinged with pale brown; antemedial line fine, dark, excurved below costa and incurved at median nervure; medial line oblique towards costa, then slightly sinuous; tufts of dark scales in cell before antemedial line, in middle, and at upper angle; postmedial line slightly incurved from costa to vein 4, then oblique and slightly sinuous; subterminal line oblique towards costa and excurved at middle; a terminal series of black points. Hind wing white tinged with brown.

*Hab.* TRANSVAAL, Piet Retief (*Crawshay, Janse*), 3 ♀ type. *Exp.* 20-22 mm.

155 b. *Roeselia pallidiceps*, sp. n.

♂. Head and tegulae ochreous white; palpi and lower part of frons black-brown; thorax grey mixed with fuscous; abdomen grey. Fore wing grey thickly irrorated with fuscous brown, the terminal half slightly paler; a dark slightly curved medial line; a black discoidal bar, the postmedial line conjoined to its upper and lower extremities and excurved beyond cell; an ill-defined line from costa beyond it joining the subterminal line at vein 4, and with a dark striga from costa between them; the subterminal line ill-defined, slightly angled outwards at vein 7 and inwards at vein 2. Hind wing grey thickly irrorated with fuscous; cilia with a fine pale line at base.

*Hab.* CEYLON (*Alston*), 1 ♂ type. *Exp.* 14 mm.

158 a. *Zia ectrocta*, sp. n.

♂. Head and thorax white; legs blackish, the tarsi ringed with white; abdomen white tinged with fuscous. Fore wing pure white; a small black spot on costa near base; a medial triangular black patch from costa to origin of vein 2,

its outer edge excised in cell; two small discoidal tufts of raised scales with a few dark scales round them; postmedial line black with small tufts of raised metallic scales on it, oblique and obsolescent from costa to vein 6, slightly incurved at discal fold and strongly below vein 4, the area beyond it rufous except at apex; subterminal line represented by a dark point on costa, then on the rufous area white, defined on inner side by black from below apex to vein 3, excurved below vein 7 and at middle and below vein 2 angled inwards to near postmedial line; cilia rufous intersected with white. Hind wing white, the terminal area slightly tinged with brown from apex to vein 3.

Ab. 1. Fore wing with the postmedial line more angled inwards below vein 4 and with large black patches beyond it on inner area and at middle, the latter connected with termen below apex by an oblique black fascia.

*Hab.* CEYLON, Haputale (*Mackwood*), 1 ♂ type, Maskeliya (*de Mowbray*), 1 ♂. *Exp.* 20-24 mm.

#### LITHOSIANÆ.

##### 222 a. *Tigrioides termineola*, sp. n.

♀. Head and thorax fulvous orange; palpi, frons, tibiæ, and tarsi blue-black; antennæ blackish; pectus mostly fuscous; abdomen yellow with lateral fuscous stripes. Fore wing fulvous orange; a black streak in submedian fold from middle to termen; a terminal blue-black band, expanding below apex and narrow towards tornus; cilia blue-black. Hind wing pale ochreous, the veins brownish; a dark terminal line expanding into a narrow purplish-fuscous band towards apex, cilia purplish fuscous except towards tornus.

*Hab.* ASHANTI, Kumassi (*Whiteside*), 1 ♀ type. *Exp.* 28 mm.

##### 254 a. *Ilema barbata*, sp. n.

Antennæ of male serrate with fascicles of long cilia; fore wing with the cell clothed with long downturned scales on upperside, narrow, veins 3, 4 curved downwards, the discocellulars oblique, an areole.

♂. Head and thorax orange; antennæ tinged with fuscous; abdomen greyish yellow. Fore wing orange-yellow, the large downturned scales in cell rather deeper orange; a small brownish spot on costa above end of cell. Hind wing pale yellow.

*Hab.* PHILIPPINES, Luzon, Benguet Prov., Irian (McGregor), 1 ♂ type. *Exp.* 20 mm.

301 a. *Ilema pentaspila*, sp. n.

♀. Head, thorax, and abdomen ochreous; fore tibiæ and tarsi suffused with fuscous. Fore wing ochreous; a post-medial somewhat oblique series of five small black spots, below costa, in end of cell, a spot below veins 3, 4 displaced outwards, a short streak-like spot in submedian fold and a spot above inner margin. Hind wing pale ochreous.

*Hab.* SINGAPORE (Lidley), 1 ♀ type; BORNEO, Kuching (Shelford), 2 ♀. *Exp.* 26-30 mm.

361 b. *Ilema atrifrons*, sp. n.

♂. Head, tegulæ, patagia, pectus, and legs fulvous yellow; palpi, frons, and fore legs in front fuscous; dorsum of thorax and base of abdomen grey-white, the rest of abdomen yellow. Fore wing yellow with a whitish suffusion. Hind wing whitish yellow.

*Hab.* NICOBARS (G. Rogers), 1 ♂ type. *Exp.* 26 mm.

Genus METAGYLLA, nov.

Type *M. miroides*.

Proboscis fully developed; palpi upturned, short, the second joint fringed in front with short rather downturned hair, the third small with pointed tuft in front; antennæ of male with bristles and cilia; tibiæ with the spurs moderate; abdomen of male with large dorsal and lateral anal tufts of hair. Fore wing rather narrow; veins 3, 4, 5 from angle of cell; 6 from below upper angle; 7, 8, 9 stalked, 7 from before 9; 10, 11 from cell. Hind wing with vein 3 shortly stalked with 4, 5; 6, 7 coincident; 8 from middle of cell; male with a patch of androconia and fringe of long hair in and beyond end of cell on upperside.

392 a. *Metagylla miroides*, sp. n.

♂. White; head and thorax above and fore tibiæ and tarsi in front tinged with fuscous; palpi with the tuft on third joint fuscous; abdomen with the dorsal anal tuft fulvous, the lateral tuft fuscous. Fore wing with the costal area and inner area to cell and vein 2 slightly tinged with

fuscous. Hind wing with the patch of androconia deep rufous with some ochreous suffusion beyond it, the fringe of hair ochreous.

*Hab.* FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type. *Exp.* 28 mm.

522 a. *Aglossosia latijusca*, sp. n.

♂. Head and thorax deep orange; antennæ blackish, the shaft whitish above; palpi fuscous above; legs striped with fuscous; abdomen orange, with black dorsal stripe and segmental bands except at base. Fore wing fuscous; a yellow fascia on costa narrowing to a point before apex; a yellow fascia on inner margin; cilia yellow. Hind wing pale yellow, the costal area suffused with fuscous or suffused irregularly with fuscous to submedian fold, leaving the inner area and termen yellow. Underside of both wings with slight dark discoidal spot.

*Hab.* UGANDA, Ketoma, 5000' (*Doggett*) 2 ♂ type. *Exp.* 40 mm.

523 a. *Caripodia albescens*, sp. n.

♀. Head orange-yellow; thorax and abdomen whitish tinged with yellow; pectus, legs, and ventral surface of abdomen orange-yellow. Fore wing white, tinged with yellow on costa and inner margin. Hind wing white, tinged with yellow. Underside suffused with orange-yellow.

*Hab.* NIGERIA (*Capt. Richardson*), 1 ♀ type. *Exp.* 30 mm.

586 a. *Halone flavinigra*, sp. n.

♂. Head, thorax, and abdomen fuscous, the vertex of head, base of shaft of antennæ, and tegulæ yellow. Fore wing orange-yellow with irregular oblique outer edge; a postmedial black band angled inwards below cell and with rather dentate edges; some diffused fuscous before termen. Hind wing pale fuscous.

*Hab.* S. INDIA, Palni Hills, 6000' (*W. H. Campbell*), 1 ♂ type. *Exp.* 20 mm.

894 a. *Neasura taprobana*, sp. n.

♂. Ochreous yellow; antennæ at tips, fore legs in front, and extremities of mid and hind tibiæ fuscous. Fore wing

with black point in base of cell; the costa fuscous to the curved diffused antemedial line; a blackish discoidal point on some fuscous suffusion; postmedial line very diffused and ill-defined, waved, emitting streaks inwards on the veins and outwards on veins 7, 6, 4. Hind wing with slight fuscous suffusion below apex.

*Hab.* CEYLON, Maskeliya (*J. Pole*), 1 ♂ type. *Exp.* 24 mm.

897 b. *Tricholepis xanthopera*, sp. n.

♂. Head and thorax fulvous yellow; abdomen yellowish, dorsally tinged with brown. Fore wing pale brown, the base, costa, and terminal area pale yellow. Hind wing pale yellow tinged with brown except terminal area.

*Hab.* SINGAPORE (*Ridley*), 1 ♂ type. *Exp.* 16 mm.

937 a. *Asura toxodes*, sp. n.

♂. Head and thorax pale ochreous slightly mixed with fuscous; antennæ and extremities of tibiæ fuscous; abdomen ochreous white. Fore wing pale ochreous; costal edge blackish on basal and terminal areas; a black point in base of cell; some fuscous in submedian fold; a highly curved antemedial line; a medial line angled inwards in cell; postmedial line confluent at costa and inner margin with the medial line, with which it forms a bow-shaped mark, very oblique from costa to vein 6 and from 4 to inner margin; a very irregular subterminal line angled outwards at veins 6 and 4; a fine black terminal line. Hind wing pale semihyaline ochreous.

*Hab.* ANDAMANS (*G. Rogers*), 1 ♂ type. *Exp.* 24 mm.

966 a. *Asura phantasma*, sp. n.

♂. Whitish ochreous; antennæ and fore legs in front fuscous. Fore wing with the base of costa black; a small black spot in base of cell; an indistinct antemedial series of spots strongly excurved in cell and less so below it, sometimes almost conjoined into a line; a medial line oblique from costa to subcostal nervure, then excurved, often almost obsolete; a small discoidal spot; a postmedial series of points, sometimes almost obsolete, those on veins 6 and 4 nearer termen; one or two points on termen sometimes present. Hind wing pale ochreous, the apex sometimes faintly tinged with fuscous.

*Hab.* ANDAMANS (*G. Rogers*), 5 ♂ type. *Exp.* 18 mm.

1017 a. *Miltochrista ocellata*, sp. n.

♀. Head and thorax orange-yellow; patagia and prothorax with black spots; tibiæ banded with black, the last joint of tarsi black; abdomen greyish ochreous, the ventral surface blackish. Fore wing orange-yellow, small black spots at base of costa and cell; fuscous spots below costa, cell, and above vein 1 before the antemedial line, which is interrupted at submedian fold and angled inwards above inner margin; a large annulus at end of cell; postmedial line strongly bent outwards below costa, then highly and irregularly dentate, strongly incurved below vein 4 and conjoined to antemedial line above and below submedian fold; a subterminal series of small spots on the veins. Hind wing yellow.

*Hab.* CEYLON, Ohiya (*de Moubray*), 1 ♀ type. *Exp.* 40 mm.

1037 a. *Miltochrista citrona*, sp. n.

♀. Head, thorax, and abdomen orange-yellow; antennæ and fore legs in front fuscous. Fore wing pale orange-yellow; small black spots on base of costa and in cell; antemedial part of costa streaked with black; a curved series of four wedge-shaped black spots before the curved, maculate antemedial black line; traces of a curved orange medial line; a black discoidal spot; postmedial black line quadrately angled outwards between veins 6 and 4, with a series of strong black streaks on the veins from it to termen; cilia black. Hind wing pale orange-yellow, with short black streaks on veins towards apex; cilia blackish on apical half.

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

1103 a. *Palpida melanotricha*, sp. n.

Palpi hardly reaching above vertex of head, the second joint moderately scaled in front; antennæ of male ciliated; fore wing with vein 10 stalked with 7, 8, 9; hind wing with veins 6, 7 stalked.

♂. Head, thorax, and abdomen white mixed with ochreous; palpi with fuscous patch on second joint at sides; tarsi slightly banded with fuscous. Fore wing white, finely striated with golden brown and irrorated with long black hair-like scales on basal, medial, and postmedial areas; antemedial line dark brown, from costa to submedian fold, straight; postmedial line red-brown, oblique from costa to

discal fold, then slightly incurved; an ill-defined, waved, white subterminal line, excurved below costa and at middle, angled inwards at discal and submedian folds; a fine black terminal line; cilia white, the tips tinged with brown. Hind wing white, the veins, inner and terminal areas tinged with brown; a fine black terminal line; the underside with the costal area irrorated with brown, a black discoidal striga and interrupted maculate fuscous postmedial and subterminal lines.

*Hab.* JAMAICA, Runaway Bay (*Walsingham*), 2 ♂ type.  
*Exp.* 16 mm.

## ARCTIADÆ.

1677 a. *Mænas ramosa*, sp. n.

♀. Head and thorax white; palpi yellow; antennæ black; tegulæ slightly edged with pale brown; patagia and vertex of thorax streaked with pale red-brown; legs streaked with brown; abdomen orange, the anal tuft and ventral surface white, a dorsal series of black spots except at base and extremity, subdorsal black points on three medial segments and a sublateral series. Fore wing white; a red-brown fascia in base of cell, then along subcostal nervure and to costa before apex expanding at angle of cell and at costa; a fascia along median nervure and to termen below vein 6, emitting branches on basal half of veins 2, 3, expanding and partially enclosing a white spot above middle of vein 4; a fascia on vein 1; an oblique fascia from apex to middle of vein 6; a spot on termen at extremity of vein 2. Hind wing white tinged with yellow; the underside with minute discoidal point.

*Hab.* GERMAN E. AFRICA, Dar-es-Salaam, 1 ♀ type.  
*Exp.* 34 mm.

1761 a. *Diacrisia hypogopa*, sp. n.

♀. Head and thorax pale ochreous, the vertex of thorax with black streak; palpi black, the first joint orange; frons black; femora crimson above, the fore and mid tibiæ fuscous, the hind tibiæ streaked with fuscous, the tarsi fuscous; abdomen orange, with dorsal and lateral series of black spots, the ventral surface ochreous with sublateral series of black points except on basal segments. Fore wing ochreous; a black point at base; an antemedial oblique series of small elongate black spots from costa to median nervure and spots on inner area above and below vein 1; a point at upper angle of cell with oblique spot from costa above it and a point just beyond

lower angle; traces of an oblique postmedial line with black point below vein 4 just beyond lower angle of cell, points above and below veins 3 and 2 and spots above and below vein 1, the spot on inner margin slightly confluent with the antemedial spot; an oblique series of black points from costa near apex above and below veins 8, 7, 6, and points near termen above and below veins 5 and 4. Hind wing pale yellow; a black discoidal spot and a subterminal series of spots above and below veins 7, 5, 2 and on vein 1; cilia white.

*Hab.* SINGAPORE (*Ridley*), 1 ♀ type. *Exp.* 56 mm.

1765 a. *Diacrisia holoxantha*, sp. n.

♀. Head and thorax brownish orange; palpi black at tips; fore and mid tibiae black, hind tibiae black at base and extremity, the tarsi black; abdomen bright orange with dorsal, lateral, and sublateral series of black points. Fore wing uniform brownish orange. Hind wing orange-yellow. Underside of both wings with blackish discoidal points and terminal points above and below vein 5.

*Hab.* NIGERIA, Old Calabar (*Sampson*), 1 ♀ type. *Exp.* 44 mm.

1794 a. *Diacrisia melanodisca*, sp. n.

♂. Head and thorax deep rufous; antennae whitish; patagia with black spots and paler tips; tibiae and tarsi dark brown; abdomen dull orange with dorsal and lateral series of blackish spots. Fore wing buff tinged with rufous, especially towards costa; a black point at base; an antemedial series of black points, angled outwards just below cell; a large blackish patch in end of cell confluent with a medial maculate band, which is angled on median nervure; an indistinct post-medial line with dark points on the veins, oblique from costa to vein 6, incurved at discal fold and oblique below vein 4, some small black spots beyond it towards costa and from vein 3 to inner margin, met at vein 6 by an oblique fascia from costa near apex; cilia with a series of black spots. Hind wing pale dull yellow with small black discoidal lunule and subterminal spots at veins 5, 2, 1.

♀. Fore wing with ground-colour bright rufous irrorated with brown.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 38, ♀ 40 mm.

1814 b. *Diacrisia coccinea*, sp. n.

♂. Head white; palpi scarlet, the third joint blackish; antennæ black; tegulæ and patagia white edged with scarlet, the latter with black spot; thorax scarlet with pair of dorsal white streaks; pectus scarlet; legs white, the femora scarlet above, the tibiæ and tarsi streaked with brown; abdomen scarlet, with dorsal, lateral, and sublateral black spots on medial segments, the ventral surface white. Fore wing scarlet, the interspaces of disk thinly scaled, the costa and veins towards base streaked with white, the inner area with slight blackish irroration; small antemedial black spots below costa and above and below vein 1; small postmedial spots above and below vein 1; cilia whitish. Hind wing semihyaline, the costal and inner areas and termen suffused with scarlet.

♀. Fore wing with the disk not thinly scaled; hind wing wholly scarlet, the cilia whitish.

*Hab.* PHILIPPINES, Luzon, Benguet Prov., Irian (McGregor), 1 ♂, 1 ♀ type. *Exp.*, ♂ 40, ♀ 54 mm.

1824 a. *Acantharctia atriramosa*, sp. n.

♀. Head and thorax ochreous white; antennæ black, ochreous at base; legs black, the femora above orange; abdomen pale orange tinged with brown, the base white, the extremity and ventral surface greyish, lateral series of black spots and sublateral stripes. Fore wing ochreous white; a black fascia from middle of subcostal nervure to apex, emitting a short spur on vein 6; a black fascia on median nervure, emitting finer branches on veins 4, 3, 2; a black streak on vein 1 to termen. Hind wing white.

*Hab.* UGANDA (Doggett), 1 ♀ type. *Exp.* 44 mm.

1860 b. *Estigmene neuriastis*, sp. n.

♂. Head whitish; palpi and antennæ blackish; thorax greyish, the tegulæ and patagia edged with orange; tibiæ and tarsi brownish streaked with black; abdomen orange with dorsal black segmental bands, the ventral surface yellowish white with lateral and sublateral series of small black spots. Wings yellowish white, the veins finely streaked with blackish; fore wing with the margins rather yellow.

*Hab.* ANGOLA, Bihe, 1 ♂ type. *Exp.* 44 mm.

1870 b. *Estigmene flaviceps*, sp. n.

♂. Head orange-yellow; palpi and antennæ black; thorax white; pectus and legs orange-yellow, the tibiæ and tarsi striped with black; abdomen orange-yellow, the basal segment and ventral surface white, a dorsal series of black bands except at base and extremity, and lateral series of black spots and sublateral series of points except at base and extremity. Fore wing white, the costal edge orange-yellow. Hind wing white.

*Hab.* SIERRA LEONE (Quinton), 2 ♂ type. *Exp.* 36 mm.

1878 a. *Pericallia nephelistis*, sp. n.

♀. Head and thorax grey mixed with fuscous brown; patagia, meso- and metathorax with paired blackish spots; pectus and legs yellow, the tibiæ and tarsi greyish, the latter banded with black; abdomen yellow with dorsal series of black patches, except on two basal segments, and lateral series of spots. Fore wing brownish grey, mostly clouded with fuscous blotches and spots, some of them forming a subbasal band from costa to submedian fold with two small spots beyond it in submedian interspace, an antemedial band angled outwards in cell, then oblique to vein 1, a medial patch in and below cell connected with a patch on costa, some confluent markings on middle of inner margin; a discoidal patch confluent with a patch on costa, and some very irregular and partly confluent postmedial and subterminal spots; a series of small spots on termen and cilia. Hind wing pale yellow, with discoidal blackish spot and point at lower angle of cell; two small spots on basal part of vein 2 and two irregular spots on vein 1; irregular subterminal patches from costa to vein 4, vein 3 to submedian fold and above tornus.

*Hab.* ANGOLA, Bihe, 3 ♀ type. *Exp.* 52 mm.

1994 a. *Turuptiana sanguinea*, sp. n.

Head, thorax, and abdomen black; femora crimson above; abdomen with crimson subdorsal fasciæ not reaching base. Fore wing black; an irregular curved antemedial crimson band expanding on costa towards base and extending to vein 1; a medial, rather triangular band from costa to vein 1, indented by black streaks on the veins; a small spot beyond the cell; a curved postmedial band from costa to vein 1 with slight dark streaks on the veins; apical part

of costa and cilia pale yellowish tinged with crimson. Hind wing crimson, a little black at base; a discoidal lunule; a terminal black band narrowing to a point at vein 1.

*Hab.* BOLIVIA, La Paz, 9000', 1 ♂, 1 ♀ type. *Exp.* 28 mm.

2028 a. *Antarctia rhodosoma*, sp. n.

♂. Head fuscous with tufts of orange hair on basal joint of antennae; palpi crimson with the third joint black; tegulae black, with dorsal crimson streak; patagia orange; thorax black; pectus and legs dark brown, the coxae and femora crimson; abdomen crimson, with dorsal and lateral series of small black spots, the ventral surface black. Fore wing pale reddish brown, the base yellowish, the subbasal area, cell, and a discal patch tinged with fuscous. Hind wing pale semihyaline brown, the cell and a streak in discal fold slightly tinged with fuscous.

*Hab.* CHILI, Maquahue, Temuco (*Middleton*), 1 ♂ type. *Exp.* 38 mm.

2034 a. *Antarctia atrifascia*, sp. n.

♂. Head and thorax rufous, tinged with brown; palpi blackish; frons and pectus in front with blackish hair mixed; fore tibiae blackish fringed with rufous hair; abdomen ochreous suffused with brown. Fore wing brownish ochreous irrorated with fuscous; a diffused black streak below median nervure to origin of vein 2; a slight streak in lower part of cell from middle to above middle of vein 5; a black discoidal point; a terminal series of small black spots. Hind wing pale ochreous suffused and irrorated with fuscous. Underside of fore wing suffused with fuscous; hind wing with black discoidal point.

*Hab.* BR. E. AFRICA, Aberdare Range (*R. Ford*), 1 ♂ type. *Exp.* 36 mm.

2086 a. *Utetheisa pulchelloides*, sp. n.

Differs from *U. pulchella* in the antennae of male being serrate instead of ciliated and in the hind wing having the fold and tuft on inner area.

It varies much in the same way as *U. pulchella*, but never seems to lose the black spots of fore wing, which usually has the ground-colour rather white; in specimens from the New Hebrides and Solomons the black terminal band on hind wing is largely developed, and it appears to be confined to Oceanic and other islands and to N. Australia.

*Hab.* SEYCHELLES, Praslin (*Fletcher*), 2 ♂, 1 ♀; CARGADOS CARFOS (*Fletcher*), 1 ♂; COETIVY (*Fletcher*), 1 ♂, 1 ♀; AMIRANTES (*Fletcher*), Poivre, 1 ♂, 1 ♀, D'Anos, 1 ♂, St. Joseph, Eagle, 1 ♂, Desroches; CHAGOS IS., Peros Banhos (*Fletcher*), 1 ♂ type, Salomon Atoll, Diego Garcia; CEYLON, Kandy (*Green*), 3 ♂, 2 ♀, Peradenyia, Ham-lantota, Trincomali (*Fletcher*), 1 ♂, 1 ♀; COCOS-KEELING I. (*Darwin, Wood-Jones*), 3 ♂; CHRISTMAS I. (*Andrewes*), 1 ♂, 2 ♀; SINGAPORE (*Ridley*), 1 ♂, 1 ♀; FORMOSA (*Seeböhm, Dickson, Hobson*), 1 ♂, 5 ♀; LOO-CHOO IS. (*Fryer*), 1 ♂; NEW GUINEA (*Mathew*), 1 ♂, 3 ♀; N. AUSTRALIA, Baudin I. (*J. J. Walker*), 1 ♂, 1 ♀, Pt. Darwin (*J. J. Walker*), 3 ♂, 2 ♀; QUEENSLAND, Cooktown (*de la Garde*), 2 ♀; SOLOMON IS., Alu (*Woodford, Mathew*), 2 ♂; GILBERT IS. (*Woodford*), 2 ♂; MARSHALL IS. (*Mathew*), 1 ♂, 2 ♀; ELLICE IS. (*Woodford, Mathew*), 4 ♂, 1 ♀. *Exp.* 34-44 mm.

I am indebted to Paymaster T. Bainbrigge Fletcher for pointing out the distinctions and suggesting the name of this species. The larva feeds on *Tournefortia argentea*. Specimens from the mainland of Africa and Asia, Ceylon, Colombo, Nicobars, Java, New Guinea, Port Moresby, New South Wales, Tasmania, and Fiji are *U. pulchella*.

2087 a. *Utetheisa pectinata*, sp. n.

♂. Differs from *U. pulchella* only in the male having the antennæ bipectinate with very short branches, and the hind wing having the fold and tuft on inner area.

*Hab.* N. AUSTRALIA, Port Essington, 1 ♂ type. *Exp.* 36 mm.

This species belongs to the same section of the genus as *U. antennata*, which also has the fold and tuft on inner area as well as the pectinate antennæ.

2107 a. *Rhodogastris atrivena*, sp. n.

♀. Pure white; palpi tinged with yellow, black above; frons black at sides and with two black spots above; vertex of head with black point; antennæ brownish; tegulæ, shoulders, patagia, and prothorax with pairs of small black spots, those on tegulæ larger; legs yellow, the knees with black spots; abdomen with lateral black points except on basal segments and minute sublateral black streaks on two medial segments. Fore wing with fine black-brown streaks

on the veins and minute discoidal point. Hind wing with minute discoidal point.

*Hab.* UGANDA, Entebbe (*Minchin*), 1 ♀ type. *Exp.* 60 mm.

### Agaristidæ.

#### 81. *Xanthospilopteryx Hornimani*.

Subsp. *Minchini*, nov.

♀. Fore wing with the antemedial and medial yellowish-white patches confluent, leaving a slight black streak on middle of subcostal nervure with small spots below it in and below middle of cell; a yellowish-white streak above inner margin, except towards base and tornus; the oblique band beyond the cell much broader, a fascia between veins 3, 2 from below end of cell to near termen; the spot above tornus slight. Hind wing with the terminal band narrower and with slightly waved inner edge.

*Hab.* UGANDA, Entebbe (*Minchin*), 1 ♀ type. *Exp.* 82 mm.

### Genus ACANTUERTA, nov.

Type, *A. (Tuerta) thomensis*, Jord.

Proboscis fully developed; palpi upturned, the second joint fringed with long hair in front, the third porrect and somewhat dilated at extremity; frons with truncate conical prominence with raised rim in front and corneous plate below it, very narrow above between the eyes, which are naked; antennæ somewhat dilated towards extremity; mid and hind tibiæ spined; abdomen with dorsal crests on first two segments. Fore wing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from middle of discocellulars; 6, 7 from upper angle, 8 anastomosing with the cell near base only.

#### 161 a. *Tuerta cyanopasta*, sp. n.

♀. Head and thorax black-brown; pectus pale orange at sides; fore tibiæ and the tarsi with greyish rings; hind tibiæ with the basal half mostly orange and fringed with orange hair; abdomen orange, the dorsal crests black, the extremity blue-black, the ventral surface with the basal half brownish, the terminal half blue-black and forming an

elliptical depression. Fore wing deep chocolate-brown suffused with silvery blue to the subterminal line; the base of inner margin black-brown; a waved antemedial black bar from costa to median nervure and an almost medial waved bar from submedian fold to inner margin; blue stigmata strongly defined by black in end of cell and on discocellulars, the former oblique elliptical and conjoined at lower extremity to the latter, which is lunulate and dilated at lower extremity; postmedial line strong, black, excurved below costa and at middle, angled inwards at discal fold, strongly incurved below vein 3 to lower edge of reniform, then waved; the outer edge of the blue area dentate, with small blackish spots in the interspaces, angled outwards at veins 6, 4, 3, then incurved; a terminal series of small black spots and a fine waved terminal line; cilia bluish fuscous with a slight pale line at base. Hind wing deep orange with black-brown terminal band, its inner edge incurved at discal fold, narrowing to a point at tornus; cilia with a fine pale line at base. Underside of fore wing orange, except costal area and the broad terminal area, a black spot in end of cell and broad oblique discoidal bar to the terminal band at vein 2; hind wing with golden-brown suffusion on costal half except at base, and before the terminal band except towards tornus.

*Hab.* BR. E. AFRICA, Njoro (*Cholmley*), 1 ♀ type. *Exp.* 46 mm.

### Noctuidæ.

#### AGROTINÆ.

##### 58 a. *Chloridea flavigera*, sp. n.

♀. Head, thorax, and abdomen yellow, the thorax suffused with pale pink, the abdomen pale at base with two pink crests; palpi suffused with purplish red, tibiæ and ventral surface of abdomen irrorated with red. Fore wing yellow with a slight greenish tinge; the costa suffused with red-brown, a subbasal red-brown striga from costa and point below cell; an antemedial red-brown striga from costa and traces of a waved line; claviform with its extremity faintly defined; orbicular with brown point in centre and a faint round circumference; reniform with grey centre defined by red-brown and traces of brown circumference, confluent with a brown mark from costa above it; postmedial line very indistinct, bent outwards below costa, then minutely waved, incurved below vein 4; subterminal line with brown tri-

angular patch on costa, then very indistinct, angled outwards at vein 7; cilia red-brown, with series of darker lunules and greyish line near tips. Hind wing yellow, with slight discoidal lunule and diffused sinuous subterminal dark band, extending to termen below apex. Underside of both wings with the costal and terminal areas irrorated with rufous; fore wing with a point in cell, dark discoidal spot, curved postmedial and indistinct subterminal lines; hind wing with slight discoidal lunule, curved postmedial line from costa to vein 2 with minute dark streaks on the veins, and diffused subterminal band.

*Hab.* RHODESIA, Buluwayo (*Marshall*), 1 ♀ type. *Exp.* 32 mm.

175 a. *Timora latinigra*, sp. n.

Head and thorax bright rufous; antennæ whitish at base, blackish at tips; a tuft of blackish hair below patagia; palpi, frons, tibiæ, and tarsi black; abdomen greyish fuscous, the anal tuft pale rufous. Fore wing ochreous tinged with cupreous red, especially on costal area; the costal edge pure white; a broad black fascia on median nervure, attenuate towards base and extending to near termen; an antemedial black point on vein 1; a postmedial series of small black spots except towards costa, oblique below vein 4; some black on costa towards apex; a terminal series of small black spots; cilia pale crimson. Hind wing ochreous white tinged with brown, especially on terminal area; a terminal series of black points; cilia pale crimson; the underside whitish.

*Hab.* UGANDA, Mulema (*Doggett*), 17 ♂, 4 ♀ type. *Exp.* 30 mm.

738 a. *Agrotis elæopis*, sp. n.

♀. Head and tegulæ red-brown; thorax fuscous; palpi fuscous; pectus, legs, and abdomen whitish tinged with brown. Fore wing red-brown with slight dark irroration; subbasal line slight, dark, from costa to submedian fold; antemedial line indistinct, double, sinuous, rather punctiform; claviform absent; orbicular and reniform small, fuscous with whitish annuli slightly defined by black, the former elongate, acute at extremity, and touching the latter; postmedial line represented by a double series of black points, bent outwards below costa, excurved to vein 4, then oblique; subterminal line absent; cilia rufous with a fine whitish line at base. Hind wing white with dark discoidal point, postmedial series of minute streaks on the veins and fine terminal line; the

underside with the markings more prominent, the costal area slightly irrorated with fuscous.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♀ type. *Exp.* 30 mm.

795 a. *Metalepsis fuegensis*, sp. n.

♂. Head and thorax clothed with white and brown hair; palpi black at sides; lower part of frons black and brown, a yellow mark between antennae, which are black; tegulae with black medial line followed by a brown patch; patagia with brown line near upper edge; dorsum of thorax mostly brown; abdomen grey, suffused with brown. Fore wing grey-white, suffused with rufous in the interspaces, except on costal area; the veins slightly streaked with black and prominently defined by grey except on terminal area; a short black and rufous streak below base of costa; a black streak below base of cell and a stronger streak above inner margin before middle; antemedial line obsolete; claviform represented by a slight white streak with short black streak beyond it; orbicular and reniform small, white with a black streak below them, the former elongate elliptical, the latter a minute lunule; a short black streak beyond upper angle of cell; postmedial line obsolete; a subterminal series of small black spots in the interspaces interrupted by the grey streaks defining veins 7, 6, 4, 3; cilia white with a brown line through them. Hind wing grey, suffused and irrorated with fuscous; cilia white with a fuscous line through them; the underside paler.

*Hab.* TIERRA DEL FUEGO, Cheena Creek (*Crawshay*), 1 ♂ type. *Exp.* 30 mm.

817 a. *Episilia clavata*, sp. n.

♂. Head, thorax, and abdomen dark reddish brown mixed with grey; tarsi with pale rings. Fore wing grey tinged with red-brown, the medial area red-brown except towards costa and inner margin; subbasal line represented by a black striga from costa; a strong sinuous black streak below base of cell with yellow streak above it to the claviform, which has a yellowish annulus defined by black and intersects the oblique sinuous antemedial line; orbicular and reniform grey with brownish centres and defined by black, the former oblique elliptical, open above, the latter a narrow lunule very strongly angled on median nervure to below orbicular, some blackish in cell before and between them;

postmedial line strongly bent outwards below costa, then dentate, strongly incurved below vein 4; subterminal line very indistinct, greyish, slightly angled outwards at vein 7 and excurved at middle, the veins beyond it with slight dark streaks; a terminal series of slight brown lunules; cilia with fine brown line near base. Hind wing grey suffused and irrorated with brown, a dark terminal line; the underside with dark discoidal lunule and diffused curved postmedial line.

*Hab.* PUNJAB, Kulu (*Dudgeon*), 1 ♂ type. *Exp.* 30 mm.

856 c. *Episilia arenacea*, sp. n.

♂. Head and thorax pale brownish ochreous; tarsi fuscous with pale rings; abdomen pale ochreous, dorsally irrorated with fuscous. Fore wing pale brownish ochreous slightly irrorated with fuscous; a double, wavy, subbasal line from costa to submedian fold; antemedial line indistinctly double, oblique, strongly wavy, interrupted; orbicular and reniform with slight yellowish annuli incompletely defined by fuscous, the former round, the latter large; postmedial line double at costa, then indistinct, bent outwards below costa, then dentate and produced to a series of black points on the veins, oblique below vein 4, some pale points beyond it on costa; subterminal line ochreous white, slightly defined by fuscous on inner side at costa, then by slight dentate marks, angled outwards at vein 7 and slightly excurved at middle; a terminal series of black points. Hind wing whitish suffused with pale brown; cilia yellowish white; the underside white, the costal area tinged with ochreous, a small discoidal spot and punctiform postmedial line.

*Hab.* BELOOCHISTAN, Quetta (*Nurse*), 1 ♂ type. *Exp.* 46 mm.

867 a. *Episilia rhodopea*, sp. n.

♂. Head and thorax fuscous slightly mixed with grey and rufous; abdomen whitish suffused with brown. Fore wing red-brown with slight dark irroration; subbasal line represented by double oblique striæ from costa; antemedial line with double black striæ from costa, then minutely dentate, above inner margin angled outwards almost to the postmedial line; claviform absent; orbicular and reniform with fuscous centres and undefined whitish annuli, the former small, narrow, oblique elliptical; a medial dark shade, oblique below the cell; postmedial line represented by a

double series of black points on the veins; subterminal line absent, the terminal area slightly darker; a terminal series of black points. Hind wing whitish tinged with brown; a dark discoidal spot, rather diffused sinuous postmedial line and terminal series of striæ; cilia ochreous white with a faint dark line through them; the underside with the markings more prominent, the costal area tinged with rufous and irrorated with fuscous.

*Hab.* UGANDA, Ruwenzori, 12,600' (*Ruwenzori Exp.*), 1 ♂ type. *Exp.* 34 mm.

890 c. *Episilia rufisigna*, sp. n.

Head and thorax ochreous white tinged with brown; sides of palpi and frons blackish; pectus tinged with rufous; abdomen fuscous brown above, whitish below. Fore wing white tinged with ochreous and sparsely irrorated with black; the lines absent; orbicular represented by a black point; reniform rufous defined by brown, quadrate, angled inwards on median nervure; a diffused oblique red-brown shade from apex; a terminal series of black points. Hind wing whitish suffused with reddish brown; a dark discoidal spot; cilia whitish; the underside whitish irrorated with brown, a dark discoidal spot, small subapical spot on vein 7, and terminal series of small spots.

*Hab.* S.E. PERU, St. Domingo, 1 ♂, 1 ♀. *Exp.* 52 mm.

913 a. *Lycophotia ecliptica*, sp. n.

♂. Head and thorax rufous; tegulæ with triangular deep rufous patch at base; abdomen pale rufous mixed with greyish. Fore wing rufous with an ochreous tinge; a slight curved rufous subbasal line; antemedial line rufous, angled outwards below costa, incurved in submedian interspace and bent outwards to inner margin; claviform represented by a faint point at its extremity; orbicular a small almost obsolete annulus; reniform narrow, fuscous defined by whitish; traces of a medial shade; postmedial line rufous, slightly bent outwards below costa, then minutely waved, excurved to vein 4, then incurved, slightly angled inwards in discal and submedian folds; subterminal line almost obsolete, with slightly darker shade before it at costa; cilia grey-brown with a dark brown line through them. Hind wing white, the veins, costal area, and termen tinged with brown; a terminal series of dark striæ; the underside with the costal

area suffused with fuscous, a small discoidal lunule and indistinct sinuous postmedial line, the terminal strizæ black.

*Hab.* TIERRA DEL FUEGO, Rio McClelland (*Crawshay*), 1 ♂ type. *Exp.* 36 mm.

916 a. *Lycophotia atrimediæ*, sp. n.

♂. Head and thorax bright rufous slightly irrorated with white; tarsi fuscous with pale rings; abdomen pale brown, the anal tuft and ventral surface rufous. Fore wing bright rufous, the costal area slightly irrorated with white; an indistinct curved subbasal line from costa to submedian fold; antemedial line bent inwards to costa, then slightly sinuous and rather oblique, indistinct towards inner margin; claviform narrow defined by black; orbicular and reniform irrorated with white and defined by black, the cell before and between them and the area between reniform and postmedial line suffused with black, the orbicular rounded, open above; the postmedial line slightly bent outwards below costa, then very minutely waved, excurved to vein 4, then incurved, some pale points beyond it on costa; subterminal line very indistinct, with somewhat darker shade before it at costa, slightly angled outwards at vein 7 and excurved at middle. Hind wing white, the costal area slightly irrorated with brown; the underside with the costal area suffused with rufous.

*Hab.* TIERRA DEL FUEGO, Rio McClelland (*Crawshay*), 1 ♂ type. *Exp.* 42 mm.

923 a. *Lycophotia atrifasciæ*, sp. n.

Head and thorax grey mixed with brown; pectus with some ochreous hair; abdomen ochreous white. Fore wing grey tinged with brown and irrorated with fuscous especially on the veins; subbasal line represented by traces of double black strizæ from costa and cell; antemedial line double, oblique, waved; orbicular and reniform small, incompletely defined by black, the former round, a black fascia in cell between them and slight streak beyond the reniform; postmedial line indistinct, double, bent outwards below costa, then minutely dentate and produced to black and white points on the veins, excurved to vein 4, then oblique; subterminal line only defined by the area beyond it being tinged with fuscous, excurved below vein 7 and at middle; a fine whitish line at base of cilia. Hind wing pure white; the underside with the costal area slightly irrorated with brown.

*Hab.* ARGENTINA, Mendoza (*Bain*), 1 ♂, 3 ♀ type. *Exp.* 32-38 mm.

924 a. *Lycophotia melanoleuca*, sp. n.

♂. Head and thorax black-brown, the scales of head and thorax slightly tipped with grey; abdomen fuscous, the base paler, the anal tuft ochreous. Fore wing black-brown with a slight reddish tinge and leaden gloss; subbasal line indistinct, waved, from costa to submedian fold; antemedial line double, the inner line very indistinct, waved, somewhat oblique; claviform minute, very indistinctly defined by black scales; orbicular and reniform defined by black, the former round; traces of a dark medial shade; postmedial line defined by paler colour on outer side, bent outwards below costa, then very minutely waved, excurved to vein 4, then incurved, some pale points beyond it on costa; traces of a dark subterminal line, angled outwards at vein 7 and excurved at middle. Hind wing white, the costal area and veins slightly tinged with brown; a fine brown terminal line; the underside with the costal area irrorated with fuscous.

*Hab.* TIERRA DEL FUEGO, Rio McClelland (*Crawshay*), 1 ♂ type. *Exp.* 42 mm.

951 a. *Lycophotia poliades*, sp. n.

♂. Head and thorax white with a few fuscous hairs; tarsi banded with black; abdomen white with tufts of long ochreous hair from the lateral stigmata. Fore wing grey-white slightly tinged with pale rufous in parts and irrorated with fuscous, the veins with dark streaks; a slight black streak below base of cell; subbasal line represented by black striæ from costa and cell; antemedial line represented by a black point on costa; claviform defined by a few black scales; orbicular represented by a short black streak defined by white, the reniform by an undefined white lunule with fuscous spot at lower angle of cell; medial and postmedial black points on costa, with some slight white points beyond them; subterminal line indistinct whitish defined on inner side by slight dentate rufous marks, angled outwards at vein 7 and inwards at discal fold; a terminal series of slight black lunules. Hind wing pure white.

*Hab.* BELOOCHISTAN, Quetta (*Nurse*), 1 ♂ type. *Exp.* 36 mm.

1004 a. *Lycophotia leucoplaga*, sp. n.

♀. Head and thorax clothed with rufous and whitish scales; tegulæ whitish with rufous tips; metathorax with rufous-tinged whitish patch; abdomen fuscous brown. Fore

wing rufous with slight dark irroration, the costal area whitish at base and with some grey beyond middle, the terminal area grey-white; subbasal line absent; antemedial line represented by faint dark points on the veins; claviform and orbicular absent; reniform represented by a diffused dark patch, a quadrate white patch in cell before it connected with costa by an oblique white bar; postmedial line represented by a white striga from costa, bent outwards below costa, then by a faint series of dark points on the veins; subterminal line indistinct, grey with dark patch before it on costa, the apex white; a terminal series of slight black striæ; cilia rufous with fine pale line at base. Hind wing pale fuscous, the basal area whitish; a slight dark discoidal point and fine terminal line; cilia whitish with a dark line through them; the underside whitish irrorated with brown, the costal and terminal areas suffused with brown, a slight discoidal lunule and postmedial series of minute dark streaks on the veins.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♀ type. *Exp.* 28 mm.

1020 a. *Ufeus carnea*, sp. n.

♀. Head and thorax pale flesh-colour mixed with brown; abdomen pale grey-brown. Fore wing pale flesh-pink slightly irrorated with fuscous; the medial area (except towards costa) and a patch on costa beyond postmedial line suffused with fuscous; subbasal line represented by double striæ from costa and cell; antemedial line rather indistinct, waved, incurved to costa and angled inwards on vein 1; claviform minute, defined by blackish; orbicular and reniform pale pinkish defined by fuscous, the former rather oblique elliptical, the latter with some brownish in centre and angled inwards on median nervure; traces of a waved medial line; postmedial line indistinct, bent outwards below costa, then minutely waved, incurved below vein 4, some pale points on costa beyond it; a subterminal series of small dentate black marks angled outwards at vein 7, then oblique; a terminal series of minute dark points; a fine pale line at base of cilia. Hind wing ochreous suffused with brown; the underside whitish tinged with flesh-colour and irrorated with brown, a small discoidal spot and indistinct sinuous post-medial line.

*Hab.* KASHMIR, Narkundah (*McArthur*), 1 ♀ type. *Exp.* 44 mm.

## Genus ANHAUSTA, nov.

Type, *A. exprinata*, Staud.

Proboscis absent; palpi porrect to well beyond frons, fringed with long hair; frons smooth; eyes large, rounded, overhung by long cilia; antennæ of female ciliated; head and thorax clothed with hair only and without crests; fore tibiæ without spines, mid and hind tibiæ with a few spines; abdomen with dorsal crest at base only. Fore wing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the arcole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from middle of discocellulars; 6, 7 stalked; 8 anastomosing with the cell near base only.

1021 *e.* *Anytus leucocyma*, sp. n.

♀. Head and thorax red-brown mixed with fuscous; frons with lateral black bars; tegulæ with slight medial black line; abdomen grey-brown. Fore wing red-brown irrorated with grey and black on basal half, the veins streaked with black; a sinuous black streak below base of cell; subbasal line absent; antemedial line represented by two black striæ from costa, then very indistinct, strongly dentate, oblique; claviform narrow, defined by black and with blackish streak from it to postmedial line; orbicular defined by black, oblique, wedge-shaped; reniform indistinctly defined by black and with slight whitish lunule on outer edge, its lower extremity produced; postmedial line double at costa, bent outwards below costa, then dentate and produced to streaks on the veins, oblique to vein 5, then inwardly oblique and angled inwards in submedian fold, some white points beyond it on costa; subterminal line white, waved, angled outwards at vein 7 and to termen at veins 4, 3, with black streaks beyond it in the interspaces; a fine waved black terminal line; cilia greyish and fuscous intersected with white. Hind wing whitish tinged with brown, the veins and terminal area suffused with brown; traces of a waved white subterminal line; cilia white with a slight dark line through them; the underside white irrorated with fuscous; a discoidal spot, slight waved postmedial line, and traces of subterminal line.

*Hab.* KASHMIR, Nubra (*McArthur*), 2 ♀ type. *Exp.* 50 mm.

1025 a. *Anytus negrita*, sp. n.

♀. Head and thorax black-brown irrorated with grey; tarsi ringed with white; abdomen grey-brown, the dorsal crests rather darker. Fore wing black-brown slightly suffused with grey; an indistinct double waved subbasal line from costa to submedian fold; a slight black streak above inner margin near base; antemedial line indistinct, oblique, waved; claviform short, deep red-brown defined by black; orbicular and reniform with brown centres and grey annuli defined by black, the former round, the latter constricted at middle and extending to below cell; postmedial line indistinct, slightly bent outwards below costa, then waved, excurved to vein 4, then oblique, some grey points beyond it on costa; a sub-terminal series of slight grey and black dentate marks; a terminal series of slight black striæ. Hind wing white, the veins brown, the inner area, and terminal area broadly, fuscous brown; cilia pale brown, whitish towards tornus, a slight dark line near base; the underside with the costal and terminal areas fuscous suffused with grey, a black discoidal point.

*Hab.* URUGUAY, Monte Video (*de la Garde*), 1 ♀ type.  
*Exp.* 36 mm.

## Genus BLEPHARITA, nov.

Type, *B. amica*, Treit.

Proboscis fully developed; palpi oblique, the second joint fringed with long hair in front; frons smooth; eyes large, rounded, overhung by long cilia; antennæ of male bipectinate with moderate branches to near apex; head and thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ fringed with hair, the mid and hind tibiæ spined; abdomen with dorsal crests on basal segments. Fore wing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

## Genus BLEPHAROA, nov.

Type, *B. (Agrotis) mamestrina*, Butl.

Proboscis fully developed; palpi obliquely upturned, the second joint fringed with long hair in front; frons smooth; eyes

large, rounded, overhung by long cilia; antennæ of male bipectinate with moderate branches, the apical third ciliated; head and thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; hind tibiæ with one spine between mid and terminal spurs; abdomen with dorsal series of crests. Fore wing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with cell near base only.

Genus PALÆAGROTIS, nov.

Type, *P. inops*, Led.

Proboscis fully developed; palpi obliquely porrect, fringed with hair in front; frons with slight truncate prominence; eyes large, rounded; antennæ of male ciliated; head and thorax clothed with hair overlying scales, the pro- and metathorax with slight crests; mid and hind tibiæ with one or two spines, fore tibiæ without spines; abdomen with dorsal crest at base only. Fore wing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

HADENINÆ.

Genus POLIA. Insert:—

	Type.
<i>Miselia</i> , Ochs. Schmett. Eur. iv. p. 72 (1816), non descr.; Treit. Eur. Schmett. v. (1) p. 386 (1825), which has precedence.....	<i>conspersa</i> .
<i>Chera</i> , Hübn. Verz. p. 211 (1827) .....	<i>serratilinea</i> .
<i>Hama</i> , Steph. Ill. Brit. Ent., Haust. iii. p. 4 (1829)....	<i>aliena</i> .

1269 a. *Miselia pyrosoma*, sp. n.

♂. Head and thorax deep red; tegulæ with blackish marks at base and two leaden-grey medial lines; patagia with leaden-grey line near upper edge; palpi and the hair on pectus and femora fiery red; tibiæ and tarsi fuscous, the latter ringed with white; abdomen fiery red, whitish at base and with the crests deep red. Fore wing deep red suffused

with black-brown, the veins streaked with fuscous and leaden grey; subbasal line represented by a leaden-grey striga from costa and an oblique pale yellow striga from cell defined by black on inner side and with minute yellow striga before it; a curved yellow mark with black suffusion above it above inner margin before the antemedial line, which is black defined by leaden grey on inner side, angled outwards below costa and inwards on median nervure, then oblique to vein 1, where it is angled outwards; claviform faintly defined by black and with wedge-shaped yellow spot defined by black beyond it; orbicular and reniform leaden grey faintly defined by black and with red lines in centres, the former oblique elliptical, the latter angled inwards on median nervure to below the former; postmedial line black defined by leaden grey on outer side, slightly bent outwards below costa, then minutely dentate, oblique to vein 5, then inwardly oblique and angled inwards on vein 1, some whitish points beyond it on costa; subterminal line represented by minute yellow streaks between veins 7 and 2, with blackish streaks beyond them and an oblique yellow striga below vein 2; a narrow leaden-grey terminal band with waved inner edge with some white points on it; cilia red at base mixed with grey and black at tips. Hind wing red-brown tinged with fuscous; cilia white at tips; the underside red tinged with brown and irrorated with black, the inner area whitish, a black discoidal spot and curved postmedial line.

*Hab.* S.E. PERU, St. Domingo, 2 ♂ type. *Exp.* 42-48 mm.

1293 a. *Miselia plumipes*, sp. n.

♂. Head, thorax, and abdomen bright rufous with a few dark scales; some of the hair on fore tibiæ fuscous; abdomen with sublateral black striæ. Fore wing bright rufous slightly irrorated with black; subbasal line represented by double black striæ from costa; antemedial line double, slightly waved; orbicular and reniform small, the former oblique elliptical with whitish annulus defined by black, the latter open above and below, concave towards base, defined at sides by white between black lines, the white on outer side forming a small triangular mark; postmedial line double, bent outwards below costa, excurved to vein 4, then oblique, sinuous, some white points on costa beyond it; subterminal line pale, angled outwards at vein 7 and excurved at middle, the area beyond it darker; a terminal series of small black lunules. Hind wing rufous, the cilia whitish at tips; the underside greyish irrorated with rufous, especially on costal area; a

small discoidal spot, minutely waved postmedial line, and some small black lunules on termen from apex to vein 2.

*Hab.* COSTA RICA, 1 ♂ type. *Exp.* 28 mm.

1361 a. *Miselia geræa*, sp. n.

♀. Head and thorax grey-white mixed with brown; frons with lateral black bars; tegulæ with medial black line; patagia edged with black; tarsi black ringed with white; abdomen grey-white, the dorsal crest at base with black line near tip, the extremity tinged with rufous. Fore wing grey-white irrorated with brown and fuscous, the veins with slight dark streaks; a sinuous black streak below base of cell; sub-basal line represented by slight black striæ from costa and cell; traces of a double antemedial line excurved from costa to submedian fold and angled inwards on vein 1; claviform narrow, defined by black; orbicular and reniform with slight whitish annuli defined by black, the former elongate elliptical; a diffused curved medial shade; postmedial line with double black points at costa, then represented by slight black streaks on the veins, bent outwards below costa, excurved to vein 4, then oblique; subterminal line represented by a series of faint dentate brown marks, the area beyond it somewhat browner except at base and tornus; a terminal series of black points. Hind wing white, the veins with dark streaks towards termen, which is tinged with brown; the underside with the costal area slightly irrorated with fuscous, a terminal series of slight black striæ.

*Hab.* BR. E. AFRICA, Taveta (*K. St. A. Rogers*), 1 ♀ type. *Exp.* 34 mm.

1930 a. *Cirphis clavifera*, sp. n.

♀. Head and thorax white slightly tinged with brown and irrorated with black; frons with lateral black bars; patagia with some black scales near upper edge; abdomen white, dorsally tinged with ochreous. Fore wing white, slightly irrorated with black and faintly tinged with brown except costal area to beyond middle and inner area to middle, the submedian and discal folds tinged with yellowish; the median nervure with fine white streak; a slight black streak below base of cell; antemedial line represented by a black point on vein 1; claviform indicated by slight black marks above and below; a rather wedge-shaped white mark in end of cell; postmedial line represented by a series of black points on the veins, bent outwards below costa and oblique below vein 4;

a slight whitish streak below terminal part of vein 7 and slight subterminal striga above tornus; a terminal series of black points. Hind wing pure white.

*Hab.* BR. E. AFRICA, Taveta (*K. St. A. Rogers*), 1 ♀ type. *Exp.* 32 mm.

1972 a. *Borolia ustata*, sp. n.

♂. Head, tegulæ, and prothoracic crest ochreous mixed with dark brown; the tegulæ with three black lines; thorax yellow mixed with fiery red; pectus and legs ochreous mixed with dark brown; abdomen ochreous suffused with brown. Fore wing yellow suffused with fiery red, the costal and inner areas with slight dark irroration, the veins whitish defined by slight brown streaks, the interspaces with slight brown streaks; the costal edge whitish, the costal area brownish on terminal half and an oblique brownish fascia from termen below apex; subbasal line represented by a series of black points strongly excurved below the cell; a white streak on extremity of median nervure; orbicular and reniform yellow with some rufous in centres, ill-defined; a curved postmedial series of black points with traces of a crenulate line between them; a terminal series of black points; cilia brown. Hind wing ochreous white, the terminal half suffused with brown; a terminal series of black points from apex to vein 2; cilia ochreous white with a brown line through them; the underside with the costal and terminal areas suffused with rufous and irrorated with black; a small discoidal spot, rather diffused postmedial line from costa to vein 2, and terminal series of black points.

*Hab.* TRANSVAAL, White R. (*Cooke*), 1 ♂ type. *Exp.* 28 mm.

1973 a. *Borolia pyrostrata*, sp. n.

♀. Head and thorax ochreous mixed with red; sides of palpi and frons brownish; patagia streaked with brown at sides; abdomen reddish ochreous irrorated with fuscous. Fore wing yellowish tinged with fiery red, the veins white defined by fine fuscous streaks, the interspaces of terminal area with fine fuscous streaks, the basal half of costal area pale yellow; antemedial line represented by two obliquely placed black points in submedian interspace; a black point at lower angle of cell; a postmedial series of black points, slightly bent outwards below costa, angled inwards in discal fold and oblique below vein 4; diffused dark shades along subcostal and median nervures and thence to apex, from which an oblique pale fascia extends to vein 4; a terminal

series of black points. Hind wing ochreous, nearly uniformly suffused with fuscous; cilia pale yellowish; the underside pale yellowish irrorated with fuscous, a black discoidal spot, postmedial series of short streaks on the veins, and terminal series of points.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♀ type. *Exp.* 32 mm.

1977 a. *Borolia fissifascia*, sp. n.

♀. Head and thorax pale ochreous tinged with reddish brown; antennae blackish; tarsi fuscous; abdomen pale ochreous tinged with fuscous brown. Fore wing pale brownish ochreous, the cell and area beyond it running obliquely to termen below apex pale rufous, the medial part of submedian interspace tinged with rufous, the inner area slightly irrorated with black except towards base; a sinuous black streak below basal half of cell; the terminal half of median nervure with prominent white streak; veins 3, 4 with slight white streaks with fine streaks above them; an oblique whitish fascia from apex; a subterminal black point on vein 4 and a terminal series of black points; cilia grey-brown. Hind wing ochreous whitish, the terminal half suffused with fuscous brown; cilia white; the underside brownish white with terminal series of black points.

*Hab.* LAGOS (*Boag*), 1 ♀ type. *Exp.* 40 mm.

1998 a. *Borolia metasarca*, n. sp.

♂. Head and thorax pale pinkish brown; patagia with a few black scales near upper edge; legs slightly irrorated with fuscous; abdomen ochreous brown. Fore wing pinkish flesh-colour, the cell and area beyond it to postmedial line, the area below it to submedian fold, and a fascia below medial part of vein 1 olive-brown; a whitish streak on median nervure and above vein 3 to termen, some sparse black irroration; a prominent black spot at lower angle of cell; postmedial line represented by a series of black points, bent outwards below costa and oblique below vein 4; the veins of terminal area streaked with olive-brown; a pale oblique fascia from apex defined above and below by fuscous shades; a terminal series of black points; cilia pinkish intersected with brown. Hind wing with the cell and area beyond it to termen flesh-pink slightly suffused with fuscous, the costal and inner areas pale brownish ochreous; cilia pale yellow; the underside with the costal area slightly irrorated with

black, a discoidal lunule, curved postmedial series of points and terminal series.

*Hab.* ASHANTI, Kumassi (*Whiteside*), 2 ♂ type. *Exp.* 32 mm.

2003 a. *Borolia phæopasta*, sp. n.

♀. Head and thorax pale ochreous irrorated with fuscous; abdomen ochreous irrorated and suffused with fuscous. Fore wing ochreous tinged with red and thickly irrorated with fuscous; traces of a waved antemedial line; orbicular represented by a dark point, the reniform by a dark lunule on yellowish patches; traces of a postmedial line with dark streaks beyond it on the veins, slightly bent outwards below costa and oblique below vein 4; subterminal line represented by the area beyond it being somewhat darker, angled outwards at vein 7 and excurved at middle; a terminal series of black points. Hind wing ochreous uniformly suffused with fuscous; cilia pale ochreous; the underside ochreous irrorated with fuscous, a slight dark discoidal spot and curved postmedial line.

*Hab.* UGANDA, Ruwenzori, 6000' (*Ruwenzori Exp.*), 1 ♀ type. *Exp.* 32 mm.

CUCULLIANÆ.

2589 a. *Trichoridia ethiopica*, sp. n.

♂. Head and thorax deep red-brown, the head and tegulæ redder; palpi dark brown fringed with rufous; pectus and legs pale brown mixed with fuscous; abdomen pale brown suffused with fuscous brown, the anal tuft rufous. Fore wing pale red-brown, the basal area and costal area to near apex suffused with dark brown leaving the costal edge rufous, the medial area deep red-brown except on costal and inner areas and defined from subcostal nervure to vein 1 by the slight pale ante- and postmedial lines, the former outwardly oblique below submedian fold, the latter inwardly oblique below vein 5; orbicular and reniform whitish tinged with brown, the former very oblique oblong and both confluent with a large elliptical patch on extremity of median nervure extending to well beyond lower angle of cell; a slight brown terminal line. Hind wing pale brown suffused with fuscous brown; cilia pale rufous; the underside whitish tinged with rufous and irrorated with fuscous, a fuscous discoidal lunule and diffused slightly curved postmedial line.

*Hab.* BR. E. AFRICA, Aberdare Range (*R. Ford*), 1 ♂ type. *Exp.* 34 mm.

XXX.—*Descriptions of Six new Freshwater Fishes from Mexico and Central America.* By C. TATE REGAN, B.A.

*Pimelodus Boucardi.*

Depth of body  $6\frac{1}{2}$  in the length, length of head 4. Breadth of head  $1\frac{1}{3}$  in its length, length of snout  $2\frac{3}{4}$ , diameter of eye 6, interorbital width 3. Lower jaw nearly as long as the upper; maxillary barbel extending to origin of adipose fin. Head covered with smooth skin; occipital process rather strong, extending  $\frac{1}{2}$  the distance from its base to the origin of dorsal. Dorsal 16, the spine slender, the fin rounded, as high as long. Adipose fin  $\frac{1}{3}$  the length of the fish. Anal 14. Pectoral spine with serrated inner edge, about  $\frac{3}{5}$  the length of the fin and  $\frac{1}{3}$  the length of head; humeral process long, nearly reaching the middle of the fin; ventrals originating nearly below the last dorsal ray, extending more than  $\frac{2}{3}$  of the distance from their base to the origin of anal. Caudal deeply notched, the lobes rounded, the lower the larger. Least depth of caudal peduncle  $\frac{1}{3}$  the length of head. Blackish.

*Hab.* Yucatan (*Boucard*).

A single specimen, 190 mm. in total length.

*Pimelodus brachycephalus.*

Depth of body  $5\frac{1}{2}$  to  $6\frac{1}{2}$  in the length, length of head  $5\frac{1}{2}$  to  $5\frac{1}{4}$ . Breadth of head  $1\frac{1}{3}$  in its length, length of snout  $2\frac{2}{3}$  to  $\frac{3}{2}$ , diameter of eye 5 to 6, interorbital width 3 to  $3\frac{1}{2}$ . Lower jaw a little shorter than the upper; maxillary barbel extending to the basal part of pectoral. Head covered with smooth skin; occipital process short. Dorsal 16, the spine slender, the fin rounded, as high as or higher than long. Length of adipose fin  $3\frac{1}{4}$  to  $3\frac{3}{4}$  in the length of the fish. Anal 12-13. Pectoral spine with serrated inner edge, about  $\frac{3}{5}$  the length of the fin and  $\frac{2}{5}$  the length of head; humeral process short; ventrals originating behind the dorsal, extending  $\frac{1}{2}$  to  $\frac{3}{5}$  the distance from their base to the origin of anal. Caudal moderately notched, the lower lobe rounded and rather shorter than the upper. Least depth of caudal peduncle  $\frac{2}{3}$  or more than  $\frac{2}{5}$  the length of head. Brownish.

*Hab.* Guatemala, Rio Nacasil (*Salvin*).

Six specimens, measuring up to 190 mm. in total length.

*Pimelodus Rogersi.*

Depth of body 6 in the length, length of head 5. Head  $1\frac{1}{2}$  as long as broad. Diameter of eye 6 in the length of head, interorbital width 3, length of snout 3. Head covered with smooth skin; fontanel not extending beyond the level of posterior margin of eye; occipital process short. Maxillary barbel extending to middle of pectoral fin. Dorsal I 6, the spine slender, the fin rounded, higher than long. Adipose fin as long as or a little longer than its distance from the dorsal, about  $\frac{2}{3}$  the length of the fish. Anal 12-14. Pectoral spine nearly  $\frac{2}{3}$  the length of the fin and nearly  $\frac{2}{3}$  the length of head, its inner edge with a series of rather small denticulations. Ventrals originating behind the last dorsal ray, extending  $\frac{1}{2}$  the distance from their base to the origin of anal. Caudal with a shallow notch. Least depth of caudal peduncle  $\frac{2}{3}$  the length of head. Brownish.

*Hab.* Costa Rica, Irazu (*H. Rogersi*).

Four specimens, measuring up to 130 mm. in total length.

Allied to *P. Salvini*, Gthr., which has a longer adipose fin ( $\frac{2}{7}$  the length of the fish), a shorter pectoral spine (less than  $\frac{1}{3}$  the length of head), a shorter anal fin with 11 rays, and the caudal more deeply notched.

*Gambusia annectens.*

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$  to  $3\frac{3}{4}$ . Snout as long as or shorter than eye, the diameter of which is 3 to  $3\frac{2}{3}$  in the length of head; interorbital width equal to the distance from middle or posterior part of eye to free edge of operculum. 28 to 31 scales in a longitudinal series. Dorsal 10-12; origin equidistant from tip of snout and middle or posterior part of caudal; free edge of the fin convex. Anal 9-10, pointed, originating a little in advance of the dorsal. Pectoral about  $\frac{3}{4}$  the length of head. Caudal rounded or subtruncate. Least depth of caudal peduncle about  $\frac{2}{3}$  the length of head. Scales with dark edges, forming series of spots on the lower part of the side; often a series of short dark vertical bars along the middle of the side; a series of dark spots on the lower part of the dorsal fin.

*Hab.* Costa Rica, Carrullo and Juan Veñas (*Underwood*); Irazu (*Rogers*).

Numerous specimens, measuring up to 70 mm. in total length.

This species is very close to *G. episcopi*, Steind., from Panama, which has only 8 or 9 dorsal rays and also differs in having a blackish spot on the anal fin. It is also close to

*G. terrabensis*, Regan, and *G. Jonesii*, Günther\*, and with them forms a series from *G. episcopi* to *G. (Pseudoxiphophorus) bimaculata*, Heck., so that the genus *Pseudoxiphophorus* can no longer be maintained.

*Gambusia terrabensis*.

Depth of body  $3\frac{1}{4}$  to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$  to  $3\frac{3}{4}$ . Snout shorter than eye, the diameter of which is 3 to  $3\frac{1}{3}$  in the length of head; interorbital width equal to the distance from posterior margin of pupil to free edge of operculum. 29 to 31 scales in a longitudinal series. Dorsal 12-14; origin equidistant from tip of snout and base of caudal or a little nearer the latter. Anal 9-10; origin below or a little in advance of the middle of dorsal. Pectoral nearly  $\frac{3}{4}$  the length of head. Caudal subtruncate. Least depth of caudal peduncle nearly  $\frac{2}{3}$  the length of head. Scales of the upper part of the body with dark edges; an interrupted dark lateral stripe; dorsal fin with a basal series of vertically expanded blackish spots and with a second series of smaller spots; anal dark at the base and also distally; posterior part of caudal dusky.

*Hab.* Costa Rica, Rio Grande de Térraba, Pacific Slope (*H. Pittier*).

Six specimens, measuring up to 48 mm. in total length.

*Sicydium Pittieri*.

Depth of body 6 in the length, length of head  $5\frac{1}{3}$  to  $5\frac{2}{3}$ . Diameter of eye  $5\frac{1}{3}$  to 6 in the length of head, interorbital width 4 to  $4\frac{1}{2}$ . Snout obtuse; mouth subterminal, with horizontal cleft, extending to below the middle of eye; upper teeth bicuspid; teeth of the outer series in the lower jaw sometimes concealed. Occipital region covered with small scales; 75 to 80 scales in a longitudinal series; abdomen with a median naked area or strip. Dorsal VI, I 10; rays of first dorsal (in the males) produced into filaments, the longest, when laid back, nearly reaching the end of the base of second dorsal; longest rays of second dorsal a little longer than the head. Anal I 10; origin equidistant from eye and base of caudal. Pectoral longer than the head, twice as long as the ventrals. A dark spot on each scale; dorsal fins with dark vermiculations; anal with a dark edge.

*Hab.* Costa Rica, Rio Grande de Térraba (*H. Pittier*).

Two specimens (males), 120 and 135 mm. in total length.

This species is nearest to *S. Salvini*, Grant, from Panama and Western Ecuador.

\* *Mollienisia Jonesii*, Gthr. = *Pseudoxiphophorus pauciradiatus*, Regan.

XXXI.—*Descriptions of Two new Characinid Fishes from Argentina.* By C. TATE REGAN, B.A.

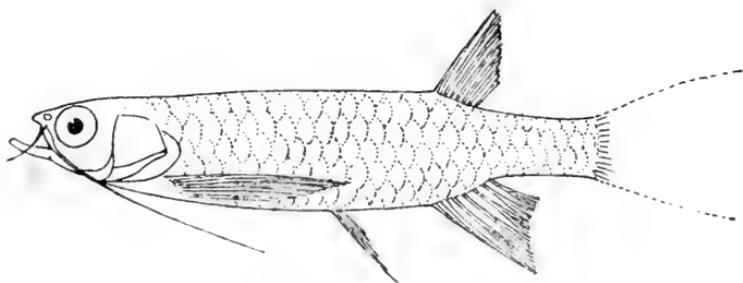
DR. L. REH, of the Hamburg Natural History Museum, recently sent a few specimens to Mr. Boulenger for determination, describing them as aquarium fishes from Argentina. These have been handed over to me and referred to three species, viz. *Tetragonopterus cordovenssis*, Gthr., and two other Characinids, each the type of a new genus and species, which are described below.

## POGONOCHARAX, gen. nov.

Closely allied to *Pyrrhulina*, C. & V., differing in the toothless mouth, the presence of two barbels on each side, respectively attached to the distal ends of the præmaxillary and maxillary, and in the more posterior position of the dorsal fin, which is opposite the anal.

*Pogonocharax Rehi*, sp. n.

Depth of body equal to length of head,  $4\frac{1}{2}$  in the length of the fish. Snout shorter than eye, the diameter of which is  $3\frac{1}{4}$  in the length of head and less than the interorbital width. Mouth small, toothless; lower jaw flat, shovel-shaped (as in *Pyrrhulina filamentosa*); præmaxillary barbel about as long as the eye; maxillary entirely in front of the eye, bearing a barbel which is  $\frac{2}{3}$  as long as the fish. Scales rather large,

*Pogonocharax Rehi.*

cycloid, apparently about 25 in a longitudinal series; no lateral line. Dorsal 8, rather elevated anteriorly. Anal 8; origin below that of the dorsal; fin larger than the dorsal and with the posterior rays much branched. Pectoral long,

pointed,  $1\frac{1}{2}$  as long as the head; outer ray of ventral somewhat produced, reaching the anal. Caudal peduncle twice as long as deep. Perhaps a dusky lateral band.

A single specimen, 45 mm. in total length.

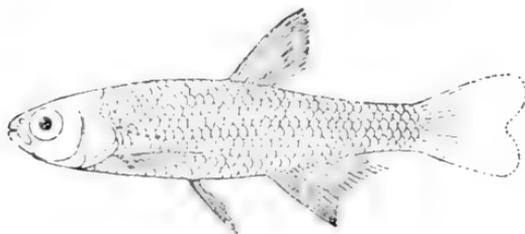
The barbels at once distinguish this remarkable fish from any other member of the family.

PHOXINOPSIS, gen. nov.

Allied to *Lebiasina*, C. & V., but with the teeth conical instead of tricuspid and the anal fin longer.

*Phoxinopsis typicus*, sp. n.

Depth of body nearly equal to the length of head, 4 in the length of the fish. Snout much shorter than eye, the diameter of which is 3 in the length of head and a little less than the interorbital width. Teeth conical, in a single series; maxillary toothless, extending to below the anterior edge of eye. Scales cycloid, 33 in a longitudinal series; lateral line



*Phoxinopsis typicus*.

developed anteriorly, on 6 or 7 scales only. Dorsal 10; origin a little nearer to base of caudal than to tip of snout; longest ray a little shorter than the head. Anal 16; origin below end of dorsal; free edge emarginate. Pectoral shorter than the head, extending a little beyond the base of ventrals, which do not quite reach the anal. Caudal peduncle a little longer than deep. A dark linear lateral streak.

A single specimen, 34 mm. in total length.

XXXII.—On some new Species of *Chrysochloris*.

By R. BROOM, M.D., D.Sc., C.M.Z.S.

DOBSON, in his monograph on the Insectivora, published in 1883, recognizes only five species of *Chrysochloris* as inhabiting South Africa, viz. *Chrysochloris aurea* (= *asiatica*),

*C. villosa*, *C. Trevelyani*, *C. rutilans* (= *hottentota*), and *C. obtusirostris*; and W. L. Sclater, in his 'Mammals of South Africa,' recognizes only the same five. Recently, as the result mainly of the researches of Mr. C. H. B. Grant, Oldfield Thomas has added a few new species belonging to the subgenus *Amblysomus*, viz. *A. chrysilus*, *A. iris*, *A. Corriæ*, and a subspecies *A. hottentottus pondolia*.

Though I have devoted comparatively little attention to systematic zoology, I have from time to time made pretty extensive collections of the bones of small mammals, and the best hunting-grounds I have invariably found to be the haunts of owls. In the disgorged pellets often found in great abundance in rock-clefts the small mammal skulls are usually preserved uninjured, and the owls frequently obtain specimens which the collector of skins will not readily come across. Having been recently studying the development and variations of the teeth of *Chrysochloris*, I have gone over with care the collection of small mole skulls that I have made from time to time, and among them I have discovered four new species. Through the kindness of Mr. Peringuey, Director of the South African Museum, I have examined all the specimens in the museum, and have found in the collection the skins of two forms of which I had already the skulls, and also another new species.

The examination of these new forms has led me to doubt the wisdom of making *Amblysomus* a distinct genus, and I shall therefore retain, provisionally at least, the generic name *Chrysochloris* for all the species.

*Chrysochloris Sclateri*, sp. n.

Of this new species two specimens have been in the South African Museum for some years. Both are preserved in spirit and come from Beaufort West.

The nose-pad at once distinguishes the species from *C. asiatica*, as its outer end is not produced into a sharp point as in the common species, but rounded. The general colour of the back is reddish brown, not unlike many specimens of *C. hottentota*. The lips and cheeks are dull cream-yellow, and the light patches extend to a little behind the ocular region, over the temporal area, and meet each other above the nasal pad. On the upper surface of the head a few brown hairs are mixed with the yellow, and above the nasal pad so many as to make the area pale brown. The general colour of the abdomen is a pale dirty brown.

The skull differs from that of *C. asiatica* in being much

narrower and in having no trace of the protuberance into the temporal well. In general proportions the skull is much more like that of *C. hottentota*, but much smaller.

The teeth are forty in number and resemble pretty closely in general structure those of *C. hottentota*, though smaller. The second last molar is not unlike the last molar of *C. hottentota*, owing to the posterior style being rudimentary. The lower teeth are almost identical in structure with those of *C. hottentota*, the premolars and molars having the well-developed posterior basal ledge. The second last molar has the ledge which is absent in *C. hottentota*, and the last molar is small. The whole structure of the skull and teeth shows this species to be much more nearly related to *C. hottentota* than to *C. asiatica*; and if this species, because it has forty teeth, is retained in the genus *Chrysochloris*, it seems scarcely advisable to make a distinct genus for *C. hottentota* merely because the minute last molar is missing.

Dimensions of the type (probably slightly shrunk by spirit):—

Head and body 96 mm.; hind foot (s. u.) 11.

Skull: greatest length 23·2; basal length 18·8; greatest breadth 15·6; greatest height 12; interorbital breadth 7·2; front of  $i^1$  to back of  $m^3$  10; palate across posterior premolars 7·7.

*Hab.* Beaufort West, Cape Colony. Also probably much further east.

*Type.* Specimen no. 3448 in South African Museum. Young female.

I have named the specimen after Mr. W. L. Sclater, late Director of the South African Museum.

#### *Chrysochloris Wintoni*, sp. n.

About ten years ago I obtained a couple of specimens of moles at Port Nolloth. Unfortunately at that time I had not seen *C. asiatica*, and assumed that the Port Nolloth animals belonged to the ordinary species. The skin of one was sent to the British Museum, but the skull was destroyed for the sake of the brain. From the other specimen a skeleton was prepared. As I had kept the lower jaw of the first specimen with a preparation of the tongue, I have for some time been aware that it belonged to an undescribed species. Luckily there is in the collection of the South African Museum a specimen from Port Nolloth which, though rather badly preserved in spirit, may be taken as the type.

The nose-pad at the sides is intermediate in shape between that of *C. asiatica* and *C. Selateri*, and forms a blunt angle. The digging portion of the snout is narrower and longer than in the other species. The back is pale slaty grey in colour, with a greenish iridescence, while the whole of the upper side of the head and the lips are yellowish grey, which becomes darker above the nose-pad. The abdomen is the same colour as the back. The fore and hind feet are relatively broader than in most species. The fore foot has a large pad on the inner side of the first digit, doubtless to facilitate digging in the sand. The fourth toe of the front foot is fairly well developed.

The skull is chiefly remarkable for the great size of the posterior olfactory region. In this it differs from all other known species. Whereas in all other species the interorbital region is flat or concave, here it is convex. There is less of a crest between the parietal and occipital regions than in *C. asiatica*, and the projection formed by the head of the malleus is smaller, though quite distinct.

The teeth are forty in number and resemble those of *C. asiatica*, except in being smaller and in the relatively smaller size of the first premolar and the last two molars. Lower molars have no basal ledge.

Dimensions of type:—

Head and body 90 mm.; hind foot (s. u.) 10·3.

Skull: greatest length 21·3; greatest breadth 16·2; greatest height 11·2; interorbital breadth 9·2; front of  $i^1$  to back of  $m^3$  9; palate across posterior premolars 7·8.

*Hab.* Port Nolloth, Cape Colony. Among the sand-dunes.

*Type.* Specimen no. 1917 in South African Museum.

The species is named after Mr. W. E. de Winton, who has done much towards the study of South African mammals, and to whom I have been indebted at different times for kind assistance.

### *Chrysochloris Granti*, sp. n.

Of this species I have four well-preserved skulls from Garies, Namaqualand; but the skin was unknown till I discovered a specimen in the South African Museum without locality or history, but which doubtless also comes from Namaqualand.

The nasal pad is rather small, the hard portion very short and the outer soft portion very narrow at the sides. The fur is extremely long, the hairs on the back being about 20 mm. in length. The general colour on the back is greyish

brown, the tips of the hairs being light and the inner part of the fur dark. In spirit the fur shows a violet iridescence. The whole head is light yellowish; it is unusually broad and the nose short. The fore feet have a much smaller pad to the first digit than *C. Wintoni*, while the fourth digit is a fairly well developed functional toe, larger than in any other known species, and with a rather large claw.

The skull is like that of *C. asiatica* in being relatively broad, but differs in being much smaller, in having a relatively much shorter snout, and in having scarcely any trace of a protuberance into the temporal fossa.

The teeth are forty in number, and the most noteworthy feature is that the first upper premolar is of small size and single-rooted. This character is constant in all five skulls. In the lower jaw of the type there are only nine teeth on the right side.

Dimensions of type:—

Greatest length 82 mm. ; hind foot 9.

Skull: greatest length 19·2; basal length 15; greatest breadth 17; greatest height 11·5; interorbital breadth 7; front of  $i^1$  to back of  $m^3$  8·5; palatal width across posterior premolars 7·6.

*Hab.* Namaqualand.

*Type.* In South African Museum.

The species is named after Mr. C. H. B. Grant, who has done so much in the last few years to advance our knowledge of South African Mammals.

#### *Chrysochloris namaquensis*, sp. n.

This new species is represented by four fairly well preserved skulls, but nothing is known of the skin; but as the skulls are easily distinguished from those of any known species, and as the skull and teeth are much safer guides than the skins, I think it well to give the form a name.

The skull is about the same size as in *C. Granti*, but is narrower and longer. It is further differentiated by having a large protuberance in the posterior wall of the temporal fossa, as in *C. asiatica*. The teeth resemble, so far as preserved, those of *C. asiatica*, the first upper premolar being large and double-rooted. The second upper incisor is relatively larger than in *C. asiatica*.

Skull: greatest length 20 mm.; basal length 16·5; greatest breadth 15·5; greatest height 11; orbital breadth 6·5; front of  $i^1$  to back of  $m^3$  8·5; palate across posterior premolars 7·8.

There are forty teeth.

*Hab.* Garies, Namaqualand.

*Type.* The type skull will be deposited in the South African Museum and a co-type given to the British Museum.

*Chrysochloris tenuis*, sp. n.

This species is only represented by two skulls, both slightly imperfect, from Garies. It differs from all the preceding species in having, like *C. hottentota*, only thirty-six teeth, and thus belongs to the subgenus *Amblysomus*. It differs, however, from all the known species of *Amblysomus* in having a large protuberance encroaching on the temporal fossa as in *C. asiatica*.

Skull: greatest length 20.5 mm.; basal length 16; greatest breadth 14.5; greatest height 10.2; interorbital width 6.5; front of  $i^1$  to back of  $m^3$  9.6; palate across posterior pre-molars 7.3.

*Hab.* Garies, Namaqualand.

*Type.* The type skull will be deposited in the South African Museum and a co-type given to the British Museum.

The following may be taken as a synopsis of the species, omitting one or two imperfectly known and very doubtfully distinct forms:—

*Synopsis of the Species.*

I. Teeth 40.

- A. Bony projection on posterior wall of temporal fossa; zygomatic arch small; ratio of breadth of skull to length 75 to 85:100.
  - a. Interorbital region narrow.
    - a'. Skull, breadth to length ratio over 80:100. *C. asiatica.*
    - b'. Skull, breadth to length ratio 75:100 . . . . . *C. namaquensis.*
  - b. Interorbital region expanded . . . . . *C. Wintoni.*
- B. Bony projection on posterior wall of temporal fossa very small or absent; zygomatic arch small.
  - a. Skull, breadth to length ratio 90:100. . . . . *C. Granti.*
  - b. Skull, breadth to length ratio 66:100. . . . . *C. Sclateri.*
- C. Bony projection on posterior wall of temporal fossa very small or absent; zygomatic arch greatly expanded.
  - a. Length of skull 33 mm. . . . . *C. villosa.*
  - b. Length of skull 42 mm. . . . . *C. Trevelyani.*

II. Teeth 36.

- A. Bony projection on posterior wall of temporal fossa; ratio of skull breadth to length 68:100. . . . . *C. tenuis.*



the surface divided into three almost equal parts by a longitudinal sulca on each side. Median segment broad, subquadrate, only slightly narrowed posteriorly, abruptly truncate, the angles above the truncation produced on each side into a minute spine, the dorsal surface of the segment coarsely rugose, the surface of the truncation irregularly obliquely striate. Abdomen shining; the three basal segments large, the second slightly constricted at the base; sparsely punctured, the sides of the segments (especially of the third) very finely and closely punctured; the apical segments small and withdrawn. The tibiæ are smooth, not serrate. The intermediate tibiæ have two apical spines.

Black; a spot beneath the scape of the antennæ at the apex pale yellow; abdomen dark fuscous. Wings hyaline, slightly tinted with yellow, the radial and second and third cubital cells clouded with pale fuscous. Tegulæ and nervures testaceous.

The first recurrent nervure is received close to the apex of the first cubital cell, the second just at the base of the third cubital cell, almost interstitial with the second transverse cubital nervure. The second cubital cell is very narrow on the radial nervure; the first transverse cubital nervure is bent sharply outwards near the base.

Length 5 mm.

♀ unknown.

*Hab.* Mackay, Queensland.

This species is very distinct from *A. tasmanica* in colour and general facies, but there does not seem to be any marked structural difference.

*Aphelotoma auriventris*, sp. n.

♀. Clypeus broad and short, truncate anteriorly, sparsely punctured; head opaque, the front strongly sculptured, irregularly longitudinally punctured striate, vertex reticulate. Pronotum subquadrate, about half the width of the mesonotum, very coarsely rugose, with an obscure indication of a median sulca; a small tubercle on each side before the posterior angle, behind the tubercles the pronotum is obliquely depressed to the posterior margin. Mesonotum and scutellum very coarsely rugose, the mesonotum reaching to the hind margin of the tegulæ, the scutellum broadly rounded at the apex. Median segment at the base as broad as long, flat above, truncate posteriorly, the lateral margins raised, the dorsal surface strongly longitudinally striate, the striae about

ten in number; the surface of the truncation coarsely rugose. Abdomen short, the two basal segments shining and finely punctured, the third segment delicately reticulate and pubescent, the apical segments small and withdrawn.

Black; the antennæ, mandibles, tibiæ, and tarsi fuscoferruginous; abdomen shining golden bronze. Wings hyaline, iridescent, with faint fuscous clouds near the centre and in the second cubital cell. The first transverse cubital nervure is sharply bent outwards near the base and throws out a short branch inwards, so that the first cubital cell is imperfectly divided.

Length 6 mm.

*Hab.* Victoria.

### Genus AUCHENOPHORUS, nov.

♀. Head as broad or broader than the thorax; the cheeks well developed; the eyes reaching to the base of the mandibles, convergent towards the vertex. Antennæ with the apical joints somewhat stouter than the basal, shorter than the head and thorax, not covered at the base by a tubercle. Mandibles acute at the apex, not bidentate; the apical outer angle of the maxilla produced into a prominent lobe, the maxillary palpi five-jointed, the joints in the typical species rather short and subequal; labial palpi four-jointed; labrum transverse, straight, strongly ciliate on the anterior margin. Pronotum narrower than the mesonotum, depressed anteriorly; mesonotum short, the posterior margin not reaching beyond the posterior margin of the tegulæ. Median segment rather long, flat above, truncate posteriorly, marked dorsally with a straight median carina from the base, continued on the surface of the truncation to the apex, also with a carina on each side converging from the base and forming a triangle. Abdomen pseudosessile or subpetiolate, the apical segments not very short, none of the segments constricted at the base. The trochanters long, the intermediate and posterior tibiæ slightly spinose, the intermediate tibiæ with only one apical spine; the joints of the tarsi slender and elongate. Wings short, with only one cubital and one discoidal cell, the radial cell short, subtruncate at the apex; the cubital cell large, receiving the recurrent nervure at about two thirds of the distance from the base to the apex. The anal cell of the hind wing is short; the apex of the median cell touches the costa; the radial and cubital nervures are only faintly indicated beyond the median cell.

This curious genus belongs to Kohl's Group X. of the Sphegidae, which includes *Ampulex* and the allied genera, but in the neuration it approaches much more nearly to some of the genera in Group XI. It should probably come next to *Aphelotoma*.

Type, *A. coruscans*, sp. n.

In size and colour these insects resemble some of the Mutillidae.

*Auchenophorus coruscans*, sp. n.

♀. Clypeus broad, rounded anteriorly, the apical margin depressed; head shining, very minutely punctured; a short, delicate, longitudinal carina from between the antennæ reaching halfway to the anterior ocellus. Pronotum convex, depressed anteriorly, narrow, with a slight depression in the middle of the posterior margin, which is strongly depressed. The sides of the prothorax are concave and the posterior angles do not reach the base of the wings. Mesonotum short and broad; the whole thorax shining, minutely punctured. Median segment long, flat above, abruptly truncate posteriorly, very coarsely rugose; a median carina starting from the base and continued to the apex on the dorsal surface and also on the surface of the truncation, with a carina on each side converging from the base and meeting above the truncation, forming an isosceles triangle; the surface of the truncation is irregularly transversely striated. Abdomen pseudosessile, smooth and shining, the first segment long, the apical segment pointed.

Bright metallic blue; the mandibles, labrum, and scape of the antennæ dark ferruginous. Antennæ fuscous. Prothorax, mesonotum, tegulæ, anterior tibiæ above, the three basal abdominal segments and the base of the fourth bright ferruginous red. Tibiæ and tarsi fuscous. Wings hyaline, crossed by two fuscous bands, one crossing the base of the discoidal cell, the other broader, from the radial cell across the apex of the cubital cell. Nervures black.

Length 10 mm.

♂ unknown.

Hab. Mackay, Queensland (October and November).

*Auchenophorus æneus*, sp. n.

♀. Clypeus broad, rounded anteriorly, with a straight transverse carina before the anterior margin, which is depressed. Head and thorax opaque, very finely reticulate;

the head broadly emarginate posteriorly; pronotum narrowed anteriorly, the posterior angles elevated, subtuberculate; mesonotum short. A depressed transverse line, smooth and shining, at the base of the scutellum. Median segment subquadrate, flat above, obliquely truncate posteriorly, rugose above, the lateral margins raised, forming carinæ; a median carina from the base, extending along both the dorsal surface and the surface of the truncation to the apex, a carina on each side converging from the base and meeting before the truncation, forming an equilateral triangle, the space included longitudinally striated; the surface of the truncation transversely striated. Abdomen subpetiolate, sharply pointed at the apex; shining, the segments almost smooth at the base, finely punctured along the apical margins.

Opaque black; the median segment metallic blue-green; the abdomen shining bronze-green; the mandibles, the scape and two apical joints of the antennæ, the mesopleuræ, the sides of the median segment, the prosternum, the base of the first abdominal segment, and the legs ferruginous. The femora and coxæ marked with green-bronze above. Wings hyaline, crossed by two fuscous bands, one crossing the base of the discoidal cell, the other broader and close to the apex.

Length 8 mm.

♂ unknown.

*Hab.* Mackay, Queensland (February).

The joints of the maxillary palpi are much longer in this species than in *coruscans*; the three apical joints are elongate as in the genus *Aphelotoma*, Westw.

*Auchenophorus fulvicornis*, sp. n.

♂. Head opaque, finely reticulate, the eyes converging towards the vertex, the ocelli placed between the eyes near their apex. Antennæ as long as the head and thorax united, the scape short, the two apical joints stouter than the others. The three terminal joints of the maxillary palpi much elongated. Pronotum short, much depressed anteriorly, broadened posteriorly, the angles prominent but not spined. Mesonotum finely reticulate, opaque, not reaching the posterior margin of the tegulæ. Median segment short, flat above, obliquely truncate posteriorly, the margins of the dorsal surface raised, forming an enclosed space, rounded at the apex and longitudinally striated within; the surface of the truncation obliquely striated at the base, smooth at the apex. Abdomen subpetiolate, shining, the two basal segments smooth, the rest very finely and closely punctured.

Black; the antennæ and the first abdominal segment at the base testaceous; the prothorax, the mesopleuræ, the sides of the median segment, and the legs ferruginous; the median segment above obscure bronze-green, testaceous at the extreme apex; the abdomen very dark bronze-green. Wings hyaline, nervures fuscous; a broad fuscous band crossing the discoidal cell, and another, broadly interrupted in the middle, near the apex.

Length 5 mm.

♀ unknown.

*Hab.* Kuranda, near Cairns, Queensland (January).

### Genus PSEN, Latr.

#### *Psen lutescens*, sp. n.

♀. Clypeus broader at the apex than at the base, as long as broad, covered with silver pubescence; the eyes diverging towards the clypeus and towards the vertex. Head shining, the front delicately reticulate, with a fine median sulca from the anterior ocellus; a large tubercle between and below the base of the antennæ; from the base of the tubercle on each side springs a carina, which skirts the base of the antennæ below, but does not reach the eye. The vertex is broad, smooth, and polished; the ocelli are large. Thorax shining, finely punctured, the pronotum linear, transverse, very broad; the scutellum transverse, with a slightly depressed row of strong punctures at the base. Median segment convex, oblique, with a transverse depressed space at the base and a very deep median sulca from the base to the apex; finely rugulose. Petiole long; abdomen shining, very finely punctured.

Yellow; the abdomen and posterior legs luteous; the head, a square spot on the middle of the mesonotum, the depressed line at the base of the scutellum, and a transverse mark on each side of the scutellum black; the antennæ fuscous; the scape and mandibles yellow. Wings hyaline, iridescent. The first recurrent nervure is interstitial with the first transverse cubital nervure, the second recurrent nervure is received by the third cubital cell near the base.

Length 9 mm.

♂ unknown.

*Hab.* Mackay and Cairns, Queensland (November to February).

Genus *POLEMISTUS*, Sauss.*Polemistus exul*, sp. n.

♀. Mandibles very broad at the apex, produced into a tooth at the outer angle, clypeus slightly produced at the apex, smooth. Head narrow, the eyes just touching the base of the mandibles, divergent towards the vertex. Front very long, concavely hollowed; the scape of the antennæ long, resting in the hollow, the flagellum short and stout. The ocelli placed on the vertex near the posterior margin. A row of large punctures surrounding the eyes, interrupted narrowly at the base of the mandibles; a transverse, emarginate carina between the eyes above the concave front, a longitudinal carina running from the anterior ocellus to the transverse carina, and another short one on each side, separated from the eye by the row of punctures only. Pronotum very short, transverse, showing only a row of large punctures, the anterior margin straight, with prominent angles. Mesonotum longer than broad, with a longitudinal, median double carina, the very narrow space enclosed by the carinæ punctured; on each side are two longitudinal carinæ, each with a row of punctures on the outer side, and another short arched carina above the tegula. Scutellum broad, smooth, broadly truncate at the apex, with a punctured depression at the base divided by a very short longitudinal carina; and a depressed transverse row of punctures at the apex. Median segment longer than broad, abruptly truncate at the apex, very coarsely rugose; the surface of the truncation concave, divided by a fine median sulca, rugulose. Abdomen short, smooth, and shining; the first segment vertically truncate anteriorly, with a short petiole; the apical segment compressed, acute. The legs smooth, not spinose.

Black; the mandibles at the apex ferruginous; the antennæ, legs, and tegulæ testaceous; the vertex of the head, the thorax, and the median segment dark green-bronze. Wings hyaline, nervures testaceous.

Length 5 mm.

*Hab.* Mackay, Queensland (December to April).

Two species only of this genus have been described, both by Saussure, the localities being Madagascar and Mexico.

Genus *PARACRABRO*, nov.

♀. Head very large and broad, half as wide again as the thorax; the mandibles large, very strongly tridentate at the

apex. Clypeus small, transverse, truncate anteriorly. The antennæ far apart at the base, inserted low down, close to the base of the clypeus, the scape long, much more than half the length of the flagellum, which is short. Front broad, concavely hollowed. Eyes entire, reaching the base of the mandibles, convergent towards the vertex; cheeks and vertex very broad; the ocelli placed close together between the eyes, near their apex, far removed from the posterior margin of the head. Pronotum very short, almost perpendicularly depressed, narrower than the mesonotum; scutellum transverse. Median segment with a broadly subtriangular enclosed space at the base, rounded and truncate posteriorly. Abdomen petiolate, the petiole linear and rather short. Fore wing with two cubital cells; the first quadrilateral, the width about two thirds of the length, receiving the recurrent nervure some distance before the apex; the second less than half the length of the first, almost square. The radial cell is long and pointed, almost reaching the apex of the wing, not appendiculate. The medial cell of the hind wing is produced at the apex, reaching downwards from the costa, the anal cell is long. Legs short, tibiæ feebly spinose, the tarsi much longer than the tibiæ.

The neuration is similar to that of *Stigmus*, but the general form is very near *Crabro*.

Type, *P. Froggatti*, sp. n.

*Paracrabro Froggatti*, sp. n.

♀. Head very large, quadrilateral, almost smooth, subopaque. Mesonotum sparsely and very minutely punctured, with a faintly impressed median line, and a faint longitudinal one on each side, not reaching the posterior margin. Median segment with a broad subtriangular space at the base enclosed by carinæ, the enclosed space longitudinally rugose striate; the segment behind the carinæ oblique, rounded and striate, then abruptly truncate and rugose to the apex. Abdomen smooth and shining.

Black; the mandibles, antennæ, tegulæ, and legs fulvo-ferruginous. Wings hyaline, tinged with yellow; nervures testaceous at the base, fuscous at the apex.

Length 7 mm.

*Hab.* Victoria.

Genus *SERICOPHORUS*, Sm.

*Sericophorus dipteroides*, sp. n.

♀. Clypeus broad, finely punctured, depressed transversely

before the apex, the apical margin subtruncate. Head broad, very delicately reticulate, eyes convergent towards the vertex; antennæ very short, the apical joints thickened. Pronotum very short, depressed below the mesonotum, which is broad, opaque, and very delicately reticulate. Median segment short, oblique, vertically truncate posteriorly, a transverse depressed row of coarse punctures at the base, from which a similar longitudinal row runs down the middle of the segment, the rest of the segment smooth. Abdomen almost smooth, triangular, the first segment vertically truncate anteriorly, the surface of the truncation concave.

Castaneous; the head black; the antennæ and clypeus castaneous; the mandibles dark ferruginous, black at the apex; the second to the fifth abdominal segments blackish brown, the apical margin of the segments testaceous. Wings hyaline, nervures fuscous.

Length 7 mm.; expanse of wings 13 mm.

*Hab.* Cairns, Queensland (April).

Nearest to *S. bicolor*, Sm., from the Swan River.

*Sericophorus funebris*, sp. n.

♀. Clypeus broad, much elevated in the centre, projecting at the apex almost at right angles. Head opaque, almost smooth, the front above the clypeus depressed concavely, clothed with silver pubescence; a very short, longitudinal, median carina above the base of the antennæ. Pronotum short, strongly depressed; mesonotum large, very delicately reticulate. Median segment almost smooth, narrowed from the base, truncate posteriorly, with a median carina from the base continued on the surface of the truncation to the apex, a small tubercle on each side of the carina just above the truncation, the lateral margins of the segment raised at the base, forming short carinæ; the sides of the segment obliquely striate. Abdomen shining, very delicately punctured, the apical margin of the segments smooth; the first segment is not truncate, and is narrower at the base and longer than in the allied species.

Black; the mandibles yellow, an interrupted line on the pronotum and the tegulæ pale yellow; the tibiæ, tarsi, and the apex of the femora testaceous. Wings hyaline, nervures testaceous.

Length 6 mm.; expanse of wings 9 mm.

*Hab.* Mackay, Queensland (November).

# THE ANNALS

AND

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XXXIV.—*Rhynchotal Notes*.—XLI. By W. L. DISTANT.

Fam. **Fulgoridæ** (continued from vol. xviii. p. 356).

Subfam. *CLIXINÆ*.

Genus **MUNDOPA**.

*Mundopa*, Dist. Faun. B. I., Rhynch. iii. p. 263 (1906).

Type, *M. cingalensis*, Dist.

*Mundopa pallens*.

*Cixius pallens*, Walk. Journ. Linn. Soc., Zool. i. p. 149 (1857).

*Hab.* Borneo.

**BAJAUANA**, gen. nov.

Head somewhat broad, the vertex widened anteriorly, its lateral margins strongly ridged, the anterior and posterior margins less strongly so, base angularly emarginate; face moderately broad and angularly marginally ampliate beyond middle, anterior margin truncate, surface flat, lateral margins strongly ridged, with a central longitudinal ridge which is continued through clypeus, containing a very indistinct ocellus a little before clypeus; pronotum exceedingly short; mesonotum very long, almost twice as long as vertex and

pronotum together, tricarinate, the interspaces between the carinations forming somewhat raised flat processes, the bases of which are angularly narrowed; legs moderately short and robust; tarsi robust, first joint longest; tegmina widened or amplified towards apex, costal margin moderately sinuate from base to stigma, before the latter it is distinctly notched, stigma elongate, a series of irregularly placed transverse veins near apex defining a series of longitudinal apical areas; claval vein extending to a little beyond middle of claval margin.

Type, *B. rufula*, Walk. (*Brixia*).

*Bajauana rufula*.

*Brixia rufula*, Walk. Journ. Linn. Soc., Zool. x. p. 103 (1867).

*Hab.* New Guinea.

*Bajauana tenebrosa*.

*Brixia tenebrosa*, Walk. Journ. Linn. Soc., Zool. x. p. 103 (1867).

*Hab.* Ceram.

*Bajauana palliceps*.

*Brixia palliceps*, Walk. Journ. Linn. Soc., Zool. x. p. 106 (1867).

*Hab.* Mysol.

*Bajauana marginata*.

*Brixia marginata*, Walk. Journ. Linn. Soc., Zool. x. p. 107 (1867).

*Hab.* New Guinea.

*Bajauana varia*.

*Brixia varia*, Walk. Journ. Linn. Soc., Zool. x. p. 108 (1867).

*Hab.* Sula.

*Bajauana variegata*.

*Brixia variegata*, Walk. Journ. Linn. Soc., Zool. x. p. 108 (1867).

*Hab.* Sula.

*Bajauana bicolor*.

*Brixia bicolor*, Walk. Journ. Linn. Soc., Zool. x. p. 109 (1867).

*Hab.* New Guinea.

*Bajauana puncticosta*.

*Brixia puncticosta*, Walk. Journ. Linn. Soc., Zool. x. p. 109 (1867).

*Hab.* Mysol, Morty.

*Bajauana trahens.*

*Cixius trahens*, Walk. Journ. Linn. Soc., Zool. i. p. 149 (1857).

*Hab.* Borneo.

Genus *BRIXIA*.

*Brixia*, Stål, Öfv. Vet.-Ak. Förh. 1856, p. 162.

Type, *B. natalicola*, Stål.

*Brixia migratoria*, sp. n.

Head, pronotum, and abdomen above brownish ochraceous; lateral angles of pronotum and mesonotum ochraceous; abdomen beneath, sternum, and legs stramineous; abdomen above more or less cretaceously tomentose; tegmina very pale brownish ochraceous, the veins thickly minutely spotted with fuscous, three transverse spots on costal area, the central one connected with a broad transverse discal fascia, a spot near apex of costal margin, a spot on inner margin beyond end of clavus, and an oblique streak at base chocolate-brown; wings pale iridescent creamy white; face extending considerably in front of and above eyes, the margins strongly ridged, centrally carinate.

Long., excl. tegm.,  $3\frac{1}{2}$  mm.; exp. tegm. 10 mm.

*Hab.* Queensland (*F. P. Dodd*, Brit. Mus.).

This appears to be the first described Australian species of this Oriental, Malayan, and Ethiopian genus. *Brixia* has already been traced to New Guinea.

*HAMBA*, gen. nov.

Head with the vertex narrow, longer than broad, with two longitudinal carinations and the lateral margins also strongly raised; face elongately subtriangular, the anterior margin convex, widened towards clypeus, with the lateral margins strongly ampliate and moderately recurved, very strongly centrally longitudinally carinate; clypeus triangular, centrally carinate; pronotum small, centrally tricarinate; mesonotum tricarinate; tegmina elongate, narrow, more than twice longer than broad, costal margin moderately convex, apical margin rounded, inwardly obliquely widened from apex of claval area; veins longitudinal, some discal transverse veins a little beyond middle, and a series of continuous transverse subapical veins defining a series of short apical areas; wings a little wider than tegmina; legs moderately short and robust, basal joint of tarsi very long.

Type, *H. perplexa*, Walk.

*Hamba perplexa.*

*Cixius perplexus*, Walk. Journ. Linn. Soc., Zool. i. p. 147 (1857).

*Hab.* Borneo.

*Hamba inclinata.*

*Cixius inclinatus*, Walk. Journ. Linn. Soc., Zool. i. p. 147 (1875).

*Hab.* Borneo.

## TALOKA, gen. nov.

Head with the vertex broad, a little longer than broad, moderately amplified anteriorly, tricarinate, the lateral carinations curved inwardly anteriorly and from each side of which there emerges a strong oblique carination in front of eyes; face very large, clypeus very small, the first tricarinate, the lateral carinations oblique and terminating considerably before clypeus, a prominent transverse rugosity on each side of central carination at region of eyes, and the appearance of an obsolete ocellus on each side of the same before clypeus; pronotum considerably shorter than head and centrally tricarinate; mesonotum indistinctly seen owing to insertion of pin in the unique typical specimen, but apparently strongly tricarinate; tegmina moderately broad, with two series of transverse veins and with a distinct ovate cell beyond claval area; legs moderately short and robust.

Type, *T. opaca*, Walk.

*Taloka opaca.*

*Briaria opaca*, Walk. Journ. Linn. Soc., Zool. x. p. 111 (1867).

*Hab.* New Guinea.

## Genus OLIARUS.

*Oliarus*, Stål, Berl. ent. Zeitschr. vi. p. 306 (1862).

Type, *O. Walkeri*, Stål.

*Oliarus maculifrons.*

*Cixius maculifrons*, Walk. List Hom. ii. p. 343 (1851).

*Hab.* Sierra Leone.

*Oliarus vicarius.*

*Cixius vicarius*, Walk. List Hom. ii. p. 343 (1851).

*Hab.* Florida.

*Oliarus testaceus.**Cixius testaceus*, Walk. List Hom. ii. p. 344 (1851).*Hab.* — ?*Oliarus simplex.**Cixius simplex*, Walk. Journ. Linn. Soc., Zool. i. p. 147 (1857).*Hab.* Borneo.*Oliarus reductus.**Cixius reductus*, Walk. Journ. Linn. Soc., Zool. x. p. 105 (1867).*Hab.* Mysol.*Oliarus intertectus.**Brixia intertectus*, Walk. Journ. Linn. Soc., Zool. x. p. 114 (1867).*Hab.* New Guinea.*Oliarus privatus.**Brixia privata*, Walk. MS.*Hab.* Mysol.

The unique typical specimen is without head, and therefore description at present is unwarranted.

*Oliarus Melichari*, nom. nov.*Oliarus frontalis*, Melich. Wien. ent. Zeit. xxiv. p. 282 (1905): nom. præocc. Melich. (1904).*Hab.* E. Africa.*Oliarus funebris.**Cixius funebris*, Walk. Ins. Saund., Hom. p. 41 (1853).*Hab.* Natal.*Oliarus modicus.**Cixius modicus*, Walk. Journ. Linn. Soc., Zool. i. p. 143 (1857).*Hab.* Borneo.*Oliarus latifrons.**Cixius latifrons*, Walk. List Hom. ii. p. 344 (1851).*Hab.* — ?*Oliarus fulvus.**Cixius fulvus*, Walk. List Hom., Suppl. p. 77 (1853).*Hab.* Santarem.

*Oliarus efferatus.*

*Cirius efferatus*, Walk. Journ. Linn. Soc., Zool. i. p. 87 (1850).

*Hab.* Singapore.

*Oliarus subpunctatus.*

*Bricia subpunctata*, Walk. Journ. Linn. Soc., Zool. x. p. 112 (1867).

*Hab.* Flores.

*Oliarus dingkana*, sp. n.

Head and pronotum black; vertical ridges to head, margins of pronotum, and carinae to mesonotum pale testaceous; face and clypeus black, margins and a central carination traversing both, pale testaceous; body beneath imperfectly seen in carded specimens now before me; legs pale testaceous, femora more or less testaceous with their apices ochraceous; tegmina hyaline, the venation and stigma piceous, interior margins to about end of clavus piceous; vertex slightly narrowed anteriorly, the margins strongly ridged; face with the base truncate, obliquely amplified towards clypeus, before which it is a little convex, the central carination is a little bifurcate at base, enclosing a small black sulcus; pronotum short, angularly narrowed to between base of eyes; mesonotum with five carinations, the two outermost strongly bent beyond middle; tibiae deeply longitudinally grooved, posterior tibiae without spines.

In some specimens the outer mesonotal carinations are black, and the interior margin of the tegmina only piceous at apical half of clavus.

Long., incl. tegm., 7 mm.

*Hab.* Queensland; Peak Downs (Colls. Dist. and Brit. Mus.).

*Oliarus lubra*, sp. n.

Allied to the preceding species, but larger; lateral margins of face from beyond middle and just extending to base of clypeus ochraceous; mesonotum much broader, with the lateral angles pale testaceous; tegmina broader and the transverse veins on apical area more pronouncedly piceous.

Long., incl. tegm., 8 mm.

*Hab.* Queensland; Peak Downs (Colls. Dist. and Brit. Mus.).

I have placed cotypes of this and the preceding species in the National Collection.

## Genus MNEMOSYNE.

*Mnemosyne*, Stål, Hem. Afr. iv. p. 150 (1866).

Type, *M. planiceps*, Fabr.

*Mnemosyne planiceps*.

*Flata planiceps*, Fabr. Syst. Rhyng. p. 43 (1803).

*Cixius columbie*, Walk. List Hom. ii. p. 339 (1851).

*Hab.* Central America; Cuba.

*Mnemosyne Dohertyi*, sp. n.

Head, pronotum, and mesonotum castaneous; abdomen above piceous; face, sternum, and legs ferruginous brown; abdomen beneath dark castaneous, the segmental margins ochraceous; tegmina subhyaline, talc-like, sprinkled with minute ferruginous setigerous spots or granules, veins pale castaneous, stigma, upper apical margin, a sinuate streak from end of radial area bifurcating to middle of apical margin and outer angle of interior margin, claval area and inner margin ferruginous brown, outer half of stigma piceous; wings very pale fuliginous, the veins and extreme base piceous, apical margin narrowly ferruginous brown; vertex a little narrowing anteriorly, lateral margins ridged and with a more obscure central carination; face centrally ridged, posteriorly angularly emarginate; clypeus elongate, globose, finely centrally ridged; pronotum very finely punctate, with a central longitudinal ridge; mesonotum with five longitudinal carinations, those on each side of the central carination more discal and obscure; tegmina elongate, apices angularly rounded; anterior legs thickened.

Long., excl. tegm.,  $10\frac{1}{2}$  mm.; exp. tegm. 24 mm.

*Hab.* South-east Borneo (*Doherty*).

Allied to *M. philippina*, Stål.

*Mnemosyne camerunensis*, sp. n.

Head, pronotum, and mesonotum castaneous, extreme apex of mesonotum and abdomen above testaceous, the segmental margins ochraceous, anal appendage piceous; face, clypeus, sternum, and legs brownish testaceous; abdomen beneath piceous, the segmental margins pale ochraceous; tegmina subhyaline, talc-like, the veins ferruginous brown, a series of similarly coloured spots round the apical margin, of which the two lowermost near apex of inner margin are largest,

stigma pale ochraceous, with its outer half ferruginous brown; wings very slightly fuliginous, the veins fuscous, apical margin ferruginous brown; vertex slightly narrowed anteriorly, the margins ridged, centrally somewhat obscurely longitudinally carinate; face and clypeus with a continuous central fine carination, face anteriorly convexly narrowed, posteriorly strongly angularly emarginate; pronotum short, centrally carinate; mesonotum with five carinations, the one on each side of the central carination more discal and obscure; tegmina with the apex rounded, the stigma moderately small and narrow; anterior legs not prominently incrassated.

Long., excl. tegm.,  $7\frac{1}{2}$  mm.; exp. tegm. 17 mm.

*Hab.* Cameroons (*Escalera*, Brit. Mus.).

#### Genus BODECIA.

*Bodecia*, Walk. Journ. Linn. Soc., Zool. x. p. 117 (1867).

Type, *B. varipes*, Walk.

The unique type of this genus is in a most mutilated condition, and its proper location is a question of doubt and difficulty. The structure of the tegmina apparently allies it to *Mnemosyne*, near which I have (awaiting better and further material) placed it.

#### Genus CIXIUS.

*Cixius*, Latr. Hist. Nat. Ins. xii. p. 310 (1830-4).

Type, *C. nervosus*, Linn.

*Cixius persicus*, nom. nov.

*Cixius longipennis*, Melich. Annuaire Mus. St. Pétersb. vii. p. 86 (1902):  
nom. præocce. Walk. (1851).

*Cixius merula*, sp. n.

Vertex of head and pronotum ochraceous, disk of vertex more or less piceous; face black, basal margin and lateral and central ridges ochraceous; mesonotum entirely jet-black; tegmina subhyaline with a very pale ochraceous tint, thickly and minutely speckled or spotted with fuscous; body beneath and legs ochraceous, lateral areas of sternum, clypeus, and basal and lateral margins of abdomen black; vertex somewhat broad, narrowed anteriorly, margins very strongly ridged and with a more or less obsolete central ridge;

face narrowed anteriorly, moderately roundly amplified towards clypeus, central and lateral ridges very pronounced; mesonotum with the disk a little depressed, tricarinate; the central carination weakest; sternal segmental margins ridged.

Long., incl. tegm.,  $3\frac{1}{2}$  to  $4\frac{1}{2}$  mm.

*Hab.* Queensland; Peak Downs (Colls. Dist. and Brit. Mus.).

Somewhat allied in general appearance to the Palæartic *C. simplex*, Herr.-Sch.

#### Genus BENNA.

*Benna*, Walk. Journ. Linn. Soc., Zool. i. p. 90 (1856).

Type, *B. capitulata*, Walk.

#### *Benna guttata*.

*Brixia guttata*, Walk. Journ. Linn. Soc., Zool. x. p. 110 (1867).  
*ditiasa*, Walk. MS.

*Hab.* New Guinea, Sula.

*Species in too mutilated a condition for Generic Determination, and some probably not even belonging to this Subfamily.*

#### — *nanula*.

*Brixia nanula*, Walk. Journ. Linn. Soc., Zool. x. p. 112 (1867).

*Hab.* New Guinea.

#### — *concinula*.

*Brixia concinula*, Walk. Journ. Linn. Soc., Zool. x. p. 110 (1867).

*Hab.* Sula.

#### — *rubiginosa*, MS.?

#### — *despectus*.

*Cixius despectus*, Walk. Journ. Linn. Soc., Zool. i. p. 148 (1857).

*Hab.* Borneo.

#### — *vilis*.

*Cixius vilis*, Walk. Journ. Linn. Soc., Zool. i. p. 148 (1857).

*Hab.* Borneo.

— *equus*.

*Cixius equus*, Walk. Journ. Linn. Soc., Zool. i. p. 147 (1857).

*Hab.* Borneo.

— *diffinis*.

*Cixius diffinis*, Walk. Journ. Linn. Soc., Zool. i. p. 148 (1857).

*Hab.* Borneo.

— *congrua*.

*Brixia congrua*, Walk. Journ. Linn. Soc., Zool. x. p. 110 (1867).

*Hab.* Mysol.

— *terminalis*.

*Brixia terminalis*, Walk. Journ. Linn. Soc., Zool. x. p. 111 (1867).

*Hab.* New Guinea.

— *munitus*.

*Cixius munitus*, Walk. Journ. Linn. Soc., Zool. i. p. 149 (1857).

*Hab.* Borneo.

— *sublucida*.

*Brixia sublucida*, Walk. Journ. Linn. Soc., Zool. x. p. 107 (1867).

*Hab.* New Guinea.

— *insuetus*.

*Cixius insuetus*, Walk. Journ. Linn. Soc., Zool. i. p. 150 (1857).

*Hab.* Borneo.

— *deductus*.

*Cixius deductus*, Walk. Journ. Linn. Soc., Zool. i. p. 149 (1857).

*Hab.* Borneo.

— *atrátula*.

*Brixia atrátula*, Walk. Journ. Linn. Soc., Zool. x. p. 107 (1867).

*Hab.* Moroty.

Subfam. *TROPIDUCHINÆ*.Genus *FICARASA*.*Ficarasa*, Walk. Journ. Linn. Soc., Zool. i. p. 162 (1857)Type, *F. pallida*, Walk.*Ficarasa straminea*, sp. n.

Body and legs dark stramineous; tegmina pale stramineous; wings pale hyaline; vertex more than twice as broad as long, marginally and centrally carinate, anteriorly convex, laterally straight, posteriorly strongly angularly emarginate; pronotum about as long as vertex, centrally and laterally carinate, strongly subconically produced between eyes, posterior margin angularly emarginate; mesonotum longer than vertex and pronotum together, tricarinate, the lateral carinations obliquely incurved anteriorly and joining the central carination a little before base of pronotum; face broad, but longer than broad, the lateral margins curved outwardly at about two thirds from base and then obliquely narrowed to clypeus, anterior and lateral margins strongly carinate, the disk tricarinate, an oblique carination on each side of the central one, commencing a little before clypeus and terminating near anterior angles; tegmina with the costal area strongly transversely veined, apical area divided by two transverse series of transverse veins, many of the outer series bifurcate.

Long., excl. tegm., 9 mm.; exp. tegm. 27 mm.

*Hab.* Malay Archipelago; Halmahera (*W. Doherty*).*Ficarasa australasiae*, sp. n.

Pale ochraceous, in fresh specimens probably pale virescent; vertex broader than long, anterior and lateral margins ridged, centrally longitudinally carinate; face broadly elongate, a little ampliate towards clypeus, anterior and lateral margins ridged, centrally longitudinally carinate; clypeus centrally ridged, not much more than half the length of face; pronotum angularly produced between the eyes, tricarinate; mesonotum tricarinate; tegmina with the costal area obliquely transversely veined, two series of transverse veins beyond middle enclosing a space much narrower than that between it and the apical margin; posterior tibiæ with three spines.

Long., excl. tegm.,  $7\frac{1}{2}$  mm.; exp. tegm.  $21\frac{1}{2}$  to 23 mm.*Hab.* Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

## MAGIA, gen. nov.

Vertex wide, a little longer than broad, flat, lateral margins straight, anterior and lateral margins ridged, centrally longitudinally carinate; face with the lateral margins a little concave, prominently angularly ampliate on each side of posterior margin, tricarinate, the lateral carinations curved and anteriorly joining the central carination, clypeus centrally ridged; pronotum a little shorter than vertex, not produced beyond base of head, tricarinate; mesonotum about as long as pronotum and vertex together, tricarinate, the lateral carinations posteriorly outwardly directed; abdomen equal in length to space between anterior margin of vertex and posterior angle of mesonotum; posterior tibiæ with two spines; tegmina somewhat long and narrow, anterior claval area with three transverse veins, apical area with numerous transverse veins, some of which form a continuous apical submarginal series; wings narrow, two series of transverse veins beyond middle.

Type, *M. subocellata*, Dist.

*Magia subocellata*, sp. n.

Body and legs pale ochraceous; two spots at anterior margin of face, two small spots at base of anterior coxæ, a spot on each lateral margin of mesosternum, lateral and posterior margins, lateral carinæ, two spots between them, and two very small spots near each lateral angle of pronotum, lateral margins, carinæ, two spots near each side of anterior margin, and two very small spots near base of mesonotum, posterior margins and angles of abdominal segments above, and the tarsal claws, black; carinations to face testaceous; tegmina subhyaline, very slightly pale fuliginous, the venation fuscous, stigma ochraceous, a lower subapical black spot with a white pupil at its upper margin; wings subhyaline, the venation fuscous.

Long., excl. tegm., 8 mm.; exp. tegm. 21 mm.

Hab. Queensland, Kuranda (*F. P. Dodd*, Brit. Mus.).

## Genus PARICANA.

*Paricana*, Walk. Journ. Linn. Soc., Zool. i. p. 158 (1857).

Type, *P. dilatipennis*, Walk.

*Paricana curvifera*.

*curvifera*, Walk. MS.

Vertex, mesonotum, abdomen above, body beneath and

legs ochraceous; pronotum, base and apical area of abdomen above, and a central fascia to face and scutellum testaceous red; posterior angle to mesonotum black; legs ochraceous, the tarsi and posterior femora piceous; tegmina hyaline, the veins ochraceous, margins, the stigma and a curved fascia connecting it with inner margin ferruginous brown; vertex very narrow; face smooth and shining, the central reddish area a little raised and grooved on each side; pronotum and mesonotum tricarinate, the latter with the lateral carinations curved and anteriorly joining the central carination; posterior tibiæ with two spines.

Long., incl. tegm., 8 mm.

*Hab.* Aru (Wallace, Brit. Mus.).

This species was standing under the genus *Cixius* in the British Museum and labelled *curvifera*, Walk., but I cannot trace any published description.

#### Subfam. *ACHILINÆ*.

#### Genus *FAVENTIA*.

*Faventia*, Stål, Hem. Afr. iv. p. 181 (1866).

Type, *F. pustulata*, Walk.

#### *Faventia guttifer*.

*Cixius guttifer*, Walk. Journ. Linn. Soc., Zool. i. p. 146 (1857).

*Hab.* Borneo.

#### *MAHUNA*, gen. nov.

Vertex of head about as long as broad, a little pointed in front, lateral margins oblique and carinate, centrally more obscurely carinate, basal margin broadly subconcave; face much narrower anteriorly than before clypeus, strongly centrally ridged, lateral margins moderately ridged, roundly amplified before clypeus, which is only about half its length and centrally and laterally carinate; pronotum narrow and centrally carinate; mesonotum elongate, about twice as long as head and vertex together, tricarinate; abdomen broad and flattened; legs simple; tegmina somewhat long and narrow, apical margin rounded, claval margin subangularly dilated near base and then narrowed to claval apex, thence obliquely widened to apex, claval vein apically curved downward and terminating at about one third before apex, a few transverse veins near apex of costal margin; wings considerably broader than tegmina.

Type, *M. conspersa*, Dist.

*Mahuna conspersa*, sp. n.

Body ochraceous or greenish ochraceous; legs paler, anterior and intermediate tibiae darkly annulated; tegmina creamy white, opaque, sprinkled with fuscous, more prominently spotted on costal and apical margins, two small piceous spots on claval margin, one near middle, the other at apex; wings very pale fuliginous.

Long., excl. tegm.,  $5\frac{1}{2}$  mm.; exp. tegm. 15 mm.

Hab. Queensland (F. P. Dodd, Brit. Mus.).

## TUDEA, gen. nov.

Head with the vertex about as broad as long, the lateral margins very strongly ridged, centrally obscurely carinate, the base subconcavely emarginate, face concave, anterior margin truncate, lateral margins convexly rounded, centrally obscurely carinate, about twice as long as clypeus, which is obscurely centrally carinate and has its lateral margin ridged; rostrum reaching the intermediate coxæ; pronotum a little longer than vertex, anteriorly produced between eyes, tricarinate, the lateral carinations almost meeting in front of the central carination; mesonotum almost twice as long as pronotum and vertex together, obscurely tricarinate; abdomen above centrally ridged and obliquely deflected on each lateral area; legs simple, posterior tibiae with a short sub-central spine, posterior tarsi with the basal joint a little longer than the other two joints together; tegmina moderately broad and short, apex truncately rounded, interior margin of clavus angularly dilated and then obliquely narrowed to claval apex, thence obliquely widened to apical margin, radial area very broad, a few transverse veins near apex of costal margin, veins on apical area longitudinal, almost entirely without transverse veins, claval vein terminating at about one third before apex; wings broader than tegmina, more densely longitudinally veined at apical angle.

Type, *T. picturata*, Dist.

*Tudea picturata*, sp. n.

Head and pronotum ochraceous; eyes, central base of pronotum, and the mesonotum chocolate-brown; abdomen above and beneath virescent, the base greyish white; face, sternum, and legs greyish white, anterior area of face and lateral margins of prosternum pale ochraceous; tegmina stramineous, upper half sprinkled with dark spots, a large spot on dilated

basal claval area, and a subapical marginal fascia broadly bifurcating on interior margin, pale purplish brown, this fascia is broken near upper apical angle; wings creamy white, hyaline.

Long., excl. tegm.,  $6\frac{1}{2}$  mm.; exp. tegm. 19–20 mm.

*Hab.* Queensland (*F. P. Dodd*, Brit. Mus.).

#### BOONETA, gen. nov.

*Booneta*, MS., Brit. Mus.

Head much shorter than pronotum, vertex shorter than broad, the margins ridged, centrally carinate, the anterior angles appearing prominent from above; face long, convexly deflected, rather more than twice as long as clypeus, nearly equally broad throughout, the lateral margins straight, both face and clypeus strongly centrally and marginally carinate; rostrum not passing the posterior coxæ, the apical joint elongate; posterior tibiæ unarmed; pronotum about as long as vertex, centrally tricarinate, the lateral carinations curved and joining the central one at anterior margin; mesonotum about as long as pronotum and vertex together, tricarinate, the lateral carinations sinuate; tegmina short and broad, apical margin obliquely truncate, inner margin obliquely ampliate from end of clavus, costal area broad, veins longitudinal, a transverse subapical line formed by transverse veins, and three transverse veins on disk; wings a little narrower than tegmina.

Type, *B. ferruginea*, Walk.

#### *Booneta ferruginea*.

*Cixius ferrugineus*, Walk. Journ. Linn. Soc., Zool. x. p. 104 (1867).

*Cixius caliginosus*, Walk. *loc. cit.* p. 105.

*Hab.* New Guinea, Mysol.

#### *Booneta lurida*.

*Cixius luridus*, Walk. Journ. Linn. Soc., Zool. x. p. 104 (1867).

*Hab.* Mysol.

#### OUWEA, gen. nov.

Head much narrower than pronotum, vertex short, very much broader than long, its anterior lateral angles prominent; face about twice as long as clypeus, somewhat flat, with the lateral margins strongly laminately reflexed, narrowing towards clypeus, its posterior margin sinuated for the reception of the clypeus, centrally longitudinally carinate; clypeus

strongly centrally keeled, its lateral margins laminately crenately reflexed; rostrum with the apical joint elongate; pronotum a little shorter than vertex, centrally carinate; mesonotum about twice as long as pronotum and vertex together, its disk moderately flatly raised, distinctly deflected before pronotum, obscurely tricarinate; abdomen broad, considerably longer than space between apex of head and posterior angle of mesonotum; legs simple, posterior tibiae with one spine, basal joint of posterior tarsi elongate; tegmina with the apical margin obliquely rounded, obliquely broadened from apex of clavus, apical third of costal area obliquely transversely veined, lower discoidal area very strongly sinuated, a subapical sinuate transverse line consisting of transverse veins, defining a series of longitudinal apical areas; wings broader than tegmina.

Type, *O. Doddi*, Dist.

*Ouwea Doddi*, sp. n.

Body brownish ochraceous, paler beneath than above; mesonotum with three longitudinal ochraceous lines above the obscure carinations, its lateral and apical margins ochraceous; first and second abdominal segments above more or less ochraceous; face and sternum mottled with ochraceous and castaneous; legs very pale ochraceous, femora obsolete annulated with brownish; tegmina bronzy ochraceous, beyond middle becoming darker between the veins, three large spots in costal area, a large sublunulate apical spot, some spots near posterior angle of inner margin, two spots in claval area, and a discal spot, greyish white; wings fuliginous brown, the basal area very much paler and subhyaline.

Long., excl. tegm., ♂ 7, ♀ 8 mm.; exp. tegm., ♂ 20-21, ♀ 25 mm.

Hab. Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

Genus RHOTALA.

*Rhotala*, Walk. Journ. Linn. Soc., Zool. i. p. 152 (1857).

*Errata*, Walk. *loc. cit.* x. p. 116 (1867).

Type, *R. delineata*, Walk.

Head moderately conically produced in front of eyes, centrally and laterally ridged, between the ridges the surface toveate, face a little longer (not twice as long) than clypeus, subconical, beyond middle rather abruptly convexly widened to base of clypeus, both moderately longitudinally carinate,

lateral margins of clypeus distinctly carinate; antennæ robust, longly produced, inserted a little beneath eyes, apical joint longest and stoutest; pronotum somewhat long and tricarinate, the carinated area convexly produced between the eyes, the posterior margin angularly sinuate, lateral margins oblique; mesonotum about as long as pronotum, triearinate, the lateral carinations inwardly obliquely bent behind middle and joining the central carination at base; femora slightly dilated, beneath strongly centrally carinate; posterior tibiæ with five spines, the first near base, the fifth and largest at about one fourth from apex; tegmina narrow, the costal margin slightly undulate and convex, apical margin rounded, claval area inwardly angularly widened and subobliquely narrowed to apex, beyond claval apex again slightly widened, costal area obliquely transversely veined from about middle, radial area obliquely transversely veined, apical area longitudinally veined and containing a few obscure transverse veins, at the base of apical area and from beneath radial area an irregular dividing-line formed of transverse veins, claval vein not reaching apex of claval area; wings about twice as broad as tegmina, and containing an irregular series of subapical transverse veins.

In his description of this genus Walker makes no mention of the five spines to the posterior tibiæ, and in his figure of the typical species only four are delineated.

Fowler (Biol. Centr.-Amer., Rhynch. Hom. ii. p. 137) places the genus as of uncertain position, and writes it most probably must be placed with the Cixiinae. He, however, also states that the genus in some respects is closely allied to *Helicoptera*. In this latter view I agree, and consider its position is with the Achilinae.

### *Rhotala delineata*.

*Rhotala delineata*, Walk. Journ. Linn. Soc., Zool. i. p. 152, t. vii. fig. 6 (1857).

Vertex of head and pronotum ferruginous; mesonotum and face piceous, the latter with the lateral margins flecked with greyish; body beneath piceous; abdomen above pale testaceous, basal segment and anal appendage castaneous brown; legs pale castaneous brown with ochraceous annulations; tegmina pale greyish brown, the veins so far as commencement of apical area spotted with castaneous, four somewhat large castaneous spots in costal area and two on disk, the dividing-veins at base of apical area suffused with dark castaneous, apical area paler and more unicolorous, with

some greyish suffusions; wings fuliginous, with the veins fuscous; face very finely and thickly granulose, somewhat foveate, centrally longitudinally carinate, margin broadly ridged; carinations to vertex, pro- and mesonota strongly pronounced.

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

*Hab.* Borneo (Wallace, Brit. Mus.).

*Rhotala philippinensis*, sp. n.

Vertex of head and pronotum ochraceous, the carinations a little paler in hue, lateral areas of the pronotum piceous; mesonotum ochraceous, the disk between the central carinations piceous, and an anterior marginal piceous spot on each side of the outer carinations, posterior angle ochraceous; face and clypeus piceous, anterior angle or base of first ochraceous; body beneath more or less piceous; legs ochraceous; tegmina ochraceous, the veins finely spotted with piceous, some larger and somewhat obscure, irregularly shaped piceous spots on disk and costal area, two distinct cretaceous white spots on disk beyond middle, the outermost just touching the inner margin of apical area, which is paler in hue and unspotted; wings pale fuliginous, a little darker at apex; vertex of head foveate above and at sides, the lateral margins distinctly raised above the level of the pronotum, the latter with its anterior margin conically produced to the latitude of the anterior margins of the eyes; posterior tibiae with five spines, the two nearer base smaller and placed closer together; apical margin of tegmina obliquely rounded.

Long. (abdomen mutilated); exp. tegm. 21 mm.

*Hab.* Philippines (Whitehead, Brit. Mus.).

TALALOA, gen. nov.

Head narrower than the pronotum, vertex obliquely narrowing to apex, its lateral margins strongly ridged, and appearing as angularly prominent at apex; face long and narrow, but not longer than clypeus, elongately subtriangular, broadening to clypeus, centrally and laterally ridged; clypeus long, slender, narrowing to apex, centrally and laterally ridged; rostrum long, its apical joint elongate; antennae robust, longly prominent, second joint nearly twice the length of first; pronotum shorter than vertex, centrally carinate; mesonotum longer than pronotum and vertex together, tricarinate; legs simple, posterior tibiae unarmed, basal joint of posterior tarsi elongate; tegmina and wings subhyaline, the first broadly rounded at apex, inner margin moderately

obliquely amplified from end of clavus, which is angularly posteriorly dilated near base, a curved line formed by transverse veins crossing tegmen at about one fourth from apex enclosing a series of narrow longitudinal apical areas; this is preceded by three transverse veins enclosing four discoidal areas; wings a little broader than tegmina, three oblique transverse veins on disk, apical veins mostly forked.

Allied to *Rhotala*, Walk., by the robust and longly produced antennæ; the tegmina give the appearance of a Tropiciduchid, but the lateral carinate margins to the clypeus induce its being regarded as an Achilid.

Type, *T. pallescens*, Dist.

*Talaloea pallescens*, sp. n.

Body above and antennæ castaneous brown; body beneath and legs pale ochraceous; abdomen beneath pale brownish, with the posterior segmental margin and a central discal line pale ochraceous; posterior tarsi annulated with pale brownish; tegmina and wings pale subhyaline, the venation fuscous; tegmina slightly fuliginous, the stigma fuscous, traversed at base by a creamy-white line which is widened posteriorly.

Long., excl. tegm.,  $4\frac{1}{2}$ -6 mm.; exp. tegm. 14-16 mm.

*Hab.* Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

Genus — ?

*Euria? globulifera*, Walk. Ins. Saund., Hom. p. 108 (1858).

*Hab.* — ?

This species does not belong to the Tropiciduchid genus *Euria*, = *Tropiciduchus*, Stål, but is an Achilid. As it is an unlocalized species, I refrain from describing the genus.

XXXV. — On a Freshwater Decapod Crustacean collected by W. J. Burchell at Pará in 1829. By W. T. CALMAN, D.Sc., British Museum (Natural History).

AMONG a few dried Crustacea belonging to the Burchell collection submitted to me for determination by Prof. Poulton is a small shrimp-like animal, little more than half an inch in length, labelled in Burchell's handwriting "From the well, 4.9.29." Prof. Poulton informs me that, at the date indicated

(Sept. 4, 1829), Burchell was living in Pará\*. The fragile and shrivelled specimen had been laid aside as indeterminate when my attention was, by chance, directed to Mr. E. J. Miers's description and figures of a form which he assigned to a new genus of Palæmonidæ under the name *Euryrhynchus Wrzesniewskii* †, and of which two specimens were obtained from a well in Cayenne by Prof. Wrzesniewsky, of Warsaw. One of Miers's types exists, in fragments, in the British Museum collection, and a comparison with Burchell's specimen shows that the two are certainly congeneric and possibly even specifically identical. Since, however, there are definite, though not very important, differences between the two, I propose to refer to Burchell's specimen under the new specific name of *E. Burchelli*.

The figures given by Miers are somewhat unsatisfactory and his description is incomplete, especially in the absence of any account of the mouth-parts. The genus has therefore remained in obscurity, and, so far as I have been able to discover, the only further reference to it is by Prof. Kingsley, who, in his revision of the Palæmonidæ ‡, quotes Miers's description and leaves the systematic position of the genus doubtful. In view of this uncertainty, it seems worth while to record the results of an examination of the two specimens. Burchell's specimen, in spite of its great age, was found, on being carefully relaxed, to be in fairly good condition.

The following diagnosis includes the characters which seem to be of generic importance.

### Family Palæmonidæ.

#### Genus EURYRHYNCHUS, Miers.

Rostrum very short, flattened, without teeth above or below. Carapace with an antennal spine, but no supraorbital, hepatic, or branchiostegal spines. Outer flagellum of antennules completely divided. Mandible without a palp. Third maxillipeds slender. Second peræopods much stronger than the first.

Type species, *E. Wrzesniewskii*, Miers.

The absence of the mandibular palp brings this genus within a group which lies near the boundary-line between the Palæmonidæ and Pontoniidæ and renders this line, as Schenkel has remarked, somewhat indefinite. The fact that

\* Cf. Poulton, Ann. & Mag. Nat. Hist. (7) xiii. pp. 45-56, pl. iii.

† Proc. Zool. Soc. 1877, p. 662, pl. lxvii. figs. 2-2b.

‡ Proc. Acad. Nat. Sci. Philadelphia, 1879, p. 424.

the two branches of the outer flagellum of the antennules are divided to the base may, however, be taken as indicating for the genus a place within the Palæmonidæ. The other genera usually included in this family which have no palps on the mandibles are *Palæmonetes*, Heller, *Palæmonopsis*\*, Borradaile, and *Ancylocaris*, Schenkel. From these the present genus is distinguished by the form of the rostrum and by the absence of spines except the antennal on the antero-lateral region of the carapace.

*Euryrhynchus Wrzesniowskii*, Miers. (Fig. 1.)

*Euryrhynchus Wrzesniowskii*, Miers, Proc. Zool. Soc. 1877, p. 662, pl. lxxvii, figs. 2-2 b.

Merus of second peræopods with two inconspicuous rounded lobes at the distal end below; carpus without a spine on the inner side; fingers hardly longer than the palm. Telson with the tip rather narrowly rounded, projecting nearly as far as the long lateral spines.

Fig. 1.



*Euryrhynchus Wrzesniowskii*, Miers. Distal end of telson.

I can find no trace of the "small spine between the eyes and the rostrum" described by Miers, and the telson, as figured, is much too narrow.

*Locality.* Cayenne, "in a well." Co-type in British Museum.

*Euryrhynchus Burchelli*, sp. n. (Figs. 2-8.)

Merus of second peræopods with two acute spiniform teeth at the distal end of its lower surface; carpus with a sharp tooth on the inner side near the distal end; fingers distinctly longer than the palm. Telson with the tip broadly rounded, not projecting nearly as far as the long lateral spines.

*Locality.* Pará, 4th September, 1829: Burchell Coll. Type in Hope Museum, Oxford.

\* Mr. Borradaile has pointed out to me that this name was first used by Stimpson in 1871 (Ann. Lyc. Nat. Hist. New York, x, p. 128), but apparently only as a *nomen nudum*. Whether Borradaile's later use of the name is illegal may be left to the decision of those interested in such questions.

Fig. 2.



Fig. 5.



Fig. 3.

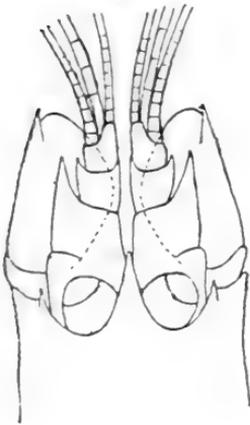


Fig. 6.



Fig. 7.



Fig. 4.



Fig. 8.

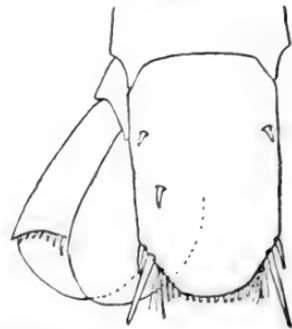
*Euryrhynchus Burchelli.*

Fig. 2.—Anterior part of carapace, from the side.

Fig. 3.—Anterior part of carapace, with eyes, antennules, and antennæ, from above (setæ omitted).

Fig. 4.—Mandible.

Fig. 5.—Distal end of merus and carpus of second pereopod from outer side.

Fig. 6.—Distal part of second pereopod (left side) from below.

Fig. 7.—Dactylus of third pereopod.

Fig. 8.—Telson and uropod. Marginal setæ of uropod omitted.

## Comparative Measurements.

	<i>E. Wrzesniewskii.</i>	<i>E. Burchelli.</i>
Total length .....	(“7½ lines,” Miers)	13.5 mm.
Length of carapace.....	5 mm.	4.75 ”
” ” rostrum .....	0.5 ”	0.6 ”
First leg, length of merus.....	1.7 ”	1.5 ”
” ” ” carpus.....	1.9 ”	1.7 ”
” ” ” chela .....	1.2 ”	1.2 ”
Second leg, length of merus .....	2.1 ”	1.95 ”
” ” ” carpus .....	2.7 ”	1.7 ”
” ” ” chela .....	5.25 ”	4.4 ”
” ” ” palm ..	2.7 ”	2.5 ”
” ” ” fingers..	2.55 ”	1.9 ”

The fact that both the forms referred to this genus were found in wells suggests that they belong to the subterranean fauna. The eyes, however, although small, are well-pigmented and faceted. Certain blind forms referred to the genus *Palæmonetes* have been described from subterranean habitats in Texas and in Cuba. They are still imperfectly known and it does not seem certain that they are correctly assigned to that genus. They are certainly specifically, and probably generically, distinct from the forms here dealt with.

XXXVI.—*Descriptions of new Species of Heterocera belonging to the Families Syntomidæ, Hypsidæ, Cyllopodidæ, Diop- tidæ, and Erateinidæ.* By HERBERT DRUCE, F.L.S. &c.

## Family Syntomidæ.

*Agyrta varuna*, sp. n.

*Male*.—Head, antennæ, and thorax black, the shaft of the antennæ white; the collar and palpi bright crimson; tegulæ black, edged with white; abdomen metallic blue above, white on the underside; a bluish-white dorsal stripe extends from the thorax to the anus. Primaries black, with a semi-hyaline white band from the base as far as the end of the cell; a white spot near the apex; secondaries pale yellow, the apex and outer margin broadly black shot with brilliant blue; the fringes of both wings black. Underside: primaries very similar to the upperside, but shot with brilliant blue: secondaries with the costal margin banded with white and an

oval-shaped white spot close to the apex, the black margin glossed with blue.

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

*Hab.* Peru, Pichón Road, 3000 feet (*Watkins, Mus. Druce*).  
Allied to *Agryta flavitincta*, Hampson, from Bolivia.

#### Family Hypsidæ.

##### *Callimorpha solai*, sp. n.

Head, antennæ, palpi, collar, tegulæ, and thorax black; abdomen above orange-yellow banded with black; the underside, anus, and legs black. Primaries yellowish cream-colour, the costal margin, apex, and outer margin black, the inner edge of the black outer margin deeply dentated about the middle; a black spot above the anal angle and a black band near the apex; a spot at the end of the cell and the base of the wing black: secondaries dark orange, broadly bordered with black; a black spot at the end of the cell; the secondaries are almost identical with those of *Callimorpha Theballi*, Druce. Underside almost identical with the upperside, but the primaries dark orange-yellow, the same as the secondaries.

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

*Hab.* British East Africa (*Mus. Druce*).

Specimens are also in the National Collection.

##### *Eucyane dilutana*, sp. n.

Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs all black; the underside of the head and front of thorax yellow. Primaries black, the veins slightly greyish; a yellow band crosses the wing beyond the cell from the costal margin to the anal angle, where it becomes quite narrow; the fringe black: secondaries black; a submarginal yellow band extends from close to the apex to the anal angle, becoming rather reddish; the outer margin black. The underside very similar to the upperside, but the bands more shaded with red.

Expanse 2 inches.

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

Allied to *Eucyane kedar*, Druce.

##### *Pericopis anadema*, sp. n.

*Male.*—Head, antennæ, palpi, and legs black; two white spots on the collar; tegulæ yellow, with a black line

down the middle; thorax blackish brown, with two yellowish-white spots at the base; abdomen above black, striped with yellow on each side, the anal segments black, the anal tuft yellow; the underside of the abdomen pale yellow. Primaries semihyaline, shaded with brown; the apex, outer margin, and inner margin brownish black; two brownish-black lines cross the wing from the costal margin, the first from the end of the cell to the outer margin, the second about the middle of the wing; a marginal row of minute white dots extends from the apex to the anal angle: secondaries orange-yellow in some specimens, the veins blackish; the outer margin black, with a marginal row of very minute white dots. Underside very similar to the upperside; the fringe blackish brown.—*Female*. Primaries pale brownish yellow, crossed from the costal margin beyond the middle by a wide broken yellow band: secondaries orange-yellow, the outer margins black, the white dots very indistinct.

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

*Hab.* Colombia, Minca, 2000 feet (*H. H. Smith*), 10 ♂, 1 ♀ (*Mus. Druce*).

One specimen in the National Collection from Panama.

*Pericopsis Forbesi*, sp. n.

*Male*.—Head, antennæ, and palpi black; collar black, spotted with yellow; tegulæ black, yellow at the base; thorax and abdomen black, the abdomen banded with yellow on each side; the underside yellow, with a central black line; the anus reddish yellow; the legs black: secondaries brownish hyaline, the veins, apex, outer and inner margins black; a wide black band crosses the wing beyond the cell from the costal margin to the outer margin above the anal angle; a second black band crosses the wing about the middle: secondaries yellowish hyaline, the veins, apex, and outer margin broadly black; a narrow black band at the end of the cell. Underside very similar to the upperside, but with a small red spot at the base of each wing.

Expanse 3 inches.

*Hab.* South Brazil (*Mus. Druce*).

A very worn and broken specimen is in the National Collection.

*Pericopsis mosera*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, and legs black; collar spotted with yellow; abdomen black, banded on the sides with bluish grey; the underside pale

yellow; the anal tuft dark yellow. Primaries greyish hyaline, the costal margin from the base to end of the cell and a streak on the inner margin from the base almost to the anal angle reddish brown; the apex, outer and inner margins black excepting at the apex; a black band crosses the wing at the end of the cell from the costal to the outer margin; the band is semihyaline black in the middle; a short, slightly curved black band crosses the wing about the middle of the cell; a marginal row of minute white dots extends from the apex to the anal angle: secondaries hyaline, shaded with black above the anal angle; the costal margin, apex, and outer margin broadly black; a black band at the end of the cell; a marginal row of white spots extends from the apex to the anal angle. Underside similar to the upperside; the primaries with a reddish-brown band at the apex and a reddish-brown spot about the middle of the outer margin; the costal margin of the secondaries reddish brown.

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

*Hab.* Peru, Rio Colorado, 2500 feet (*Watkins & Tomlinson, Mus. Brit.*).

#### Family Cylopodidæ.

##### *Devara bicolorata*, sp. n.

*Male.*—Head, antennæ, collar, tegulæ, thorax, legs, and the abdomen black; the underside of the abdomen greyish white. Primaries black, with a large round white spot about the middle of the wing, some white scales near the base, the veins black: secondaries black; the fringes of both wings black. Underside: primaries, the white spot larger, extending to the base of the wing; the apex dark grey, covered by the black veins: secondaries dark grey, the veins all black, the outer margin slightly white.

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

*Hab.* Peru, San Remon, 3000 feet (*Watkins, Mus. Druce*); Bolivia, Yungas la Paz (*Mus. Brit.*).

The specimen from Bolivia is slightly paler in colour on the underside of the secondaries, but in all other respects it is identical with the Peruvian specimens. It is allied to *Devara bubona*, Druce, from Ecuador.

##### *Devara xanthion*, sp. n.

*Male.*—Head, antennæ, collar, tegulæ, thorax, and abdomen black, the sides of the abdomen yellow; legs black. Primaries black; a reddish-brown streak extends from the

base almost to the middle of the wing; a rather large yellowish-white square-shaped spot close to the costal margin nearest the apex; the fringe black: secondaries black, the central part of the wing reddish brown irrorated with black scales; the fringe black. Underside of primaries very similar to the upperside; the white spot larger and reaching the costal margin; several small yellowish-white streaks at the apex and a white dot on the outer margin nearest the apex; secondaries pale yellowish white, the veins all black, broadly bordered with blackish brown from the apex to the anal angle, some of the spaces between the veins yellowish white.

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

*Hab.* S.E. Brazil, Rio Janeiro (*Mus. Brit.*).

Allied to *D. bifenestrata*, Herr.-Schäff., and *D. pallida*, Druce.

*Devara trebonia*, sp. n.

Head, antennæ, collar, tegulæ, thorax, abdomen, and legs greyish black. Primaries black, the cell semihyaline white; a large round yellow spot beyond the cell nearest the apex; the fringe black: secondaries white, broadly bordered with black from the apex to the anal angle. Underside very similar to the upperside.

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

*Hab.* Peru, Rio Colorado, 2500 feet; La Mercede, 3000 feet (*Watkins, Mus. Druce*); San Remon, 3000 feet (*Watkins, Mus. Brit.*).

*Devara chilion*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and upperside of the abdomen brownish black; the underside of the abdomen and legs greyish white. Primaries brownish black; three greyish-white streaks near the base and a white spot close to the apex; the veins yellowish brown; the fringe black: secondaries white, broadly bordered with black from the apex to the anal angle; the inner margin dusky white. The underside very similar to the upperside, but blacker.

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

*Hab.* Peru, Rio Colorado, 2500 feet (*Mus. Druce*).

A specimen of this species is in the National Collection from the same locality.

*Devara ion*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black; the underside of the thorax and abdomen

greyish white. Primaries black, the basal third white; a white spot close to the apex: secondaries white, broadly bordered with black from the apex to the anal angle; the inner margin black; fringes of both wings black. Underside: primaries very similar to the upperside; two white spots close to the apex; the apex greyish: secondaries greyish white, the veins black; a black mark at the apex and one close to the anal angle, the outer margin irrorated with black scales.

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

*Hab.* Bolivia, Yungas la Paz (*Mus. Brit.*); 2 ♂ and 1 ♀ (*Mus. Druce*).

*Devara pieroides*, sp. n.

*Male.*—Head, antennæ, collar, tegulæ, thorax, and abdomen above black; the underside of the thorax and abdomen greyish white; legs greyish. Primaries black, the basal half of the wing white, the base irrorated with black scales: secondaries white, edged with black, broadest at the apex; the fringe black. Underside: primaries very similar to the upperside, excepting that the costal margin and apex are greyish white: secondaries glossy white, the veins black.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Bolivia, Yungas la Paz (*Mus. Brit.*).

*Devara cressida*, sp. n.

*Male.*—Head, antennæ, and thorax black; collar and tegulæ grey; abdomen black, banded with grey, the underside white; legs black. Primaries black; an elongated spot at the base whitish hyaline, and a small white spot on the costal margin near the apex: secondaries creamy white, broadly bordered with black from the apex to the inner margin. Underside: primaries very similar to the upperside, but with the apex greyish, crossed by the black veins and a small white spot about the middle of the outer margin: secondaries creamy white, the veins all black, the apex and outer margin clouded greyish black; a small white spot near the apex.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Peru, Rio Colorado (*Watkins, Mus. Druce*).

*Devara protea*, sp. n.

*Female.*—Head, antennæ, thorax, and upperside of the abdomen black, the underside white; collar orange; tegulæ

black, edged with white. Primaries black; a curved hyaline white band extends from the base to the end of the cell; the inner margin from the base to about the middle greyish; a round white spot near the apex: secondaries white, broadly bordered with black from the apex to the anal angle. Underside very similar to the upperside, but not so black; the outer margin of the secondaries has an indistinct greyish-white line on the black border which extends from the apex to the anal angle; the fringes of both wings black.

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

*Hab.* Peru, La Mercede, 2000–3000 feet (*Watkins, Mus. Druce*).

*Nelo cosyra*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs brownish black. Primaries brownish black, the costal margin from the base almost to the apex orange-red; a wide orange-red band crosses the centre of the wing from the costal margin to the anal angle; the fringe dark brown: secondaries brownish black. Underside: primaries very similar to the upperside; secondaries pale brown, the veins all black.

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

*Hab.* Peru, San Remon, 2000–3000 feet (*Watkins*), 10 ♂ (*Mus. Druce*), 1 ♂ (*Mus. Brit.*).

Allied to *Nelo coccinata*, Walk.

*Nelo cretes*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black, the underside of the abdomen reddish. Primaries black, with a white spot shaded with blue beyond the cell nearest the outer margin: secondaries black; the fringes of both wings black. Underside: primaries very similar to the upperside, the white spot more distinct, the apex and half of the outer margin red: secondaries red, the veins black.

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

*Hab.* Peru, Rio Colorado, 2500 feet; La Mercede, 2000 feet (*Watkins, Mus. Druce*), 13 ♂; 1 ♂ (*Mus. Brit.*).

*Nelo dolopia*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs dark brown. Primaries dark brown, crossed about the middle by a wide red band, which is straight on the inner side and much curved on the outer side: secondaries dark

brown. Underside very similar to the upperside, but much paler brown, the veins black.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Bolivia, La Paz (*Garlepp, Mus. Druce*); Peru, Oroya, 1000 feet (*Mus. Brit.*).

*Nelo cunaxa*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs brownish black. Primaries brownish black, with a large orange-red spot extending from the costal margin nearest the apex to the anal angle: secondaries dark brown; the fringe of both wings dark brown. Underside: primaries similar to the upperside, but paler in colour, the orange-red spot edged with white on the costal margin: secondaries pale brown, the veins black; a white streak on the costal margin just above the apex.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Peru, Rio Colorado, La Mercede, 2000–3000 feet, 5 ♂ (*Mus. Druce*).

*Nelo cyphara*, sp. n.

*Male*.—Head, antennæ, collar, thorax, abdomen, and legs black. Primaries deep blue-black, with a large, almost round, orange-red spot beyond the cell: secondaries deep blue-black. Underside very similar to the upperside, excepting that the costal margin, apex, and outer margin are pale brown: secondaries round the outer margin, the veins all black.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* North Peru, Huancabamba, 6000–10,000 feet; Pozuzo, 5000–10,000 feet (*Native Collector*); Rio Colorado, 2500 feet (*Watkins*), 16 ♂ (*Mus. Druce*).

A specimen of this species is in the National Collection from Peru.

*Nelo donuca*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black. Primaries and secondaries black, primaries slightly glossed with dull blue near the apex. Underside of both wings black.

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

*Hab.* Peru, Pozuzo, 5000–10,000 feet (*Native Collector, Mus. Druce*).

Allied to *Nelo philodamea*, Druce, but very distinct.

*Sangala cydrara*, sp. n.

*Male*.—Head, collar, tegulæ, thorax, and abdomen black, the point of the tegulae red. Primaries dark brown, with a large central red patch that does not reach either the costal or inner margin; secondaries dark brown. Underside: primaries pale brown, the veins black; the red spot smaller than above: secondaries pale brown, a red spot at the base, the veins black.

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

*Hab.* Bolivia, Yungas la Paz (*Mus. Brit.*).

*Sangala anasa*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black. Primaries bright glossy dark blue: secondaries dark brownish black, in some lights slightly glossed with blue. Underside: both wings pale brown, the veins black.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Peru, La Mercede, 2000–3000 feet (*Watkins, Mus. Druce*).

Allied to *Sangala antiphates*, Druce, but very distinct on the underside.

*Sangala marpesia*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black, the sides of the abdomen streaked with red and yellow. Primaries dark brown, with a large central reddish-orange spot crossing the wing from the costal margin nearly to the inner margin; the fringe dark brown: secondaries dark brown. Underside: primaries pale brown, the veins black, the costal margin from the base to the end of the cell red; a red spot at the end of the cell: secondaries pale brown, the veins black; a small red spot at the base and two large white spots close to the apex.

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

*Hab.* Bolivia, La Paz (*Garlepp, Mus. Druce*).

*Sangala cynara*, sp. n.

*Male*.—Head, antennæ, collar, thorax, upperside of abdomen, and legs all black, underside of abdomen reddish brown. Primaries dark brown, with a large red spot at the end of the cell; the wing is glossed with bright blue from the base almost to the outer margin; the red spot varies greatly in

size in the eight specimens before me: secondaries dark brown, in some specimens the wing is slightly glossed with blue on the outer margin. Underside: primaries pale brown, the veins black; an orange-red, rather wide streak at the end of the cell; secondaries pale brown, greyish brown at the apex, the veins black.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Peru, Upper Rio Toro (*Mus. Druce*).

In some specimens the red spot on the underside of the primaries is entirely wanting. This species is allied to *Sangala antiphates*, Druce.

*Taraxineura quadripuncta*, sp. n.

*Male*.—Head, antennæ, tegulæ, thorax, abdomen, and legs black; collar orange-yellow; anal tuft yellow. Primaries black, a large square white spot at the end of cell; fringe black; secondaries black, a small white round spot at the end of the cell. Underside similar to the upperside.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* British Guiana, Roraima (*Whitely*); Paramaribo (*C. W. Ellacombe, Mus. Druce*), 2 ♂, 1 ♀; Potaro River (*C. B. Roberts, Mus. Brit.*), 1 ♂.

Family Dioptidæ.

*Lauron halizoa*, sp. n.

*Female*.—Head, antennæ, and thorax black; tegulæ orange-red; abdomen brownish black, with a greyish-white line on each side; legs brownish black. Primaries reddish orange, semihyaline near the base, the veins mostly black; a band of five white spots crosses the wing near the apex from the costal to the outer margin; the fourth and fifth spots are quite small: secondaries semihyaline brownish black; the underside of both wings brownish black; the costal margin of the primaries reddish orange.

Expanse 2 inches.

*Hab.* Jamaica (*Mus. Brit.*).

*Dioptis quirites*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black; the front of the head and underside of the thorax and abdomen white. Primaries hyaline, the veins black, the apex and outer margin broadly black; a semi-hyaline white band partly crosses the wing near the apex,

but does not reach the outer margin; a round semihyaline white spot at the anal angle: secondaries hyaline, the veins black; the costal margin, apex, and outer margin black; a submarginal pale yellow line edged with black on the inner side extends from the apex to the anal angle. The underside very similar to the upperside.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Colombia, Bogota (*Mus. Brit.*).

From the Crowley Collection. Allied to *Dioptis Trailii*, Butler, and *Dioptis cheledonis*, Druce.

*Dioptis albifasciata*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black; underside of the abdomen white. Primaries hyaline, the veins black; a black line crosses the wing beyond the cell from the costal margin to the anal angle, beyond which a wide white band crosses from the costal to the outer margin; the apex and outer margin broadly black: secondaries hyaline, the veins, costal and outer margins black. The underside very similar to the upperside.

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

*Hab.* Peru, La Mercede, 2000–3000 feet (*Watkins, Mus. Druce*).

*Locha hermes*, sp. n.

*Female*.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black. Primaries hyaline, the veins all black; the costal margin, apex, outer and inner margins black; a black band crosses the wing at the end of the cell from the costal to the outer margin; a small orange-red spot at the base of the wing: secondaries hyaline, the veins, costal and outer margins black. The underside the same as the upperside.

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

*Hab.* Colombia (*Mus. Brit.*).

Allied to *Locha hyalina*, Walk.

*Phanoptis tuxila*, sp. n.

*Female*.—Head, antennæ, collar, thorax, abdomen, and legs black; tegulæ black, with a white spot at the base. Primaries hyaline, the costal margin, apex, outer and inner margins, and a wide band crossing the wing beyond the cell all black glossed with brilliant blue: secondaries hyaline, the costal margin, apex, and outer margin and veins black glossed

with brilliant blue. Underside similar to the upperside, but not so much glossed with blue.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Colombia, Bogota (*Mus. Brit.*).

From the Crowley Collection.

*Phanoptis lydia*, sp. n.

*Female*.—Head, antennæ, and tegulæ black; collar bright red; thorax and abdomen bright blue, abdomen with a white central line, underside of the abdomen white. Primaries hyaline, the veins, costal margin, apex, outer and inner margins, and a band crossing the wing beyond the cell all black glossed with brilliant blue: secondaries hyaline, the veins and margins black glossed with brilliant blue; the fringe of the secondaries white. Underside very similar to the upperside, but without the blue gloss.

Expanse 2 inches.

*Hab.* Peru, La Mercede, 2000–3000 feet (*Watkins, Mus. Druce*).

Allied to *Phanoptis cyanomelas*, Felder.

Family *Erateininae*.

*Eratina amazonia*, sp. n.

*Female*.—Head, thorax, and abdomen black; collar white; abdomen banded with white above, the underside white; legs black, white on the underside. Primaries pale greyish brown from the base to about the middle; the apical half black, crossed from the costal margin almost to the anal angle by a yellowish-white band: secondaries greyish brown, the outer margin broadly black; a submarginal row of yellowish-white spots extends from near the apex to the anal angle; a red spot at the anal angle; the fringe alternately black and white. Underside: primaries similar to the upperside, but redder and with a submarginal white band from the costal margin near the apex to the anal angle; secondaries white, streaked with yellow and red bands, the outer margin reddish brown.

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

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

*Eratina Garleppi*, sp. n.

*Male*.—Head, antennæ, collar, tegulæ, thorax, and upper-side of the abdomen black, underside of the abdomen white. Primaries black, with white streaks from the base, the inner

margin white; a wide semihyaline white band crossing the wing about the middle, but not reaching either margin; a second small band near the apex; the fringe black; the semihyaline bands are glossed with dark blue: secondaries black, the central part of the wing bluish hyaline white; the fringe alternately white and black. Underside of both wings very similar to the upperside, but the black parts reddish in tint.

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

*Hab.* Bolivia, Yungas la Paz (*Garlepp*), 3 ♂ (*Mus. Druce*).

A specimen in the National Collection from the same locality.

*Eratina albonulata*, sp. n.

*Female*.—Head, antennæ, tegulæ, thorax, and abdomen above black; collar and underside of the abdomen pale yellow, abdomen banded with white on the upperside. Primaries black, slightly greyish at the base; a large oval-shaped white spot about the middle of the wing; secondaries black. Underside: primaries, the base streaked with yellow and white, the white spot as above, but extending to the costal margin; a submarginal line of bright yellow spots from near the apex almost to the anal angle: secondaries pale yellowish white, the veins yellow, and a submarginal yellow line; the apex reddish.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Bolivia, Yungas la Paz (*Garlepp*, *Mus. Druce*); one specimen (*Mus. Brit.*).

XXXVII.—On new Species of Histeridæ and Notices of others. By G. LEWIS, F.L.S.

THIS is the thirtieth paper of this series.

In the last few years certain Histeridæ have been found in India which show in a marked degree a connexion between the fauna of our eastern possessions and that of Japan.

Mr. E. P. Stebbing has found *Niponius canalicollis*, Lew., on the mountain of Shinghun, in the northern part of Zhob in Baluchistan, at an elevation of 7500 feet; it was found feeding on a species of *Polygraphus* which infests the Himalayan pine, *Pinus Gerardiana*. The locality is of interest, as it is probably the western geographical limit of *Niponius*,

as Japan is of its eastern boundary. The best time for searching for the species is June and early in July; they are diurnal, and occur in the higher regions of large forests. I found the species in Japan chiefly on deciduous trees, elm, oak, and celtis, and they seemed to feed on various sub-cortical and wood-boring Coleoptera. It is likely that there are unrecognized species in collections, as one from Borneo remained in the Pascoe collection for many years until detected by Mr. Arrow.

Species of two other peculiar genera have been recently discovered in the Nilgiri Hills by Mr. H. L. Andrewes which have a like distribution from Japan in the east to India in the west, viz. *Trypeticus* and *Pachylomalus*, and in both instances the species are very similar to each other. *Hister punctulatus*, Wiedem., one of the most curious species in the family, occurs in Bengal, and I have found it in China and Japan; the species should now be placed in *Zabromorphus*, as it has longitudinal antennal fossæ.

It is by the peculiar genera and species of a family that the connecting-links in a fauna are principally shown, not by the ordinary genera, such as *Hister* and *Saprinus*, which are world-spread.

#### List of Species.

Hololepta scissoma, Mars. (maura, Lew.).	Isolomalus truncatus.
Trypanæus thoracicus, F.	Microlomalus, gen. nov.
— torpedo, Lew.	Discozocelis argentinæ.
Campylorhabdus Poggei, Har.	Abreus orientalis.
Teinotarsus latipes, Lew.	Saprinus cæsoopygus, Mars.
Hister nyassæ.	Euspilotus, gen. nov.
— Silantjevi, Shir.	— zonalis.
Carcinops arquatus.	— flavopictus, Lew.
Paromalus, Erichson.	— decoratus, Er.
Isolomalus, gen. nov.	— bisignatus, Er.
— elongatus.	Gnathoneus brevisternus.

*Hololepta maura*, Lew., 1885, = *H. scissoma*, Mars., 1860.

In 1885 I knew *H. scissoma* by description only. *H. maura*, Lew., is a variety in which the first dorsal stria is interrupted in the middle; in more than fifty examples I have since seen the first dorsal stria is complete, as shown in Marseul's figure (pl. xi. fig. 10, Monograph, 1860).

*Trypanæus thoracicus*, F., and *T. torpedo*, Lew.

The females of these species are very similar to each other,

except that the latter is more robust and the lateral thoracic stria is conspicuously stronger; but the male of *torpedo* has a rostrum which has a protuberance on either side, and in this respect agrees with the males of *T. carinerostris*, *noxius*, *nasicornis*, and *volvulus*, Mars. Two figures are given to show the differences of the outlines of the rostrum.

Fig. 1.



*Trypanæus thoracicus*, F.

Fig. 2.



*Trypanæus torpedo*, Lew.

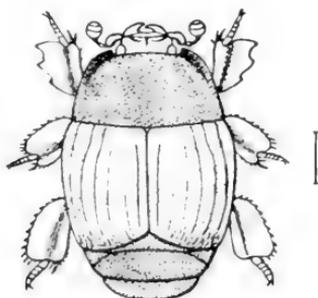
CAMPYLORHABDUS, Schmidt, 1889.

*Teinotarsus Poggei*, Har., is undoubtedly congeneric with *Campylorhabdus singularis*, Sch. There is a very great resemblance in the sculpture and form of the sterna and in the peculiar dorsal striæ of both species.

*Teinotarsus latipes*, Lew., 1904.

I give a figure of this species, drawn from the type example in the British Museum.

Fig. 3.



*Teinotarsus latipes*, Lew.

*Hister nyassæ*, sp. n.

Breviter ovalis, convexus, niger, nitidus; fronte biimpressa, stria recta; pronoto lateribus impunctato, marginato et bistriato; clytris striis 1-3 et subhumerali integris, 4 basi evanescenti, 5

apicali, suturali utrinque abbreviata; propygidio pygidioque densissime punctatis; prosterno angustato haud striato; mesosterno truncato, marginato; tibiis anticis 3-dentatis.

L.  $5\frac{1}{3}$  mill.

This species is extremely similar to *H. Marshalli*, Lew., from Mashonaland, but it is a little larger, rather less convex, and somewhat more oval. The thorax is smooth laterally, not conspicuously punctate, and the pygidia are more densely punctured. In *Marshalli* there is a short basal outer humeral stria which is wanting in *nyassæ*, but in both species the mesosternum is truncate and has a fine marginal stria, and the anterior tibiæ are tridentate, with the apical tooth very robust.

*Hister aneus, angoniensis, africanus*, and *sulcipygus*, Lew., with *ajer*, Payk., may be associated with the above, as they all have a truncate mesosternum and a complete subhumeral stria; the thoracic striæ and the form of the anterior tibiæ are also similar.

*Hab.* Nyassaland, Central Africa.

I give the following description for convenient reference:—

*Hister Silantjevi*, Shirjajev. Rev. Russe d'Ent. iii.  
p. 16 (1903).

“ Corps ovulaire, assez convexe, luisant, antennes noires. Stria frontale à peine sinuée. Pronotum à bords latéraux renflés, avec une stria latérale unique, non parallèle au bord mais s'en rapprochant davantage en avant qu'en arrière; dessus ponctué contre la stria latérale (intérieurement). Elytres avec une stria subhumérale entière et fortement arquée, à sa base, vers l'intérieur; épaules avec une striole oblique, bien distincte, reliant la partie basilaire de la stria subhumérale au bord de l'élytre; stries dorsales 1-3 entières, la 4<sup>e</sup> excédant légèrement le milieu des élytres, la 5<sup>e</sup> n'atteignant pas leur tiers, la 6<sup>e</sup> égale à la 4<sup>e</sup>. Épipleurès ponctués assez fortement. Propygidium ponctué un peu moins densément et un peu plus grossièrement que le pygidium. Tibias rougeâtres, les antérieurs munis de cinq dents dont la dernière est simple et assez aiguë.

“ Long.  $5\frac{1}{3}$  mill.

“ Cette espèce est notamment voisine de *H. marginatus*, Er., mais la stria latérale du pronotum n'atteint pas son bord postérieur, la base des élytres n'offre aucun vestige d'une 5<sup>e</sup> stria dorsale et les tibias antérieurs n'ont que 5 dents à leur

bord externe. Elle se rapproche également de *H. carbonarius*, Hoffm., mais le pronotum est ponctué contre la strie latérale, intérieurement, etc.

“Un spécimen ♂ de cette intéressante espèce dans le district de Starobielsk, gouv. de Kharkov.”

*Carcinops arquatus*, sp. n.

Ovalis, convexus, niger, nitidus; fronte stria integra; pronoto punctato, punctis sæpe confluentibus; elytris striis subhumerali, 1-5 dorsalibus integris, 5 pone scutellum, conspicue incurvatis, suturali parte tuberculiformis; mesosterno antice leviter sinuato, stria marginali late interrupta; tibiis anticis 3-dentatis.

L. 1 $\frac{3}{4}$  mill.

Oval, convex, black, and shining; the head, frontal stria complete, punctulation rather sparse and interspaces with microscopic points; the thorax, marginal stria complete and finely crenellate behind the head, punctured somewhat like the head, but the points are more distinct and many are confluent, along the basal edge there is a row of punctures; the elytra, striæ, inner humeral fine and complete, 1-3 are complete, 4 crenellate on the apical half and bent inwards at the base, 5 apical half crenellate, rather widening out before the middle and bending to the suture at the base. The fifth striæ appear to meet at the suture and together form a complete arch. The sutural stria is composed of three small dorsal tubercles, with one point anterior to them, and in their line are some apical points; the propygidium is transversely punctured in the middle; the pygidium is irregularly and sparingly punctate; the prosternum, lobe punctate and marginate, keel smooth, stria joined anteriorly and sinuous at the sides; the mesosternum is feebly sinuous and the marginal stria widely interrupted, closely behind the anterior edge there is an arched stria which continues in a parallel line along the sides to the base of the metasternum, and there is no visible suture between the sterna; the anterior tibiæ are feebly 3-dentate.

This species resembles *C. striatisternus*, Lew., in that the meso- and metasterna are connate and in the remarkable lateral stria which is common to both.

*Hab.* Nilgiri Hills (*H. L. Andrewes*).

“Found in a nest of a harvesting-ant, *Pheidologeton diversus*, in a decaying *Ficus* on the Barwood Estate, altitude 3500 feet.”

Six examples; Paussidæ and other Coleoptera have been found with the same ant.

## PAROMALUS, Erichson, Jahrb. p. 167 (1834).

Type, *complanatus*, Panz.

After founding the two new genera, as below, the species now remaining in this genus are:—*acistrigus*, *biarculus*, *clavis*, *despectus*, *crucioscens*, *Forestieri*, *honoratus*, *keicola*, *khongius*, *miliaris*, *musicus*, *occantilis*, *Roberti*, *sculptipygus*, *teibodæ*, *umbilicatus*, *Victoriar*, *vittula*, Mars.; *aqualis*, Say; *Atluandi*, *decasus*, *lenticula*, *Modiglianii*, *Schultheissi*, Sch.; *amellus*, *brevipes*, *commeatus*, *Fer.*, *fugisanus*, *goliath*, *indicus*, *locellus*, *longicornis*, *mendicus*, *montivagus*, *niponensis*, *obliquus*, *persimilis*, *submetallicus*, *tardipes*, *vermiculatus*, *viaticus*, Lew.; *cylanicus*, Motsch.; *complanatus*, Panz.; *digitatus*, Woll.; *eripius*, Fahr.; *Ludovici*, *saucius*, *terræ-reginæ*, Blk.; *javanus*, Redt.

The prosternum of *P. complanatus* and all the above are marginate (see fig. 4, p. 318).

In my Catalogue of 1905 not more than 100 species of *Paromalus* were given, but the number of species yet undescribed in collections is considerable.

## ISOLOMALUS, gen. nov.

Type, *verminosus*, Lew.

Body more or less convex; outline varying considerably, being sometimes elongate-oblong or sometimes shortly oval; dorsum with a sutural stria, abbreviated anteriorly; the prosternum, anterior lobe somewhat short, keel narrowed before the coxæ, without striæ, and semicircular at the basal edge (see fig. 5); the mesosternum is wide posteriorly.

The other species are:—*addendus*, *irregularis*, Sch.; *bicinctus*, *balixatus*, *causticus*, *concentricus*, *cordypygus*, *didymus*, *hariolus*, *hispaniola*, *infimus*, *inunctus*, *Luderti*, *malus*, *oculipygus*, *preductus*, *rugigenius*, *trifolium*, Mars.; *bistriatus*, *seminulum*, Erich.; *complexus*, *mancus*, Casey; *fissus*, *jjunus*, *notabilis*, *orbis*, *pupillus*, *rogalis*, *selectus*, *similis*, *sincerus*, *scrinus*, *verminosus*, Lew.; and *difficilis*, Horn.

There are four species in which the sutural stria is obsolete or wanting, but the general form of the body is the same, viz. *convexus*, Mars.; *divaricatus*, *inflatus*, and *sulcatus*, Lew. The figure of the last species (Biol. Cent.-Amer., Col. vol. ii. pt. 1, tab. vi. fig. 7) shows that it has a trace of a sutural stria.

*I. Luderti*, Mars., has made a settlement along the borders of the Mediterranean, having doubtless been introduced with *Opuntia* largely grown there.

*Isolomalus elongatus*, sp. n.

Elongatus, parallelus, subdepressus, niger, nitidus, undique punctatus; fronte plana, punctulata; mesosterno antice haud marginato; pygidio postice margine elevato, antice vermiculato; tibiis anticis 5-dentatis.

L.  $2\frac{1}{4}$ - $2\frac{1}{2}$  mill.

Elongate, parallel at the sides, somewhat depressed, black and shining; the head clearly punctured, stria complete; the thorax, marginal stria obsolete behind the neck, lateral punctures somewhat oblong and well marked, punctures on the disc resemble those of the head, but they are evanescent behind the neck; the elytra are more distinctly punctured than the thorax, but on the same plan, largest latterly, finer on the dorsum, with the sutural margin smooth, sutural stria fine and reaching just beyond the middle; the propygidium is flat and very distinctly punctate; the pygidium ♂ has a raised rim with a crescent sulcus within it, the disc is irregularly not finely vermiculate; the prosternum, lobe slightly punctured and with the keel microscopically strigose; the mesosternum is deeply margined at the sides only, with two fine detached striæ at the suture formed like inverted V's; the pygidium ♀ is densely punctulate; the anterior tibiæ 5-dentate.

*Hab.* Para and Santarem, Amazon River (*H. H. Smith*).

*Isolomalus truncatus*, sp. n.

Parum elongatus, parallelus, depressus, niger, nitidus; stria frontali integra; elytris apicibus anguste impunctatis; propygidio disco conspicue punctato; prosterno haud striato; mesosterno stria suturali interrupta et biarcuata.

L.  $2\frac{1}{4}$  mill.

Rather long, parallel, depressed, black and shining; the head clearly and rather closely punctured, frontal stria complete; the thorax punctured, finely strigose laterally, marginal stria complete, disc finely punctulate; the elytra, sutural stria abbreviated before the middle, sutural margin smooth, surface punctate and feebly strigose longitudinally, apical margin smooth; the propygidium, disc conspicuously punctate, outer margin smooth; the pygidium, ♂ apex obtusely triangular and punctured, base deeply, irregularly, and unevenly sculptured, ♀ unknown; the prosternum, anterior lobe rather coarsely punctured, keel more finely pointed and without striæ; the mesosternum immarginate anteriorly, laterally there is a well-marked stria, the sutural or transverse

stria consists of two short, detached, bent striæ; the metasternum is laterally widely and microscopically strigose, with a shallow rugose sculpture; the anterior tibiæ are 4-5-denticulate.

The form of the meso-metasternal transverse stria connects this species with *I. elongatus*.

*Hab.* Serra de Communaty, Pernambuco (*Gounelle*).

#### MICROLOMALUS, gen. nov.

This genus is established to receive species hitherto included in *Paromalus*. The body is somewhat cylindrical and elongate, but not much depressed as in the type of the genus *Paromalus* (*complanatus*, Panz.), and the form of the prosternum is on a different plan. The prosternum is without striae and the keel is narrowed anteriorly and not much flattened out, the metasternum throughout its length is relatively more narrow, see fig. 6.

The species are *flavicornis*, *parallelepipedus*, Herbst; *cinereus*, *vernalis*, Lew.; *filum*, Reit.; *sculptipectus*, Mars.; and *simplicisternus*, Sch. *M. sculptipectus*, from Java, I only know by description; the other species are from the north-temperate zone of the Old World.

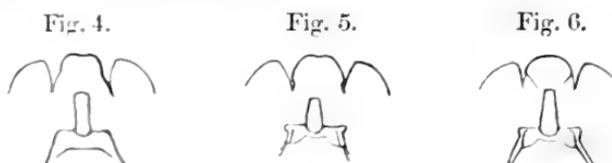


Fig. 4.—*Paromalus complanatus*, Panz.

Fig. 5.—*Isomalus verminosus*, Lew.

Fig. 6.—*Microlomalus flavicornis*, Herbst.

#### *Discoscelis argentinae*, sp. n.

Late ovata, convexa, nigra, nitida; fronte cum clypeo marginata; pronoto stria marginali antice recta, disco oblique striato; clytris striis subhumerali et dorsalibus 1-2 integris; pygidio apice longitudinali sulcato; tibiis anticis emarginatis.

L.  $3\frac{1}{4}$  mill.

Broadly oval, convex above, black and shining; the head slightly impressed anteriorly, faintly and irregularly strigose, lateral stria elevated and continued round the clypeus, which has a widely sinuous edge; the thorax, anterior angles obtuse and slightly explanate, marginal stria fine and continued behind the head, where it is markedly straight, at the

base, in a line with the second dorsal stria, there is a fine oblique stria bent inwards at the basal edge and in length about one third of that of the thorax; the elytra, the inner humeral stria is complete and carinate in the basal half, 1 dorsal fine and complete and incurved at the apex, 2 complete and similarly fine and turns inwards at the base, 3 is very short basal and hamate, between the third stria and the suture along the base is a very fine widely arched stria, which apparently represents the fourth and sutural striæ, there is no fifth stria, but there is a very fine stria round the apical margin which continues partly along the suture; the surfaces of the pygidia are scantily and microscopically punctulate, the propygidium is margined anteriorly with a fine stria, and the pygidium at its apex has a series of longitudinal grooves, about 24 in all, these constitute a well-marked character and may be sexual; the prosternum, the striæ are didymous and widen out behind the coxæ and in front the two parts of each stria join; the mesosternum has a marginal stria along its edge and behind it there is a transverse stria which is sinuous in the middle; the tibiæ are disciform, the anterior pair are minutely serrate on the outer edge and markedly emarginate on the inner edge at the tarsal end. *D. arechavaletæ*, Mars., is similar but larger, and has a third dorsal stria and the 4-6 very short and apical. The oblique thoracic striæ resemble those of *Renimus meticulosus*, Lew., and if more species of *Discoscelis* and *Renimus* are at any time detected the genera may require revision.

*Hab.* Tucuman, Argentina.

*Abræus orientalis*, sp. n.

Suborbicularis, convexus, piccus, opacus, ruguloso-punctatus, supra setulis erectis flavescentibus; prosterno basi conspicue punctato; mesosterno stria marginali late interrupta; mesosterno metasternoque subocellato-punctatis; tibiis obscure rufo-brunneis.  
L.  $1\frac{2}{3}$  mill.

Circular in outline, convex, rugosely punctured and setulose above; the head slightly impressed anteriorly; the prosternum straight at the base, narrowly marginate anteriorly, with an extremely fine stria behind the marginal stria, across the middle there is a feeble ridge and behind the ridge the punctures are very distinct and arranged in two rows, anterior to the ridge the punctures are irregular and inconspicuous, basal margin narrowly smooth not striate; the mesosternum, marginal stria widely interrupted and the punctures, which are similar to those of the metasternum, are in two irregular

rows; the metasternum, suture straight and rather coarsely crenellate, the crenellations numbering about twelve, the punctures are deep, circular, very evenly placed, somewhat ocellate and closely but not densely set; the legs are obscurely reddish brown.

This is the fifth species known from India; it is of stercoreaceous habits.

*Hab.* Nilgiri Hills (*H. L. Andrewes*).

*Saprinus caesopygus*, Mars.

I have received examples of this species from Tucuman, Argentina; there is therefore no longer any doubt as to its being a native of S. America. *S. pygidialis*, Lew., is a similar species, and in both the curious form of the pygidium is a masculine character only.

EUSPILOTUS, gen. nov.

Body oval, shining, metallic; head without a definite frontal stria; thorax transverse; elytra maculate, sutural stria with an arcuate basal extension; prosternum, keel narrow, bistriate, with a strong and straight carina on either side, as shown in fig. 7; mesosternum widely sinuous and the margin interrupted; anterior tibiae multidenticulate.

The species to be included are *Saprinus bisignatus*, *decoratus*, *lepidus*, Er.; *crenatipes*, Solier; *Blanchardi*, Mars.; *dichrous*, *flavopictus*, *lesus*, and *zonalis* (type), Lew.

The elytral markings of *Saprinus interruptus*, Payk., a Central Asian species, are remarkably similar to *decoratus*, and I give a figure of the prosternum to show that the species are structurally very different.

Fig. 7.



*Euspilotus zonalis*, Lew.

Fig. 8.



*Saprinus interruptus*, Payk.

*Euspilotus zonalis*, sp. n.

Ovatus, æneus, nitidus; fronte dense punctata; pronoto ciliato, lateribus late rugoso-punctatis; elytris macula flava lata, striis 1-2 brevissimis, suturali integra basi arcuata, cæteris nullis; mesosterno stria marginali interrupta; tibiis anticis multidenticulatis.

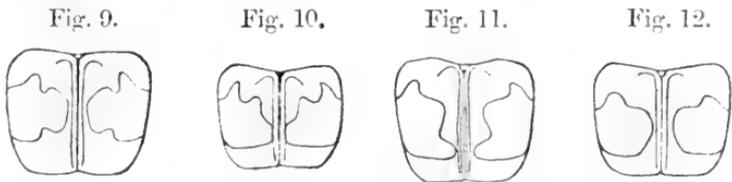
L. 3½-4 mill.

Oval, brassy and shining; the head densely punctate, stria obsolete; the thorax broadly rugose-punctate laterally, and narrowly at the base, smooth behind the head and on the disc, lateral edge with flavous hair; the elytra, humeral angle smooth, striæ 1-2 basal and very short, interstices strigose, sutural stria complete with an arcuate basal extension, the other striæ are wanting, the flavous band has a lobeshaped outline on the sutural disc and extends to the outer margin, anteriorly it is obtusely pointed on the inner side of the second stria (see fig. 9); the pygidium is somewhat closely but not densely punctate; the prosternum bistriate; the mesosternum evenly not closely punctured, with the marginal stria interrupted in the middle; the anterior tibiæ have 12-13 small teeth.

This species differs from *E. flavopictus*, Lew., in the thoracic band of punctures not continuing behind the head; in the form of the flavous band it is most similar to *bisignatus*, Er.

*Hab.* Chubut, Patagonia. Many examples.

As the elytral markings are fairly constant in these species I give outlines of the patterns of *E. zonalis* (fig. 9), *flavopictus* (fig. 10), Lew., *decoratus* (fig. 11) and *bisignatus* (fig. 12), Er., as an aid to their identification.



*Gnathoncus brevisternus*, sp. n.

Ovalis, convexiusculus, nitidus; fronte parum convexa, parce punctulata; elytris striis 1-4 dorsalibus dimidiatis, 4 basi crenata ad suturam continuata; prosterno striis brevibus antice obtuse cœuntibus.

L. 2 $\frac{3}{4}$  mill.

Oval, rather convex, black and shining; the head, forehead slightly convex, almost smooth, punctures being fine and sparse; the thorax clearly punctured laterally, punctures much finer on the disc, stria interrupted anteriorly, scutellar fovea well-marked; the elytra, striæ 1-4 dimidiate, inner striæ gradually shorter, 4 continues along the base to the suture as a crenellate stria, sutural wanting; the pygidia finely and evenly not densely punctulate; the prosternum,

striae are very distinctly shorter and wider apart than those of *G. nonnetensis*, Mars., and *rotundatus*, Kugel, and meet more obtusely in front.

Except for the characters given above this species is similar to *rotundatus*.

*Hab.* Yunnan.

### XXXVIII.—On a new Species of *Karschia* from Tibet.

By A. S. HIRST.

#### *Karschia tibetana*, sp. n.

♂.—*Colour.* Cephalic and thoracic segments pale yellow, the cephalic plate being tinged with brown in the anterior and lateral parts; ocular tubercle dark. Abdomen greyish white; the tergal plates black; ventral surface of this part of the body marked laterally with a longitudinal series of dark spots. Dorsal surface of mandible ornamented with three dark longitudinal stripes; tibia, metatarsus, and tarsus of palp, together with the corresponding segments of the fourth leg, infuscate dorsally, the remaining segments of these appendages and the other legs being light yellow in colour or but little darkened.

*Mandible.* Edge of upper finger of mandible with thirteen teeth; the first, third, fourth, sixth, seventh, ninth, tenth, and eleventh from the anterior end being of rather large size, the others small. Lower finger bearing five teeth, of which the posterior three are minute.

The two main bristles of the inner side of the mandible are long, slender, and provided throughout the greater part of their length with a ventral row of minute hairs, which are absent from the basal part (fig. 2).

*Flagellum* long and spiral, retained in position by a hook or thorn placed above it and by a long whip-like seta below; a small spine present on the lower surface towards the terminal portion, which is long and very slender; otherwise the flagellum is smooth (fig. 2).

*Palp.* Tarsus and metatarsus of palp furnished below with long and slender thorns, which are six in number in the case of the tarsus. Metatarsus on the inner side with many minute tufted hairs.

*Abdomen.* Third abdominal segment with many (over twenty on each side) setae arranged in several irregular rows towards the hinder edge of the ventral surface. Posterior

margin of fourth abdominal segment with a single row of nineteen long and slender setæ.

*Ocular tubercle* beset anteriorly with numerous bristles, several of which are of fairly great length, the chief of these being a pair of diverging and upwardly directed bristles, situated near the summit of the tubercle.

Fig. 1.

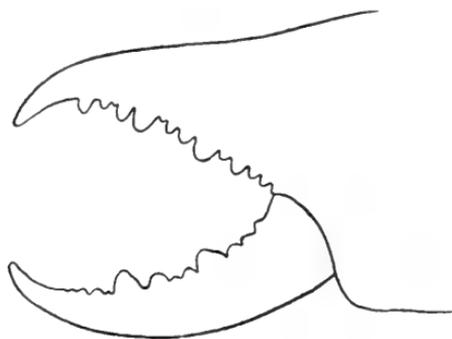


Fig. 2.



Fig. 1.—Left mandible of ♀ from the outside.

Fig. 2.—Right mandible of ♂ from the inside.

*Measurements in mm.* Length of mandible (finger incl.) 5.25, of palp 24.5, of first leg 18.5, of second leg 15, of third leg 20, of fourth leg 30, of cephalic plate 2.5; total length (mandible incl.) about 19; breadth of mandible (at base) 2, of cephalic plate 4.

♀.—*Mandible.* Teeth of upper finger of mandible fifteen in number, the fourth and eighth from the anterior end being of large size; first, third, seventh, and tenth fairly large; second, sixth, and ninth small, and the fifth granular; the

row of teeth divides after the tenth into two branches, an outer of two and an inner of three denticles. Lower finger of mandible provided with two teeth of large size, the first of which is preceded by three or four small denticles, the two large teeth being separated from one another by three teeth, of which the median one is minute; posterior enlarged tooth followed by three small teeth (fig. 1).

*Abdomen.* Ventral surface of fourth abdominal segment furnished posteriorly with a fringe of nineteen long setæ.

*Palp.* Tarsus and metatarsus of palp provided with a few long hairs; thorns absent.

*Size.* The female is of much larger size than the male, which has appendages of greater length.

*Measurements in mm.* Length of mandible (finger incl.) 7, of palp 21.5, of first leg 16.75, of second leg 13.75, of third leg 18, of fourth leg 24.5, of cephalic plate 3.5; total length 24; breadth of mandible (at base) 3, of cephalic plate 6.

*Hab.* Fourteen males and five females of this species were collected by Captain H. J. Walton, I.M.S., at Gyantse, Tibet, in the year 1904.

*Remarks.* Allied to *K. nasuta*, from which it apparently differs in the disposition and size of the teeth of the mandibular fingers, in the slenderness of the terminal portion of the flagellum, and in the absence of the tooth which is situated antero-dorsally towards the inner side of the upper finger of the mandible in *K. nasuta*. The female differs from that of *persica*, which is the only other species of this genus in which this sex is known, in that the ventral surface of the fourth abdominal segment is provided with nineteen long setæ on the hinder edge. It is necessary to state that I have not been able to examine specimens of the two species mentioned above.

XXXIX.—*Descriptions of Three new Snakes discovered by Mr. G. L. Bates in South Cameroon.* By G. A. BOULENGER, F.R.S.

*Dasyveltis macrops.*

Eye larger than in *D. scabra*. Rostral nearly twice as broad as deep, just visible from above; internasals as long as or a little shorter than the præfrontals; frontal a little longer

than broad, longer than its distance from the end of the snout, as long as or a little shorter than the parietals; one præ- and two postoculars; two superposed temporals, followed by keeled scales; seven upper labials, third and fourth entering the eye; a pair of large chin-shields, followed by a smaller pair or by the first ventral shield. Scales in 20 to 23 rows, the smaller oblique lateral scales with serrated keel reduced to two or three series. Ventrals 237-239; anal entire; subcaudals 79. Olive above, with very indistinct yellowish cross-bars on the back; upper surface of head with black vermiculations; belly plumbeous grey or olive-grey, more or less speckled with blackish.

Total length 900 mm.

Two specimens, ♂ (Sc. 20; V. 239; C. 79) and ♀ (Sc. 23; V. 237; C. ?), from Efulen.

The larger size of the eye, combined with the low number of scales and the coloration, induces me to regard this snake as specifically distinct from any of the numerous forms of *Dasypeltis* hitherto described. In the larger (♀) specimen (900 mm.) the head measures 25 mm. and the eye 4; in the smaller (♂) specimen (765 mm.) the head measures 18 mm. and the eye 4. In adult specimens of *D. scabra* the eye measures only 3 mm.

#### *Dipsadoboa isolepis.*

Rostral a little broader than deep, just visible from above; internasals a little broader than long, half as long as the præfrontals; frontal a little longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal deeper than long; one præocular, forming a suture with the frontal; two postoculars; temporals 1+2; eight upper labials, third, fourth, and fifth entering the eye; six lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 19 rows, not oblique, vertebrals scarcely enlarged. Ventrals 199; anal entire; subcaudals 56. Blackish grey above and under the tail; upper lip and lower surface of head and body yellowish white.

Total length 435 mm.; tail 70.

A single female specimen from Efulen.

This species connects the genera *Dipsadoboa* and *Leptodira*.

#### *Aparallactus Batesii.*

Diameter of eye greater than its distance from the oral margin. Rostral a little broader than deep, the portion

visible from above nearly half as long as its distance from the frontal; internasals much shorter than the præfrontals; frontal once and a half as long as broad, longer than its distance from the end of the snout, shorter than the parietals; nasal divided, in contact with the præocular; two post-oculars, lower very small, upper in contact with the fifth and sixth upper labials; a single temporal; seven upper labials, third and fourth entering the eye, sixth largest and forming a long suture with the parietal; first lower labial in contact with its fellow behind the symphysial; two pairs of chin-shields, posterior longer. Scales in 15 rows. Ventrals 145; anal entire; subcaudals 48. Snout and upper parts of body blackish, upper lip and back of head yellowish, lower parts yellowish white.

Total length 235 mm.; tail 40.

A single female specimen from the forest 5 miles inland of Kribi.

*XL. — The Synonymy and Generic Position of certain Species of Muscidae (sens. lat.) in the Collection of the British Museum, described by the late Francis Walker. By ERNEST E. AUSTEN.*

ALTHOUGH nothing in the shape of general interest can be claimed for the following notes, it is hoped that they may at any rate prove useful to compilers of catalogues who wish to avoid a long list of unidentified Walkerian species, chiefly at the end of the genus *Tachina*. Even with the types before him the present writer has often found it a matter of great difficulty to assign Walker's species of Muscidae to their proper genera, owing to the fact that the species are almost invariably based upon single specimens, usually in very poor condition. It would have taken far too long to correct the manifold inaccuracies and imperfections of the original descriptions, and in the majority of cases no attempt has been made to do so. As proving that Walker described the *specimen*, and not the species, the characters of which he was generally incapable of grasping, it may be mentioned that he is responsible for no fewer than eleven synonyms of the well-known *Eutachina rustica*, Mg., the description in every case being based upon a single specimen.

The present paper contains but a first instalment of notes upon Walker's species of Muscidae, since it is hoped to deal with other species in a similar manner at a later date.

*Phasia argentifrons* (List Dipt. Ins. in Coll. Brit. Mus. part iv. (1849) p. 691.—Interior of South Africa).—This species may be assigned provisionally to the genus *Hyalomyia*, Rob.-Desv., though possibly it should be transferred to yet another genus: the posterior transverse vein is nearer to the bend of the fourth vein than to the small transverse vein.

*Ocyptera picta* (*ibid.* p. 695.—Sierra Leone).—Apparently belongs to *Paralophosia*, Br. & v. Berg.

*Trichopoda lateralis* (*ibid.* p. 697.—Brazil).—Belongs to *Homogenia*, v. d. Wulp.

*Trixa apicalis* (*ibid.* p. 699.—Locality unknown) = *Microphthalma disjuncta*, Wied.

*Tachina melanax* (*ibid.* p. 700.—Venezuela) is a *Dejeania*, Rob.-Desv.

*Tachina alterna* and *T. aurifera* (*ibid.* pp. 701–702.—Venezuela) belong to *Saundersia*, Schin.

*Tachina diversa* (*ibid.* p. 703.—Venezuela) = *Saundersia ornata*, Macq. (*Micropalpus ornatus*, Macq. Dipt. Exot. ii. 3, p. 47).

*Tachina æquabilis* and *T. constans*\* (*ibid.* pp. 704–705.—Venezuela), as also *T. transiens* (*ibid.* p. 706.—Quito, Ecuador), *T. alligans* (*ibid.* p. 713.—Venezuela), *T. leucomelana* † (*ibid.* p. 714.—Locality unknown), and *T. contraria* ‡ (*ibid.* p. 716.—Mexico) belong to *Saundersia*, Schin.

*Tachina notata*, *T. varia*, *T. lativitta*, and *T. vittata* (Insecta Saundersiana.—Diptera, pp. 267, 268, 269, 273.—Colombia), and *T. transversa* (*ibid.* p. 274.—Brazil) belong to *Saundersia*.

*Tachina signata* (List Dipt. Ins. in Coll. Brit. Mus. part iv. (1849) p. 709.—Locality unknown §) is a *Hystricia*, Macq.

*Tachina zelica* (*ibid.* p. 711.—New Zealand).—As stated by Hutton (Trans. N. Zealand Institute, vol. xxxiii. (1901) p. 51), this is a synonym of *Hystricia* (*Musca*) *lupina*,

\* *Saundersia nigropilosa*, v. d. Wulp (Biol. Centr.-Americana, Diptera, ii p. 23.—Mexico; Costa Rica), is a synonym of this species: it may also be noted that *S. bipartita*, v. d. Wulp (*ibid.* p. 25.—Mexico) = *S. bicolor*, Will.

† *Saundersia unicolor*, v. d. Wulp (*op. cit.* p. 23.—Mexico), is a synonym of this species. The “palpi” of Walker’s description are really *pollinia* of a flower!

‡ *Saundersia rufitibia*, v. d. Wulp (*op. cit.* p. 24.—Mexico), is a synonym of this species.

§ The species is from New Zealand, and *Hystricia pachyprocta*, Nowicki (Beitr. zur Kenntn. Diptf. Neu-Seelands (1875), p. 25), is a synonym.

Svederus (K. Vet.-Akad. Nya Handl. viii. (1787) p. 289) : according to Svederus, the type of the species is in "Mus. Dom. Banks," but it is not now to be found in the Banksian Collection.

*Tachina patula* (*ibid.* p. 712.—Locality unknown) is a *Hystricia*. The face is hairy.

*Tachina anthemion* (*ibid.* p. 733.—Brazil), *T. amisiæ* (*ibid.* p. 734.—Locality unknown), *T. epileuca* (*ibid.* p. 716.—Jamaica), and *T. caliginosa* (Ins. Saund.—Dipt. p. 268.—Brazil) belong to the genus *Hystricia*. In *H. epileuca* the face is hairy : *H. amisiæ* is possibly a synonym of *H. anthemion*, but in the type of the former species, which is the only specimen in the Museum, the macrochætæ near the front margin of the second abdominal segment are differently disposed.

*Echinomyia furiosa* (Trans. Ent. Soc. Lond. iv. (1858) p. 194.—Rio Grande, Brazil) is a *Hystricia* : the face is hairy.

*Tachina basalis*\* (List Dipt. Ins. &c. part iv. p. 713.—Jamaica) is a *Jurinia*, Rob.-Desv.

*Tachina decisa* (*ibid.* p. 715.—Hudson's Bay, Nova Scotia) is a *Jurinia* ; *J. punctata*, v. d. Wulp (Biol. Centr.-Americana, Diptera, ii. p. 468.—Mexico) is a synonym of this species.

*Tachina iterans* (*ibid.* p. 727.—Nova Scotia) = *Peleteria tessellata*, Fabr. The statement that there are "no bristles on the side of the face" is precisely the opposite of the fact ; the same remark applies to the same statement in the case of *Tachina punctifera* (*ibid.* p. 728.—Massachusetts), which, as recorded by Coquillett (Revision of the Tachinidæ of America North of Mexico. U.S. Dept. of Agriculture. Division of Entomology. Technical Series, no. 7 (1897), p. 141), is likewise a synonym of *P. tessellata*, Fabr.

*Tachina sacontala* (*ibid.* p. 728.—Nepaul) apparently = *Tachina fera*, Linn.

*Tachina orbilius* (*ibid.* p. 736.—England) = *Macquartia flavipes*, Mg., ♀.

*Tachina mesula* (*ibid.* p. 737.—England) = *Demoticus plebejus*, Flin.

\* *Jurinia adusta*, v. d. Wulp (*op. cit.* p. 28.—Mexico), is very closely allied to this species ; but in the former the antennæ, especially the third joints, are more reddish beneath and not wholly dark, and the dorsum of the thorax is more yellowish pollinose in front.

*Tachina crisia* (*ibid.* p. 738.—England) = *Ernestia* (*Erigone*) *radicum*, F.

*Tachina tyche* (*ibid.* p. 738.—England) and *T. amphiro* (*ibid.* p. 749.—England) = *Blepharidea vulgaris*, Fln.

*Tachina megaleas* (*ibid.* p. 739.—England), *T. pitho* (*ibid.* p. 740.—England), *T. admete* (*ibid.* p. 743.—England), *T. pamesos* (*ibid.* p. 744.—England), *T. medoacus* (*ibid.* p. 746.—England), *T. telestho*, *T. cerceis* (*ibid.* p. 747.—England), *T. philonis* and *T. nymphidius* (*ibid.* p. 751.—England) = *Eutachina rustica*, Mg.

*Tachina separata* (Insecta Britannica.—Diptera, ii. p. 67 (1853).—England) = *Brachycoma devia*, Fln.

*Tachina lucifera* (Insecta Saundersiana.—Diptera, pt. iv. (1852) p. 282.—Locality?) perhaps belongs to the "Section" *Blepharipoda*, Br. & v. Berg., but the writer is at present unable to determine its proper genus with certainty.

*Tachina inornata* and *T. nervosa* (Trans. Linn. Soc. Lond. xvii. (1836) p. 349.—Cape Gregory and Port Famine, Strait of Magellan) belong to the "Section" *Pseudodevia*, Br. & von Berg., near the genus *Mucquartia*, Rob.-Desv. The eyes are bare, or but faintly pubescent, and the face and arista are also bare. The face has a distinct keel and the jowls (*Backen*) descend posteriorly. The types of both species are males. The two species are very similar in appearance and extremely closely allied; in *T. inornata*, however, the palpi and tibiae are orange and the last joint of the tarsi is ochraceous, while on the underside of the abdomen there is a long and very prominent tuft of stiff black hair on either side of the hypopygium. In *T. nervosa* the palpi are black, the tibiae blackish at the extremities, and the anal hair-tufts are wanting.

*Tachina piceiventris* (*ibid.* p. 350.—S. America; precise locality uncertain) is a *Masicera*.

*Tachina trifasciata* (*ibid.* p. 350.—S. America; precise locality uncertain) belongs to the "Section" *Masicera*, Br. & von Berg. A new genus will probably have to be founded for this species, differing from *Ceromasia*, Rond., in the narrowness of the body, the depth of the jowls being only one-sixth of that of the eyes, the long and slender arista, and the third vein being setigerous nearly as far as the small transverse vein.

*Tachina albifrons* (*ibid.* p. 351.—S. America; precise locality uncertain) is a *Sisyropa*, Br. & von Berg.

*Tachina chrysocephala* (*ibid.* p. 351.—S. America; precise locality uncertain) is a *Phorocera*, Rob.-Desv.

*Tachina basalis* (*ibid.* p. 351.—Port Famine, Strait of Magellan) belongs to the "Section" *Phorocera*, Br. & v. Berg., and apparently to a new genus near *Chatogaedia*, Br. & v. Berg. Eyes bare; depth of jowls, which descend noticeably behind, equal to half that of the eyes; facial ridges ciliated to above the middle; face with a row of bristles (a continuation of the frontal series) which descends nearly to level of lower margin of eye; abdominal macrochaetae discal and marginal; bend of fourth vein somewhat rounded.

*Tachina maura* (*ibid.* p. 352.—Port Famine, Strait of Magellan) is a synonym of the foregoing species.

*Tachina atriventris* (Ins. Saundersiana.—Diptera, pt. iv. (1852) p. 290.—India) is assigned by Walker himself at the commencement of his description to the genus *Nemoræa*. It is not, however, congeneric with *N. pellucida*, Mg., and apparently a new genus, possibly referable to the "Section" *Paramacronychia*, Br. & von Berg., will have to be founded for its reception.—Eyes hairy; arista bare; antennæ long; jowls not descending; abdomen thickly clothed with erect hair; first, second, and third segments with marginal but no discal macrochaetae; costal spine wanting; no appendix or "*Faltenzinke*" to bend of fourth vein; claws in male very long.

*Tachina alta* (*ibid.* p. 293.—India).—The type of this species proved to be an unrecognizable fragment, and has consequently been destroyed. The name should be deleted from van der Wulp's 'Catalogue of the Described Diptera from South Asia.'

*Eurigaster languida* (Trans. Ent. Soc. Lond. iv. (1858) p. 198.—India) is a *Blepharipoda*.

*Tachina tricincta* (Ins. Saundersiana.—Diptera, pt. iv. (1852) p. 301.—India) belongs to the genus *Frontina*—*sens. lat.* Br. & von Berg.

*Masicera incivica* (Trans. Ent. Soc. Lond. n. ser. v. (1861) p. 305.—Asia.—? India) is an *Aporomyia*, Rond. The facial ridges are ciliated to the level of the descending orbital setae—*i. e.* to above the middle. The length is incorrectly given by Walker as 4, instead of 2 lines.

*Tachina adusta* (Ins. Saundersiana.—Diptera, pt. iv. (1852) p. 292.—India) is a *Frontina*, Mg.

*Echinomyia stolidia* (Trans. Ent. Soc. Lond. vol. iv. (1858)

p. 195.—New South Wales) is the male of *Tachina obtusa*, Walk. (Ins. Saund.—Diptera, pt. iv. 1852, p. 274.—New South Wales). Under the latter name Walker professed to describe both sexes, but the female alone is now to be found in the Museum collection. It is quite possible that the type of *E. stolidus* is really the specimen previously described by Walker as the male of *Tachina obtusa*. This species may be assigned provisionally and with doubt to the genus *Microtropesa*, Macq. There is no noticeable keel on the face, and in the female the third joint of the antennæ is somewhat square and distinctly shorter than the second (the antennæ are wanting in the male), so that the species might be regarded as belonging to the genus *Fabricia*. The head, however, is rather wide, and in an obviously closely allied but undescribed species from Tasmania in the Museum collection the third antennal joint is as long as or slightly longer than the second. In both species there is a row of from six to eight small admedian macrochætæ on the margin of the second abdominal segment, which are absent in *Microtropesa sinuata*, Don., the typical species of the genus. In general appearance, however, *T. obtusa* and the species from Tasmania resemble *Microtropesa* more than *Fabricia*.

*Tachina despicienda* (Trans. Ent. Soc. Lond. n. ser. v. (1861) p. 306.—New South Wales) apparently belongs to the "Section" *Pyrrhosia*, Br. & v. Berg., but the condition of the typical specimen is such that it is impossible to determine the genus. The first posterior cell is closed at the margin of the wing.

*Tachina hebes* (Ins. Saund.—Dipt. pt. iv. (1852) p. 289.—Tasmania) is not a female as stated by Walker, but the male of *Tachina densa* (*ibid.* p. 288.—New South Wales). The species apparently belongs to a new genus near *Exorista*, Mg. The antennæ are inserted above the level of the middle of the eye; the face is broad and the frontal bristles descend to the level of the arista, while a number of small bristles descend still lower; the facial ridges are ciliated on the lower third; depth of jowls about one-third of that of the eye; abdominal macrochætæ only marginal.

*Eurigaster tasmaniæ* (Trans. Ent. Soc. Lond. n. ser. iv. (1858) p. 197.—Tasmania) belongs to a new genus, near *Frontina*, Mg., "Section" *Phorocera*, Br. & von Berg.:—Eyes hairy; ocellar bristles wanting; face hairy; oral margin very prominent; abdominal macrochætæ marginal; claws in male short, as in *Frontina*. The type is a male, not a female as stated by Walker; the tip of the abdomen (last segment) is dull, not "shining" as stated in Walker's description.

*Tachina australis* (Ins. Saund.—Dipt. pt. iv. (1852) p. 279.—New South Wales) = *Blepharipoda* (*Tachina*) *zebina*, Walk.

*Tachina leocrates* (List Dipt. Ins. Brit. Mus. pt. iv. p. 475 (1849).—South Africa) is perhaps to be assigned to the genus *Brachelia*, Rob.-Desv. (Ess. sur les Myod. p. 61)—the type of which is *Tachina Westermanni*, Wied. (Auss. zw. Ins. ii. p. 291), from the Cape of Good Hope. On the genus *Brachelia*, cf. Brauer & von Bergenstamm, Denkschr. math.-naturw. Cl. k. Akad. Wiss., Bd. lx. 1893, p. 184.

*Tachina cassotis* (*ibid.* p. 761.—Sierra Leone).—Head of type wanting; the species apparently belongs to the genus *Rhynchomyia*, Rob.-Desv.

*Tachina verritus* (*ibid.* p. 774.—South Africa) belongs to the "Section" *Phorocera*, Br. & von Berg., and may, provisionally at any rate, be assigned to the genus *Doria* (*sensu* Rondani). The statement in Walker's Latin diagnosis as to the colour of the palpi, antennæ, and legs is misleading; in the typical specimen (a female) the palpi, so far as it is possible to see them, appear to be brown with yellowish tips; in a male in the Museum collection from Malvern, Natal, March 1897 (*G. A. K. Marshall*), and a second male from Leopoldville, Congo Free State, Dec. 13, 1903, "In bush" (*Drs. Dutton, Todd, & Christy*), the palpi are entirely yellow; in both sexes the antennæ and legs are black, the front femora greyish beneath. The arista is long and slender, with its second joint greatly elongated in the male; the third vein is bristly nearly to the small transverse vein, and the bend of the fourth vein has a "*Faltenzinke*."

*Tachina subaurata* (Ins. Saund.—Dipt. pt. iv. (1852) p. 298.—Cape of Good Hope) belongs to the genus *Ceromasia*, Rond.

*Tachina aychus* (List Dipt. Ins. Brit. Mus. pt. iv. p. 770 (1849).—Jamaica) is a *Frontina*, Mg.

*Tachina basifulva* (*ibid.* p. 725.—Jamaica) is correctly referred by Aldrich (Cat. N. Amer. Diptera, p. 485 (1905)) to the genus *Archytas*, Jaenn.

*Tachina infirma* (*ibid.* p. 719.—Chile) is an *Archytas*, Jaenn.

*Tachina pilosa* (Ins. Saund.—Dipt. pt. iv. (1852) p. 266 ("Musca pilosa? Drury").—S. America) = *Archytas hystrix*, Fabr.

*Tachina latifrons* (*ibid.* p. 284.—S. America), correctly

referred by Walker himself (*loc. cit.*) to the genus *Blepharipeza*, is, as stated by Aldrich (*op. cit.* p. 472), a synonym of *B. leucophrys*, Wied.

*Tachina contermina* (*ibid.* p. 285.—S. America) is a *Belvosia*, and perhaps = *Belvosia (Tachina) atrata*, Walk.

*Tachina divisa* (*ibid.* p. 270.—Pará) = *Archytas analis*, Fabr.

*Tachina apicalis* (*ibid.* p. 245.—California:—not "Columbia," as stated by Walker) = *Peleteria robusta*, Wied.

*Trixa? sejuncta* (Trans. Ent. Soc. Lond. iv. (1858) p. 200.—Cape of Good Hope) belongs to the genus *Dexiosoma*, Rond. *Microphthalma capensis*, Schin. (Reise Novara.—Diptera, p. 322), is a synonym of this species.

*Echinomyia albiceps* (Trans. Ent. Soc. Lond. n. ser. v. (1860) p. 295.—Brazil) is an *Archytas*, near *A. (Tachina) basifulva*, Walk.

*Echinomyia ludens* (*ibid.*—Brazil) is devoid of palpi. The species would be a *Saundersia* but for the fact of the presence of a strong bristle on the face on each side, just above the level of the bottom of the eye. The same character is exhibited by *Saundersia truncaticornis*, v. d. Wulp, from Panama, and a new genus in the near vicinity of *Saundersia* will probably be needed for these two species. In Walker's species the front tarsi are not expanded in the female, although they are in *S. truncaticornis*.

*Tachina similis* (Ins. Saund.—Dipt. pt. iv. (1852) p. 266.—New South Wales) apparently belongs to the genus *Chaetophthalmus*, Br. & von Berg. (Denkschr. math.-naturw. Cl. k. Akad. Wiss., Bd. lviii. (1891) p. 383).—"Section" *Micropalpus*, Br. & von Berg. So far as can be seen from the type, which is in very poor condition, the palpi are entirely wanting.

*Tachina basalis* (*ibid.* p. 281.—Locality unknown) is an *Aporia*, Macq., near *A. (Macquartia) venusta*, v. d. Wulp.

*Tachina vulgata* (*ibid.* p. 300.—S. America). The head of the type is wanting, and since this species, like the majority of those described by Walker, is based upon a single specimen, it is impossible to be certain as to the genus. From Walker's description of the head, however, the species would appear to belong to the genus *Phorocera*, Rob.-Desv.

*Masicera longiuscula* (Trans. Ent. Soc. Lond. iv. (1858) p. 198.—S. America).—"Section" *Phorocera*, Br. & von Berg.: genus uncertain.

*Tachina chrysolteus* (Ins. Saund.—Dipt. iv. (1852) p. 296.—Brazil = *Tachina tineta*, Walk. (*ibid.* p. 287). The species is a *Phorocera* with the abdominal macrochaetae confined to the margins of the segments. The Museum collection contains a female of this species from Santa Catharina, Brazil (*Crowley Bequest*).

*Tachina compacta* (*ibid.* p. 294.—Brazil) is a *Blepharipoda*, Br. & von Berg.: *Masicera alacris*, Walk. (Trans. Ent. Soc. Lond. new ser. vol. v. (1861) p. 304) is a synonym of this species.

*Tachina scita* (Ins. Saund.—Dipt. iv. (1852) p. 302.—Brazil).—The type is a female, not a male as stated by Walker. The face is slightly hairy; the lower anterior angle of the third joint of the antenna is somewhat prominent; the facial ridges are ciliated on rather less than the lower half; the abdomen has only marginal macrochaetae, and the second and third segments are serrate below.—Genus uncertain: "Section" *Pseudodexia*, Br. & von Berg., near *Dexodes*, Br. & von Berg., and *Gymnostylia*, Br. & von Berg. (*nec* Macq.); *sensu* Aldrich (Cat. N. Amer. Dipt.) the species is probably a *Masicera*.

*Tachina sordida* (*ibid.* p. 297.—S. America).—Genus uncertain: "Section" *Pseudodexia*, Br. & von Berg.?—The type is a male, not a female as stated by Walker; the palpi are orange, not "black." The vibrissae are well above the oral margin, and the jowls descend considerably behind; the abdominal macrochaetae are confined to the margins of the segments.

*Tachina umbrifera* (*ibid.* p. 294.—Brazil).—Genus uncertain, possibly new; near *Ptilodegeeria*, Br. & von Berg. ("Section" *Pseudodexia*, Br. & von Berg.). Eyes bare; jowls somewhat descending behind; abdominal macrochaetae only marginal.

*Tachina cincta* (*ibid.* p. 303.—Brazil).—The type (a male, not a female as stated by Walker) is in poor condition, since the abdomen has been damaged. The species belongs to the "Section" *Pseudodexia*, Br. & von Berg.; genus uncertain, perhaps new; near *Degeeria*, Mg., but the facial ridges are bare, and the arista is pubescent.

*Tachina squamata* (*ibid.* p. 279.—Colombia) apparently belongs to the genus *Lepidodexia*, Br. & von Berg. (Denkschr. math.-naturw. Cl. k. Akad. Wiss., Bd. lviii. (1891) p. 379); however, in the type, at any rate, the bristles on the third vein do not extend quite so far as halfway between the

base and the small transverse vein. Walker's "alulae," in the description of this and other species, are in reality the squamæ.

*Tachina tincta* (*ibid.* p. 287.—Brazil) is a *Phorocera*.—*Vide supra*, under *T. chrysotelus*.

*Tachina atratula* (*ibid.* p. 305.—Brazil) is a *Phorocera*.

*Tachina ruficornis* (*ibid.* p. 304.—S. America) is a *Chryso-tachina*, Br. & von Berg. The Museum collection contains two specimens of this species from Atoyac and Teapa, Mexico (presented by Messrs. Goldman & Salvin), which were assigned by van der Wulp (Biol. Centr. Amer., Dipt., Suppl. p. 480) to *Gymnochaeta alcedo*, Lw.

*Sarcophaga parva* (*ibid.* p. 321.—Pará, Brazil) is not a *Sarcophaga*. The species should perhaps be assigned to the "Section" *Paramacronychia*, Br. & von Berg., but the type and solitary representative is in such poor condition that it is impossible to be certain as to the genus. The face is narrow and somewhat receding, otherwise the species might perhaps be regarded as allied to the genus *Sphixapata*, Rond.

*Tachina candens* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 720.—Nova Scotia) is an *Archytas*. Walker's name is given by Aldrich (Cat. N. Amer. Diptera, p. 486) as a synonym of *Archytas (Jurinia) lateralis*, Macq., but at any rate the type is not conspecific with specimens in the Museum collection determined as belonging to the latter species by Prof. Tyler Townsend; the pile on the face in Walker's type is golden yellow instead of black, the second, third, and fourth joints of the front tarsi are much more expanded, and the pollinose covering of the thorax and scutellum is denser and deeper yellow. It may be noted, however, that according to Macquart the pile on the face of *A. lateralis* is white ("Face d'un jaune pale, à duvet blanc"), so that Townsend's identification is probably incorrect.

*Tachina speculifera* (*ibid.* p. 731.—N. America), of which the type is a female, is a *Micropalpus*, Macq. (*Liunemyia*, Rob.-Desv.), near *M. pictus*, Mg. In neither of these species are the palpi reduced to mere stumps.

*Tachina degenera* (*ibid.* p. 732.—Hudson's Bay) is an *Ernestia*, Rob.-Desv. Contrary to Walker's statement, the eyes are hairy.

*Tachina melobosis* (*ibid.* p. 743.—Florida) is a *Phorocera*,

Rob.-Desv.: syn. *Tachina addita*, Walk. (Ins. Saund.—Dipt. iv. (1852) p. 290), as correctly stated by Coquillett & Aldrich.

*Tachina dydas* (*ibid.* p. 748.—Hudson's Bay) = *Eutachina rustica*, Mg.

*Tachina masurius* (*ibid.* p. 753.—N. America) is an *Acemyia*, Rob.-Desv., apparently distinct from *A. dentata*, Coq., and *A. tibialis*, Coq.

*Tachina clesides* (*ibid.* p. 757.—N. America) is a *Phorichæta*, Rond. *P. tricineta*, Rond. (Dipt. Ital. Prodr. iv. (1861) p. 103), described from Italy, is apparently a synonym of this species.

*Tachina hybreas* (*ibid.* p. 785.—Hudson's Bay).—The head of the type is missing: discal as well as marginal macrochaetae are present on the abdomen, and the species may perhaps be referred provisionally to *Ceromasia*,—sensu Br. & von Berg.

*Tachina epicycles* (*ibid.* p. 786.—Hudson's Bay).—Genus *Exorista*: Walker's name is given by Aldrich (*op. cit.* p. 455) as a synonym of *Exorista* (*Tachina*) *ajjinis*, Fln., but the shape of the third joint of the antenna in Walker's type does not agree with Fallen's description.

*Jurinia innovata* (Trans. Ent. Soc. Lond. new ser. vol. v. (1861) p. 296.—Mexico) is doubtfully referred by Aldrich (*op. cit.* p. 486. to *Archytas*, but does not belong to that genus, in spite of the fact that the proboscis is slender and polished, with small labella. The species must apparently be assigned to the "Section" *Erigone*, Br. & von Berg., in which a new genus will probably have to be founded for it near *Ernestia*, Rob.-Desv. (*Erigone*, *olim*). The head is proportionately somewhat small; eyes bare; face hairy; second joint of antennæ somewhat elongate; palpi small and slender, orange, not black as stated by Walker; third vein bristly for rather more than half the distance from the base to the small transverse vein.

*Tachina atra* (Ins. Saund.—Dipt. iv. (1852) p. 273.—Georgia) is correctly given by Aldrich (*op. cit.* p. 485) as a synonym of *Archytas aterrima*, Rob.-Desv.

*Masicera expergita* (Trans. Ent. Soc. Lond. new ser. vol. v. (1861) p. 304.—Mexico) is a *Degeeria*, Mg. (*Medna* of Aldrich's Catalogue), of which *Degeeria longipes*, v. d. Wulp, from comparison of the types, is a synonym. *Apud* v. d. Wulp (Biol. Centr.-Amer., Dipt., Suppl. p. 485) *D. longipes* is a synonym of *D.* (*Ophsa*) *nigrifacies*, Big.

(Ann. Soc. Ent. Fr. 1888, p. 268).—The facial ridges in Walker's type are not bare, as stated by Walker, but are somewhat sparsely ciliated up to the middle.

*Masicera gentica* (*ibid.* p. 302.—Mexico) apparently belongs to *Ceromasia*,—*sensu* Br. & von Berg. The type is now a mere fragment.

*Tachina ancilla* (Ins. Saund.—Dipt. iv. (1852) p. 299.—United States) is correctly assigned by Coquillett (Rev. Tachinidæ, p. 106) to the genus *Frontina*, Mg.

*Eurigaster saginata* (Traus. Ent. Soc. Lond. n. ser. v. (1861) p. 298.—Mexico) does not belong to *Exorista*, to which it is referred by Aldrich (*op. cit.* p. 459). The head of the type is missing, and the genus must therefore remain uncertain, but the species must apparently be assigned to the "Section" *Plagia*, Br. & von Berg.—Costal spine wanting; third vein bristly as far as the small transverse vein; posterior transverse vein much more oblique than the apical portion of the fourth vein, which is very abruptly bent up; bend of fourth vein with a very small appendix; abdominal macrochætæ marginal.

*Tachina ampelus* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 732.—Nova Scotia) is an *Ernestia* (*Panzeria* of Coquillett & Aldrich), but is not synonymous with *radicum*, Fabr., as erroneously stated by the American writers.—It would appear from the fact that specimens of another species in the Museum collection, from Vernon, British Columbia, April to May, 1902 (*Miss Ricardo*), were determined by Coquillett as "*Panzeria radicum*, Fabr.," but have in reality nothing to do with that species, that the interpretation of *Musca radicum*, Fabr., by American authors is incorrect. *Miss Ricardo's* species is one of two species of *Ernestia* obtained by her at the same locality, and both remarkable for the smallness of the eyes. The species wrongly identified by Coquillett has the abdomen unicolorous shining bronze-black, while in the other the second, third, and fourth segments have a pollinose band in front.

*Tachina alcis* (*ibid.* p. 710.—Locality unknown) = *Hystricia* (*Tachina*) *signata*, Walk. (*op. cit.* p. 709), from New Zealand.

*Tachina metallifera* (*ibid.* p. 717.—Locality unknown) is an *Archytas*.

*Tachina damippus* (*ibid.* p. 719.—Locality according to the "List" unknown, but from a label on the specimen—Mexico) = *Archytas analis*, Fabr.

*Tachina carbonifera* (*ibid.* p. 721.—Locality unknown) is an *Archytus*, and apparently = *A. (Tachina) metallifera*, Walk.

*Tachina fimbriata* (*ibid.* p. 724.—Locality unknown) is a true *Tachina*, Mg. (*sensu* Meigen and Br. & von Berg.). The species is very likely from India, since it is closely allied to *Tachina nitida*, Walk.

*Tachina pagasus* (*ibid.* p. 750. — Locality unknown) = *Eutachina rustica*, Mg.

*Tachina thymis* (*ibid.* p. 756.—Locality unknown).—The specimen in the Museum collection which figured as the type of this species did not agree with Walker's description; the name must therefore be cancelled as unrecognizable.

*Tachina thymis* (*ibid.* p. 771. — Locality unknown) = *Pelatachina tibialis*, Fln.

*Tachina enarette* (*ibid.* p. 758.—Locality unknown).—The type is a mere fragment and the species consequently unrecognizable.

*Tachina nysas* (*ibid.* p. 758.—Locality unknown) is a *Rhynchomyia*, Rob.-Desv.

*Tachina petalus* (*ibid.* p. 759.—Locality unknown) is also a *Rhynchomyia*.

*Tachina segonax* (*ibid.* p. 762.—Locality unknown).—Genus uncertain: near *Xysta*, Mg.

*Tachina sosicles* (*ibid.* p. 772.—Locality unknown) is apparently a *Frontina*. The type is in very poor condition. Walker's statement "sides of the face without bristles" is precisely the opposite of the fact.

*Tachina onchestus* (*ibid.* p. 773.—Locality unknown) belongs to the genus *Bothria*, Rond. (*sensu* Br. & von Berg.).

*Tachina nepia* (*ibid.* p. 774. — Locality unknown) = *Baumhaueria goniasformis*, Mg.

*Tachina ipsea* (*ibid.* p. 776.—Locality unknown).—Genus uncertain; resembles *Metopia* in venation, except that the posterior transverse vein is much more oblique; front not prominent; sides of face but little receding, fringed nearly to level of base of third joint of antennæ with stout sparsely-set bristles; jowls narrow. This species has been placed near *Metopia* in the Museum collection.

*Tachina opiter* (*ibid.* p. 776.—France) belongs to the genus *Sisyropa*, Br. & von Berg., and perhaps = *S. (Tachina) excisa*, Fln.

*Tachina calliphon* (*ibid.* p. 777.—Locality according to

the "List" unknown; the type, however, bears a small label with the word *Picton* on it, and so is presumably from either New South Wales or Canada).—Apparently an *Exorista*; the type, which is accompanied by its puparium, is in very poor condition.

*Tachina scotinus* (*ibid.* p. 742.—Locality unknown) is apparently a *Pseudopachystylum*, Wlk. (Wien. ent. Z. x. (1891) p. 208).—The arista, however, is not geniculate, although its second joint is elongate; the face, except next the eyes, is very bristly to the level of the bottom of the eyes, but its sides are not "fringed with bristles" as stated by Walker.

*Tachina broteas* (*ibid.* p. 763.—England) is a *Thryptocera*, probably *T. pilipennis*, Flin.

*Tachina rhæo* (*ibid.* p. 778.—Locality unknown) is a *Masicera*.

*Tachina cymelus* (*ibid.* p. 790.—Locality unknown) is a *Blepharipoda*, Br. & von Berg.

*Phorocera expellens* (Journ. Proc. Linn. Soc. v. (1860) p. 155.—Amboyna) is an *Exorista*.

*Nemoræa tenebrosa* (*ibid.* iv. (1860) p. 123.—Macassar, Celebes) belongs to the "Section" *Blepharipoda*, Br. & von Berg., and is apparently allied to the genus *Otenophorocera*, Br. & von Berg. (Denkschr. math.-naturw. Cl. k. Akad. Wiss., Bd. lviii. (1891) p. 342), so far as can be judged from the description of the latter. In the type (a male, not a female as stated by Walker), and in another male from Macassar (*Wallace*), the first and second abdominal segments are totally devoid of macrochætæ in the middle line; a female from the same locality, however, has a pair of marginal macrochætæ on the second segment. The hind *tibiæ*, not the hind femora as stated by Walker, are strongly ciliated. The second joint of the antennæ is somewhat elongated, and the ciliation of the facial ridges, consisting of *fine* bristles, extends to the level of the base of the third joint.

*Nemoræa postulans* (*ibid.* v. (1861) p. 240.—Dorey, New Guinea) is an *Exorista*. The abdomen is narrow, and the wings are narrow and elongate.

*Masicera vicaria* (*ibid.* i. (1857) p. 20.—Singapore) is a *Sisyropa*, Br. & von Berg.

*Masicera guttata* (*ibid.* iii. (1859) p. 99.—Aru Is.).—Genus uncertain, "Section" *Phorocera*, Br. & von Berg. Contrary

to Walker's statement, the facial ridges are ciliated to rather above the middle; eyes bare; arista minutely pubescent to just beyond the middle; abdominal macrochætæ discal and marginal; first posterior cell opening close to tip of wing.—An examination of the type of *M. guttata* shows that the "row of white dots along each side on the fore borders of the segments" of the abdomen are really transverse silvery bands, which are interrupted and become more or less obsolete in the median dorsal region: the depth of the band on the fourth segment is twice that of the bands on the second and third segments.

*Masicera horrens* (*ibid.* iv. (1860) p. 124.—Macassar, Celebes) may be referred, at least provisionally, to the genus *Tricholyga*, Rond. The second joint of the antennæ is not noticeably elongated, but the bend of the fourth vein has a long "*Faltenzinke*." This species presents a strong superficial resemblance to *Masicera morio*, Dol., but may be distinguished at once by its hairy eyes.

*Masicera sarcophagata* (*ibid.* vii. (1864) p. 235.—Ceram) may provisionally be referred to *Eutachina*, Br. & von Berg., but a new genus near *Eutachina* will perhaps have to be founded for its reception, since the second joint of the arista is not elongated, while the third joint is long and tapering and not noticeably incrassated towards the base; the oral margin, too, is not at all prominent.

*Masicera dotata* (*ibid.* iv. (1860) p. 123.—Macassar, Celebes) belongs to the "Section" *Pseudodexia* and "Sub-Section" *Thelairia*, Br. & von Berg., where a new genus allied to *Thelairia* will doubtless have to be founded for its reception.—Walker's statements are misleading in some respects. The eyes are hairy, the arista pubescent; facial ridges ciliated with stout bristles on the lower third; one or two stout bristles on the jowls beneath the eyes; orbital setæ stout in the ♀ (♂ as yet unknown); abdominal macrochætæ discal and marginal; third vein bristly almost to small transverse vein, other veins bare; bend of fourth vein abrupt, deeply incurved, with an appendix.

*Masicera immersa* (*ibid.* p. 124.—Macassar, Celebes) is a *Blepharipoda*, Br. & von Berg., and = *B. (Tachina) ophirica*, Walk.

*Masicera mysolana* (*ibid.* vii. (1864) p. 213.—Mysol, E. Indian Archipelago) is the ♀ of *Exorista (Nemoræa) postulans*, Walk.

*Masicera manifesta* (*ibid.* v. (1870) p. 154.—Amboyna) is an *Exorista*.

*Phorocera convertens* (*ibid.* v. (1861) p. 240.—Dorey, New Guinea) is apparently the ♀ of *Masicera notabilis*, Walk. (*ibid.* iii. p. 97), described from the Aru Is. This species may be left provisionally in the genus *Masicera*, although from its general *facies*, and especially its elongate shape, it can scarcely be congeneric with *Masicera sylvatica*, Fln., the type of the genus.

*Masicera prominens* (*ibid.* v. (1860) p. 155.—Amboyna) may be allowed to remain, at least for the present, in the genus *Masicera*.

*Masicera* (?) *tentata* (*ibid.* iii. (1859) p. 98.—Aru Is.) apparently belongs to a new genus of the "Section" *Pseudodecia*, "Sub-Section" *Thelaira*, Br. & von Berg., allied to *Thelaira*, Rob.-Desv. The arista is pubescent on its basal half; the third vein has a few bristles at the base, the other veins are bare.

*Masicera solemnis* (*ibid.* p. 98.—Aru Is.) is a *Blepharipoda*, Br. & von Berg., closely allied to and perhaps identical with *B. (Tachina) ophirica*, Walk.

*Masicera simplex* (*ibid.* p. 99.—Aru Is.) may be allowed to remain for the present in the genus *Masicera*.

*Masicera*? *ficta* (*ibid.* v. (1861) p. 286.—Batchian, Molucca Is.): head of type now missing; true genus uncertain.

*Eurygaster conglomerata* (*ibid.* iv. (1860) p. 126.—Macassar, Celebes) is a *Sisyropa*, Br. & von Berg.

*Eurygaster prominens* (*ibid.* p. 127.—Macassar, Celebes) is a *Sisyropa*, Br. & von Berg. The palpi are yellow, not black as stated by Walker.

*Eurygaster interdicta* (*ibid.* vii. (1864) p. 213.—Mysol).—The type is in poor condition. Genus uncertain; perhaps new, and belonging to the "Section" *Erigone*, Br. & von Berg. The oral margin descends considerably below the vibrissæ; above the few small bristles next to the vibrissæ the facial ridges are ciliated with fine hairs nearly to the level of the arista; eyes hairy, not bare as stated by Walker; palpi short and slender; antennæ short; abdominal macrochaetæ discal and marginal; no appendix to bend of fourth vein.

*Eurygaster apta* (*ibid.* iv. (1860) p. 126.—Macassar, *Ann. & Mag. N. Hist. Ser. 7. Vol. xix.* 24

Celebes) is a *Blepharipoda*, Br. & von Berg.: the palpi are yellow, not black as stated by Walker.

*Eurygaster jingens* (*ibid.* viii. (1865) p. 132.—Salwatty I. New Guinea) is a *Phorocera*. The eyes are hairy, not bare as stated by Walker; the first portion of the third longitudinal vein, to a point midway between the base and the small transverse vein, is bristly.

*Eurygaster contracta* (*ibid.* iv. (1860) p. 128.—Macassar, Celebes).—Genus uncertain; near *Blepharipoda*, Br. & von Berg., but hind tibiæ not uniformly ciliated; eyes large, jowls very narrow, linear; tips of palpi yellow; four post-sutural dorso-central bristles; abdominal macrochætæ marginal.

*Eurygaster progressa* (*ibid.*—Macassar, Celebes).—Genus uncertain, probably new; near *Hamaxia*, Walk., and *Leskia*, Rob.-Desv. ("Section" *Pyrrhosia*, Br. & von Berg.).—Eyes pubescent, not bare as stated by Walker; arista minutely pubescent; oral margin only slightly prominent; jowls bearing a pair of bristles on their central portion and descending somewhat posteriorly; number of post-sutural dorso-central bristles uncertain, owing to condition of type; abdominal macrochætæ marginal, in pairs; a pair of admedian bristles and a lateral pair on each side on each segment.

*Sarcophaga ingens* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 816.—Locality unknown).—A series of specimens in the Museum collection from Trinidad, B.W.I. (*J. H. Hart*: taken in a flower of *Aristolochia gigas*) and a male from Union I., Grenadines, B.W.I. (*H. H. Smith*), apparently belong to this species.

*Sarcophaga edax* (*ibid.* p. 832.—"France?") = *Myiostoma* (*Estheria*) *cristatum*, Mg.

*Sarcophaga inoa* (*ibid.* p. 832.—Galapagos Is.) is not a *Sarcophaga*, but belongs to the "Section" *Paramacronychia*, Br. & von Berg.,—genus uncertain, perhaps new, near *Arrenopus*, Br. & von Berg. Frontal bristles small; face sparsely clothed with minute hairs; epistoma prominent; eyes bare; two post-sutural dorso-central bristles; abdominal macrochætæ confined to a row on the hind margins of the fourth and fifth segments.

*Sarcophaga?* *punctipennis* (Trans. Ent. Soc. Lond. iv. (1858) p. 208.—Colombia) is not a *Sarcophaga*, but apparently belongs to a new genus allied to *Phorichæta*, Rond. ("Section" *Thryptocera*, Br. & von Berg.). The type is very

mouldy, so that it is not easy to make out its characters; the face, however, on each side has a row of stout bristles descending from the front. The apical portion of the fourth vein and the posterior transverse vein are abruptly bent in and out in an unusual manner; the basal portion of the third vein is bristly almost as far as the small transverse vein; abdominal macrochaetæ discal and marginal.

*Sarcophaga chrysoletus* (Ins. Saund.—Dipt. iv. (1852) p. 329.—S. America) is an *Exorista*.

*Dexia aurinia* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 847.—Locality unknown) = *Dexia vacua*, Fln., ♀.

*Dexia posio* (*ibid.* p. 844.—Cape of Good Hope) is a *Microphthalma*, Macq., with the first posterior cell closed well before the margin of the wing, and long-stalked: owing to this peculiarity in the venation it may eventually be advisable to found a new genus for this species.

*Dexia australis* (Ins. Saund.—Dipt. pt. iv. (1852) p. 314.—Australia) is a *Thelaira*.

*Dexia notata* (*ibid.* p. 309.—New South Wales) is a *Myiostoma*, Rob.-Desv.

*Dexia randa* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 852.—Brazil) belongs to the genus *Mesembrinella*, Giglio-Tos.

*Dexia obscura* (Ins. Saund.—Diptera, pt. iv. (1852) p. 307.—Brazil).—Genus uncertain, probably new ("Section" *Dexia*, Br. & von Berg.).—Arista feathered with long hairs; septum between antennæ and grooves for latter well-marked; proboscis slender, polished, and somewhat elongate; abdominal macrochaetæ marginal on second segment, discal and marginal on third; terminal portion of fourth vein bent up sharply, then incurved; bend with a small appendix.—In spite of the greater development of the facial septum and of the antennary grooves, this species is probably congeneric with *Rhamphinina picta*, Bigot (Ann. Soc. Ent. Fr. sér. 6, t. viii. (1888) p. 265), from Cuba, the type of which, through the generosity of Mr. G. H. Verrall, is now in the British Museum. According to Brauer (SB. k. Akad. Wiss., math.-naturw. Cl., Bd. cvi. (1897) p. 359. 105) *Rh. picta*, Big., with *Dexia potens*, Wied., belongs to *Stomatodexia* according to the head, and to *Leptoda* according to the bend of the fourth vein. The proboscis, however, is very different from that of *Stomatodexia*.

*Dexia muscaria* (*ibid.* p. 308.—Brazil) is congeneric with the foregoing, though discal and median marginal macrochaetæ are absent from the second abdominal segment, and discal macrochaetæ from the third segment.

*Dexia angusta* (*ibid.* p. 314.—Brazil) is a *Stomatodexia*, Br. & von Berg., near, or perhaps identical with, *S.* (*Dexia*) *diadema*, Wied.

*Dexia plana* (*ibid.* p. 315.—Brazil) is a *Stomatodexia*, near *S. diadema*, Wied.

*Dexia suffusa* (*ibid.* p. 317.—Locality unknown) apparently belongs to a new genus of the "Section" *Pseudodexia*, "Sub-Section" *Thelaira*, Br. & von Berg., near *Xanthodexia*, v. d. Wulp. This species presents a deceptive resemblance to *Xanthodexia sericea*, Wied., from which, however, it can at once be distinguished by the frontal stripe being wide and by the presence of marginal macrochætæ on all the abdominal segments. Orbital setæ in female stout and conspicuous; face and jowls narrow; antennæ rather below level of middle of eyes; bend of fourth vein rounded.

*Dexia? albicans* (Trans. Ent. Soc. Lond. iv. (1858) p. 204.—R. Amazons, Brazil) belongs to the "Section" *Sarcophaga*, Br. & von Berg., and apparently to a new genus.—Very narrow and somewhat resembling a *Scatophaga* in shape and general appearance; head in profile square, with rather prominent front; eyes semicircular in outline; face bare; arista feathered on rather more than basal half; abdomen, femora, and front and middle tibiæ clothed with short woolly hair; hind tibiæ in male shortly ciliated on inner side; first joint of front tarsi somewhat excavated on underside; abdomen totally devoid of macrochætæ except on hind margin of fourth segment; third vein bristly for three-fourths of the distance from the base to the small transverse vein; remaining veins bare.

*Dexia insolita* (Ins. Saund.—Dipt. iv. (1852) p. 318.—Brazil) may, provisionally at any rate, be referred to *Hystri-chodexia*, von Rüder: there is a row of stout macrochætæ on the hind margins of the second and third abdominal segments, but on the disc of the latter segment macrochætæ appear to be wanting.

*Tachina similis* (*ibid.* p. 269.—S. America) is a *Peleteria*, near *P. robusta*, Wied.

*Dexia harpasa* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 840.—N. America) = *Ptilodexia tibialis*, Rob.-Desv.

*Dexia cerata* (*ibid.* p. 847.—N. America) is a *Rhynchodexia*, v. d. Wulp (Bigot, *pro parte*).

*Dexia pristis* (*ibid.* p. 841.—Massachusetts) belongs to the genus *Aporia*, Macq. The type is in very poor condition.

*Devia cremides* (*ibid.* p. 842.—N. America) must be cancelled as unrecognizable. The specimen that the writer found in the Museum collection doing duty as the type does not agree with the description, and is a female of *Dinera griseascens*, Fln., a species apparently not included in Aldrich's 'Catalogue of North American Diptera,' where (p. 500) *Devia cremides*, Walk., is placed under *Myiocera*.

*Devia ogoa* (*ibid.* p. 841.—Nova Scotia) must also be cancelled as unrecognizable, since the type is not now to be found in the Museum collection, and Walker states that when he described it the head was missing.

*Devia dirphia* (*ibid.* p. 836.—Locality unknown) is a *Myiocera*, Rob.-Desv.

*Devia prexaspes* (*ibid.* p. 837.—Georgia, U.S.A.) is a *Ptilodexia*, Br. & von Berg., to which genus *Estheria abdominalis*, Rob.-Desv., from Nova Scotia (assigned by Aldrich, Cat. N. Amer. Dipt. p. 501, to *Devia*), also belongs.

*Devia abzoe* (*ibid.* p. 846.—Georgia, U.S.A.).—Type not now to be found in the Museum collection; name should consequently be cancelled.

*Tachina corythus* (*ibid.* p. 797.—Georgia, U.S.A.).—So far as it is possible to determine from a comparison of Walker's type and the descriptions, Coquillett (Rev. Tachinidæ, p. 73) is apparently correct in quoting *T. corythus*, Walk., as a synonym of *Xanthomelana* (*Phasia*) *atripennis*, Say.

*Tachina alops* (*ibid.* p. 796.—Georgia, U.S.A.).—Correctly referred by Coquillett (*op. cit.* p. 73) to the genus *Beskia*, Br. & von Berg.

*Devia hypsa* (*ibid.* p. 866.—Locality unknown) is a *Pycnosoma*, Br. & von Berg.

*Musca liris* (*ibid.* p. 882.—Locality unknown) is the female of *Rutilia minor*, Macq. (Australia and Tasmania), which apparently should be referred to a new genus near *Rutilia*.

*Devia albifrons* (Ins. Saund.—Dipt. iv. (1852) p. 317.—United States) is a *Rhynchodexia*, v. d. Wulp (Bigot, *pro parte*).

*Devia canescens* (*ibid.* p. 310.—United States) is a *Ptilodexia*, near and perhaps only a dark form of *P. tibialis*, Rob.-Desv.

*Devia pedestris* (*ibid.* p. 313.—United States) has nothing to do with *Devia*. It is synonymous with *Tachina menapis*, Walk. (List Dipt. Ins. Brit. Mus. iv. (1849) p. 769), the

type of which was stated to be from Upsala, Sweden. The present writer is unable to assign this species to its proper genus, but it perhaps belongs to the "Section" *Masicera*, Br. & von Berg. The front is prominent and the face hairy; depth of jowls rather greater than half the height of the eye; first posterior cell opens at or close to tip of wing.

*Gymnostylia invita* (Journ. Proc. Linn. Soc. v. (1861) p. 243.—Dorey, New Guinea) = *Devia alulifera*, Walk. (*ibid.* p. 157; described from Amboyna).—Genus uncertain, probably new ("Section" *Pseudodevia*, "Sub-Section" *Thelaira*, Br. & von Berg.).

*Gymnostylia luteicornis* (*ibid.* vi. (1862) p. 10.—Gilolo, E. Indian Archipelago) belongs to an apparently new genus near *Thelaira*, Rob.-Desv.—Eyes large, occupying whole depth of head, so that jowls are reduced to a mere line; antennæ below level of middle of eyes; abdominal macrochaetæ discal and marginal; first and third veins bristly.

*Trichoprosopa? marginalis* (*ibid.* v. (1860) p. 157.—Amboyna).—A new genus will have to be founded for this species close to *Ocyptera*, Latr., from which it is distinguished by the dorso-central bristles being greatly reduced, as well as by the depth of the head, narrowness of the face, and length of the third joint of the antennæ.

*Trichoprosopa? divisa* (*ibid.* vii. (1864) p. 213.—Mysol) appears to be a *Plesiocyptera*, Br. & von Berg., although differing from *P.* (*Ocyptera*) *bicolor*, Wied. (the type of the genus), in the face being narrow and the proboscis not slender. In the typical specimen, at any rate, the second and third abdominal segments are devoid of admedian marginal macrochaetæ.

*Tachina titan* (List Dipt. Ins. Brit. Mus. iv. (1849) p. 735.—Sylhet) is a *Nemoræa*, Rond., near, but apparently distinct from, *N. tropidobothra*, Br. & von Berg. Van der Wulp (Cat. Descr. Dipt. S. Asia, p. 126) assigns this species to the genus *Micropalpus*, doubtless misled by Walker having headed the page on which the description appears "Group II. *Linnæmyia*, Desv. Essai Myod. 52."

*Musca aluta* (*ibid.* p. 911.—"Lapland?, France?").—The type is a female of *Myiospila meditabunda*, Fabr.

*Tachina zebina* (*ibid.* p. 772.—North Bengal) is a *Blepharipoda*, Br. & von Berg. (i. e. *Sturmia*, Rob.-Desv., *apud* Coquillett & Aldrich), and perhaps a synonym of *B.* (*Tachina*) *cilipes*, Macq. (Dipt. Exot. ii. 3 (1843), p. 62, tab. 6. fig. 6). The following Walkerian species are synonyms of *B. zebina*:—*Tachina fusiformis* (List Dipt. Ins. in Coll. Brit. Mus. iv.

(1849) p. 1161); *Eurygaster mutans* (Journ. Proc. Linn. Soc. v. (1861) p. 210); *Tachina australis* (Ins. Saund.—Dipt. iv. (1852) p. 279); and *Nemoræa amplificans* (Journ. Proc. Linn. Soc. iv. (1860) p. 122). The extensive series of specimens in the Museum collection shows that *B. zebina* is among the commonest of the larger Tachinidæ in India and Ceylon, and also occurs in Burma, Malacca, Java, the Sunda Is., Celebes, Dorey (New Guinea), Queensland, and New South Wales.

*Tachina grandis* (Ins. Saund.—Dipt. iv. (1852) p. 278, pl. vii. fig. 1.—India) belongs to the genus *Nemoræa*, Rob.-Desv., and may be the female of *N. tropidobothra*, Br. & v. Berg., as stated by van der Wulp (Tijdschr. v. Ent. xxxvi. p. 161, & Cat. Descr. Dipt. S. Asia, p. 129). But, since Walker's type does not altogether agree with the description by Brauer and von Bergenstamm, it seems advisable, for the present at any rate, to regard the two species as distinct.

XLI.—*Some new Species and Genera of Lamellicorn Coleoptera from the Indian Empire.* By GILBERT J. ARROW.

THIS paper contains descriptions of some of the most important Indian Lamellicornia which are yet unnamed in the British Museum collection, together with observations upon allied forms which have accrued in the course of its preparation.

PART I.

Cetoniidæ.

*Heterorrhina dispar*, sp. n.

Sat elongata, crebre punctata, processu sternali haud longo, sat acuto.

♂. Viridi-olivacea, abdomine pedibusque rufis, nitida; capite inermi, excavato, clypei margine antica valde reflexa et arcuata; pedibus sat gracilibus, tibiis anticis vix dentatis.

♀. Obscure castanea, opaca; clypeo valde excavato, antice nasuto, vertice cornu decumbente truncato armato; pedibus crassioribus, tibiis anticis latis, bidentatis.

Long. 20–22 mm.

*Hab.* N. India, Darjeeling.

The form is elongate, not much depressed, rather strongly and uniformly punctured above. Head rugosely punctured, with the clypeus rather broader than long and the front margin prominent in the middle. Prothorax coarsely and closely punctured, with the interstices extremely finely punctulated. Scutellum punctured except along the middle line.

Elytra rugosely punctured, some of the punctures forming double rows. Pygidium transversely rugose. Sternal process short, but rather sharp. Metasternum smooth in the middle and coarsely punctured at the sides. Abdomen finely punctured.

♂. Olive-green, shining, with the abdomen and legs reddish. Head unarmed behind. Clypeus somewhat excavated, with the front margin curved, reflexed, and slightly produced in the middle. Sides of the prothorax strongly angulated in the middle and nearly straight in front and behind.

♀. Purplish black, with abdomen and legs castaneous. Form more elongate, with the upper surface more opaque. Clypeus strongly excavated, with the front margin rather strongly produced upwards in the middle and the vertex armed with a horizontal process freely produced and truncated in front. Prothorax more convex and less contracted in front than in the male. Legs stouter, with the front tibiæ strongly bidentate and all the tarsi shorter and thicker than in the other sex.

In the peculiar differences of form and colouring between the two sexes this species shows relationship only to *H. mutabilis*, Hope, from which it is quite easily distinguished. It is larger and has less distinctly costate elytra, besides which the sternal process, although short, is much less so than in that species, and the clypeus is longer and quite differently shaped in both sexes.

A male and female have formed part of the British Museum collection for fifty years, but have not hitherto been distinguished from the allied species.

*Anomalocera subopaca*, sp. n.

Olivaceo-vel purpureo-viridis, antennis tarsisque nigris, elongata, paulo depressa; capite granulato, clypeo quadrato, antice paulo dilatato, marginibus fere rectis; prothorace crebre punctato, medio subtilissime, lateraliter grosse et rugose, lateribus vix arcuatis, medio leviter angulatis; scutello elongato, acuto; elytris parum profunde rugose punctatis, obsolete striatis, postice marginibus grosse rugulosis; pygidio dense rugoso, breviter setoso; processu sternali sat longo, parum curvato, metasterni lateribus dense punctatis, piliferis; abdomine fere lævi.

♂. Angustior, prothorace antice magis contracto, abdomine sulcato, clava antennali longissima; tibiis anticis muticis, posticis dense et longe fulvo-ciliatis.

Long. 22 mm.

*Hab.* N. India, Manipur.

Green, with pinkish reflections; elongate, parallel-sided,

rather flat above, and not highly glazed. Clypeus granulated, about as long as it is broad, slightly widening towards the front, with the anterior and lateral margins nearly straight. Prothorax very finely punctured upon the disk and very coarsely and rugosely at the sides, rather shorter than in *A. glaberrima* and *Mearesi*, and with the sides rather more distinctly angulated in the middle and the base strongly trisinate. Elytra finely and shallowly but rather closely strigosely punctured, some of the punctures forming rows anteriorly, with the apical and posterior lateral parts coarsely strigose, but scarcely setose, and the apical angles slightly produced. Pygidium densely rugose and clothed with short and not closely-set setæ. Sternal process moderately long, depressed, blunt, and not much curved. Metasternum smooth and deeply grooved at the middle and densely punctured and pubescent at the sides. Abdomen almost smooth.

The male is more elongate, with the prothorax more narrowed in front, the abdomen deeply channelled, the antennal club very long, and the hind tibiæ thickly fringed.

Half a dozen specimens were collected by Mr. Doherty. The species is closely related to *A. glaberrima* and *Mearesi*, but is rather more elongate and depressed, and the upper surface is much less glassy, being rather closely sculptured all over. The male has the prothorax less narrowed in front than in those two forms.

The genus *Anomalocera* was formed for *A. Mearesi*, Hope, alone, but that species is only peculiar in the rather greater length of the antennal club of the male than that of its allies, and a natural group is formed by associating with it the species which have been placed in *Heterorrhina* and *Rhomborrhina*, characterized by a tapering sternal process, the clypeus simple in both sexes, and the hind tibiæ straight. The genus *Heterorrhina* will then be confined to the forms in which the clypeus is armed in one (the female) or both sexes, and *Rhomborrhina* to those in which the sternal process is broadly transverse and the clypeus of the characteristic spatulate shape.

The species I include in *Anomalocera* as thus defined are *A. Mearesi*, Hope, *glaberrima*, Westw., *subopaca*, sp. n., *microcephala*, Westw., *Mellii*, G. & P., *heros*, G. & P., *resplendens*, Schönh., *rufitibis*, Bates, *unicolor*, Motsch., *Fortunei*, Saund., and *olivacea*, Jans. There still remains one isolated species, which, while it has the clypeus simple in both sexes and the sternal process long and slender, cannot be associated with this group. The antennal club is equally short in both sexes, the clypeus is nearly square in shape, the elytra are very strongly and regularly punctate-striate,

and in particular the hind tibiæ of the male are strongly bent and furnished with a thick brush of hairs. This is *Cetonia lata*, F., with which *Heterorrhina sylhetica*, Thoms., is synonymous. It was described by Thomson from North India and by Fabricius from Java, but it has a continuous range through Burma and the Malay Peninsula, and the differences mentioned by Thomson have no reality when a series of specimens is compared. For this form I propose the new genus *Euchloropus*.

The chief differential characters of the *Heterorrhina* group of genera may be tabulated as follows:—

Clypeus armed in one or both sexes .....	<i>Heterorrhina</i> .
Clypeus unarmed.	
Hind tibiæ of ♂ strongly curved .....	<i>Euchloropus</i> .
Hind tibiæ of ♂ straight.	
Sternal process elongate .....	<i>Anomalocera</i> .
Sternal process transverse.....	<i>Rhomborrhina</i> .

#### *Macronota gracilis*, sp. n.

Nigra, supra opaca, elytris obscure rufis, macula postscutellare ad humeros producta, fascia media transversa apicibusque nigris, scutelli apice, suturæ medio lineolisque duabus transversis post-humeralibus albis, sterni abdominisque lateribus plus minusve albis; sat parva, angustata, capite (tuberculo lævi postico excepto), prothorace pygidioque omnino granulosis, clypeo modice emarginato; prothorace fere circulari, postice leviter lobato et depresso, angulis vix perspicuis; singulo elytro fortiter unicastato, lateribus post humeros sat leviter sinuatis; pedibus gracilibus, tibiis anticis tridentatis, posterioribus omnibus sine dentibus.

Long. 15 mm.

*Hab.* Assam, Naga Hills.

Black, with the elytra dark red except for a black patch behind the scutellum produced to the shoulders, a transverse median fascia, and the apical margins, and decorated with white markings consisting of a spot behind the scutellum, another at the middle of the elytral suture, and two transverse marginal spots on each elytron. The sides of the sternum and the margins of the basal segments of the abdomen are also marked with white.

The form is very elongate, tapering behind, and the legs are slender. The head, pronotum, and pygidium are coarsely granulated. The head is flat, with a smooth tubercle on the vertex and moderately notched in front. The prothorax is almost circular in shape, with all the angles almost obsolete, and moderately depressed behind. The elytra have a silky sheen, and each has a strong costa and is feebly sinuated

behind the shoulder. The front tibiæ have three slight teeth and the four posterior tibiæ are without teeth or spines at the middle. The antennal club is of moderate length.

*Glycosia biplagiata*, sp. n.

Nigra, nitida, clytris opacis, plaga suturali nitida excepta, singulo post medium flavo-maculato; elongata, depressa, ad humeros lata, deinde angustata, capite parvo, crebre punctato, antice sat emarginato; prothorace convexo, grosse punctato, sat late marginato, lateribus medio angulatis; scutello sat parvo, impunctato; clytris striato-punctatis, lateribus post humeros valde sinuatis, apicibus sinuatis, angulis suturalibus acutis; pygidio parvo, fere levi; corpore subtus nitido, lateribus grosse punctatis: ♂ prothorace basi latiore, tibiis anticis minus distincte tridentatis.

Long. 20 mm.

*Hab.* Andaman Is.

Shining black, with the elytra opaque and sooty except at the inner margins, and with a lemon-yellow patch beyond the middle of each, broad at the outer margin and pointed at its inner extremity. The form is depressed, broad at the shoulders, with the head small and the elytra straight at the sides and strongly narrowing towards the extremity. The head is strongly punctured, with the clypeus long, narrowing towards the front, where it is rather deeply notched, and not at all reflexed at the margin. The prothorax is convex, coarsely punctured, with the sides strongly margined, and angulated in the middle. The scutellum is rather small, pointed, and impunctate. The elytra are coarsely striate-punctate, with the margins strongly sinuated behind the shoulders and minutely excised at the extremities, and the apical angles acute. The pygidium is feebly punctured and the metasternum and abdomen coarsely, except at the middle. The sternal process is compressed, truncated in front, and directed obliquely downwards. The front tibiæ are 3-dentate in the female, but the uppermost tooth is almost obsolete in the male. In the latter the prothorax is broader at the base and the apical angles of the elytra are strongly spinose.

The type specimen is a female found by Roepstorff in the Andamans. There is a male in the Calcutta Museum labelled "Rangoon," probably by mistake.

The only other known species of *Glycosia* are *G. tricolor*, Oliv., and *G. palliata*, Mohn.

*Protætia bidentipes*, sp. n.

Elongata, parallela, depressa, nigra vel purpureo-nigra, supra velutina, subtus nitida, maculis capitis 2, prothoracis 6-8, utriusque

elytri 9, pygidii 2, flavis; capite crebro punctato, antice profunde exciso; prothorace luce punctato, transverso, lateribus medio angulatis, postice fere parallelis; elytris punctato-striatis, apice paulo spinosis; pygidio crebre punctato, breviter flavo-setoso; tibiis anticis acute bidentatis.

Long. 18 mm.

*Hab.* Nicobar Is.

Sooty black or piceous black, with the head, legs, and underside shining, decorated with yellow spots distributed as follows:—a pair upon the vertex of the head, a pair at the middle and three at each lateral margin of the pronotum, the two posterior ones sometimes uniting; three placed in an oblique line upon the anterior half of each elytron, two adjoining the suture posteriorly, and four adjoining the lateral margin, and a large patch at each side of the pygidium. There are also patches upon the mesosternal epimera and the sides of the sternum and abdomen. The head is thickly punctured, with the clypeus long and deeply notched in front. The prothorax is very transverse, distinctly but not densely punctured all over, with the sides strongly angulated in the middle, and nearly parallel from there to the base, which is strongly emarginate before the scutellum. The scutellum is rather narrow. The elytra are parallel-sided, punctate-striate, with the sutural angles rather spinose. The mesosternal process is moderately prominent, nearly circular, and not much dilated at the end. The metasternum is rugose at the sides and the abdomen sparsely punctured. The front tibiæ are bidentate in both sexes. The pygidium is pubescent in two female specimens in the British Museum collection, but in a male in the Calcutta Museum labelled (no doubt wrongly) "Rangoon" the setæ are scarcely visible. The yellow markings in that specimen are also of a deeper colour.

*Clinteria truncata*, sp. n.

Nigra vel obscure cuprea, opaca, capite, pedibus corporeque subtus nitidis, prothoracis lateribus anguste flavo-marginatis, elytrorum maculis 2 vel 4 minutis post medium transverse positis, apicalique minuta, pygidii maculis duabus sat magnis; depressa, sat parallela, postice parum attenuata; capite elongato, dense sat regulariter punctato, antice valde exciso; prothorace subtiliter punctato, postice fortiter sat acute lobato; elytris grosse seriato-punctatis, costis duabus distinctis; processu sternali valido, conico, acuminato, abdomine medio glabro.

Long. 15-18 mm.

*Hab.* S. India, Nilgiri Hills.

Black or very dark coppery, velvety and opaque above,

with the head, legs, and underside shining, and with white or yellow markings, consisting of a narrow line on each side of the prothorax, frequently interrupted or absent, a spot upon the mesosternal epimeron, two small spots placed close together behind the middle of each elytron and frequently coalescing, a minute external apical spot, a large patch on each side of the pygidium, and a row of spots on each side of the sternum and abdomen.

The head is closely punctured, rather long, and deeply notched in front. The prothorax is finely punctured, attenuated in front, and strongly and rather sharply lobed behind. The elytra are rather parallel-sided and little narrowed towards the extremity; they are coarsely punctured in rows, with two well-marked costæ upon each. The sternal process is conical, rather long, and acuminate.

In the female there are three sharp equidistant teeth to the front tibia. In the male the uppermost tooth is distant from the other two and much shorter.

The pale markings are liable to reduction, and in one specimen in the British Museum have disappeared entirely.

I have seen a considerable number of specimens of this form, which is generally confused with *Clinteria guttifera*, Burm. (= *C. valida*, Lansb.). It differs by its straight and more parallel sides, the median spots of the elytra placed farther back and not obliquely, and the more sharply pointed sternal process.

I at first regarded this as possibly the *C. modesta*, Blanch., but the examination of a co-type kindly sent from the Paris Museum by M. Lesne shows the latter to be a variety of *C. Klugi*, Hope (= *C. flavopicta*, Bl.), with the pale markings very much reduced.

*Anthracophora bufo*, sp. n.

Ovata, sat depressa, piceo-nigra, velutina, supra et subtus fulvo-variegata, prothoracis, metasterni abdominisque medio costisque duabus elytrorum basi glabris, immaculatis; capite grosse punctato, prothoracis lateribus grossissime et crebre, medio levius sed fortiter punctatis, marginibus valde sinuatis, basi angulatim emarginata; scutello haud longo, punctato, variegato; elytris irregulariter striatis et punctatis, costa distincta basali, lateribus vix sinuatis; pygidio rugoso, variegato; corpore subtus grosse punctato, lateribus rugose punctato, opaco et variegato. processu sternali breviter acuminato; pedibus brevibus, variegatis, tibiis anticis minute bidentatis.

Long. 16 mm.

*Hab.* Sylhet.

Deep red-brown, irregularly speckled above and below with

yellow markings, and opaque and velvety except at the middle of the prothorax, metasternum, and abdomen, and a strong costa on the anterior half of each elytron.

The form is ovate and depressed. The clypeus is broad, entire, and strongly punctured. The prothorax is strongly but not closely punctured in the middle, very coarsely and rugosely at the sides, with the lateral margins distinctly angulated at the middle and strongly sinuated behind. The scutellum is rather short, punctured, opaque, and variegated. The elytra are irregularly punctured and striated, and each has a smooth curved costa on the basal half. The pygidium is rugose and the metasternum and abdomen are strongly punctured and shining in the middle, and opaque and closely sculptured with crescent-shaped impressions at the sides. The legs are very short, opaque, and decorated like the body, and there are two very short teeth to the front tibia.

A single specimen from the Bowring Collection has been many years in the Museum.

#### Rutelidæ.

##### *Fruhstorferia birmanica*, sp. n.

Rufo-castanea, corpore subtus pygidioque sat longo rufo-hirsuta.

Corpus breve, robustum, grosse punctatum, modice nitidum, capite rugoso-punctato, antice angustato, apice curvato, carina oculari minuta, haud acuta; prothorace transverso, grosse punctato, medio indistincte sulcato, lateribus bisinuatis, angulis anticis fere rectis, posticis obtusis, margine basali leviter trisinuato; scutello lato, obtuse angulato, punctato; elytris crebre irregulariter punctatis, lineis indistinctis nonnullis; pedum 2 anteriorum tibiis tridentatis, 4 posteriorum unguibus externis profunde fassis.

♂. Corpore brevior, magis parallelo, pygidio incurvato; sat nitido, mandibulis omnino exsertis, ad capitis longitudinem æqualibus, valde recurvatis, acutis, tarsis anticis incrassatis ungueque externo multo majore.

Long. (sine mandibulis) 16 mm.

♀. Multo longiore, ovali, pygidio producto, crebre punctato, corpore supra grossius punctato, punctis annuliformibus, mandibulis parvis, obtusis, elytrorum lateribus post medium callosis.

Long. 20 mm.

*Hab.* Burma, Ruby Mines (*Doherty*).

Chestnut-red, strongly punctured, with the pygidium and lower surface clothed with tawny hair. The legs are stout, with the front tibiæ tridentate and the outer claws of the two posterior pairs strongly bifid. There is a short tubercular prosternal process tufted at the end.

♂. Short, robust, and parallel-sided, with the head coarsely punctured, the clypeus small, narrowed and rounded at the apex, the mandibles produced (about as long as the head), strongly recurved, and acute at the tips. The prothorax is transverse, rather strongly punctured, with the sides parallel behind and the base feebly trisinuated. The scutellum is very short and finely punctured. The elytra are strongly and irregularly punctured, some of the punctures forming lines. The pygidium is turned inwards and sparingly punctured. The front tarsi are thickened and the outer claw much larger than the inner one.

♀. Longer and more oval, with the mandibles not produced or acute, the head more rugose and the prothorax, elytra, and pygidium more coarsely and closely punctured. The elytra have a small but well-marked fold beyond the middle of the outer edge, and the pygidium is prominent.

A single pair of this species was received with the Fry Collection. They are about equal in size to small specimens of *F. 6-maculata*, Kr., but are more robust and convex than that species. It is more strongly punctured above and more hairy beneath, and differs also by the prominent pygidium and well-marked lateral thickening of the elytra in the female and the form of the mandibles in the male. It is likely that the latter attain a greater development than in the type, but they are peculiar by their twisted appearance and abruptly acuminate tips. The maxillary palpi are much stouter than in the other species.

Dr. Ohaus has sent me for comparison a female from Tonkin in his collection. It is like the Burmese female, but more elongate and rather more finely sculptured upon the elytra, and may prove to represent another species.

#### DESMONYX, gen. nov.

Labium elongatum, acuminatum, sine ligula distincta, palpis prope apicem positis, triarticulatis, articulo ultimo grandi, fusiformi.

Maxillæ reductæ, absque lobis aut dentibus, palpis prope apicem positis, 4-articulatis, articulo ultimo grandi fusiformi.

Mandibulæ porrectæ, falciformes.

Labrum porrectum, angustum, integrum, dense ciliatum.

Clypeus antice latus, trilobatus, ad antennarum basin valde constrictus.

Oculi parum prominentes.

Antennæ (♂) longæ, 10-articulatæ, articulo primo valde clavato, 2-6 subæqualibus, 7 sat brevi, 8-10 longissime flabellatis, ad præcedentes omnes longitudine æqualibus.

Prothorax transversus, lateribus basi que arcuatis.

Scutellum latum, fere semicirculare.

Sternum muticum.

Pedum coxæ anticae prominentes, tibiæ 4-dentatæ, tibiæ 4 posteriores extus spinosæ, posticæ apice minute serratæ: pedum anticorum (♂) ungue externo lato, valde dentato, articulo penultimo subtus lobato: pedum 4 posteriorum unguibus æqualibus, gracilibus, integris.

*Desmonyx humeralis*, sp. n.

Late ovatus, brunneus, antennarum clava, vertice, prothoracis medio, scutello elytrorumque parte antica obscurioribus, singulo elythro antice bimaaculato, maculis flavis, approximatis, una prope scutellum alteraque minore posteriore prope marginem lateralem. Corpus supra grosse et rugose punctatum; clypeo subtiliter rugoso, lato, antice trilobato, medio acuto, postice valde constricto; fronte prothoraceque grosse irregulariter punctatis, laxè hirsutis, hujus medio longitudinaliter impresso, basi leviter arcuata, lateribus arcuatis, antice paulo approximatis: scutello sat minute punctato; elytris grosse punctato-striatis et rugosis, singulo apice arcuato; pygidio nitido, minute et laxè punctato; corpore subtus longe hirsuto.

Long. 9-10 mm.

*Hab.* Burma, Ruby Mines (*Doherty*).

Dark mahogany colour, with the back of the head, the middle of the prothorax, the scutellum, and the anterior part of the elytra, as well as the club of the antennæ, black, and with two yellow spots near the anterior border of each elytron—one near the scutellum and a rather smaller one a little behind and outside the first. The body is robust and convex, coarsely and rugosely punctured above, with the vertex of the head and the prothorax hairy. The clypeus is finely rugose, broad and trilobed in front, strongly constricted at the base of the antennæ. The prothorax is channelled down the middle, broadly rounded at the base, with the front angles acute and the hind angles rounded. The scutellum is nearly semicircular and finely punctured. The elytra are coarsely punctate-striate with the intervals rugose. The pygidium is minutely punctured and shining.

The female is unknown. The antennal club is very long in the male, the last joint of the front tarsus is enlarged, the inner claw thickened and very widely cleft, and the fourth joint produced beneath the claw-joint. The other claws are simple, slender, and equal.

This is an isolated and very remarkable genus, which must be placed amongst the primitive and polymorphic Rutelidæ of the *Parastasia* group, although it has considerable affinities with the Dynastidæ. The slender and symmetrical claws of the four posterior feet are quite foreign to the Rutelidæ and

the clypeus and the organs of the mouth are very peculiar. Another aberrant genus to which *Desmonyx* seems to show some relationship is *Oryctomorphus*, a Chilian genus for which Lacordaire formed a special group of Dynastidæ (the *Oryctomorphides*), associating with it an African genus, *Homœomorphus*, and an Australian one, *Corynophyllus*. This curious assemblage is quite unnatural and a better resting-place has to be found for *Oryctomorphus*. Its claws are movable and slightly unequal on all the feet, and those of the front feet of the male are exactly as in *Desmonyx*, the labrum has a thickened front margin which is visible externally, and in other respects, conspicuously in its bright colouring and sexual differences, it agrees less with any other genus of Dynastidæ than with the *Parastasia* group of Rutelidæ. The latter embraces a variety of forms already recognized as connecting the Rutelidæ and Dynastidæ, but the latter family, if these aberrant members are excluded from it, becomes fairly homogeneous. H. W. Bates in forming the genus *Metapachylus* has pointed out its relationship to *Oryctomorphus* and also to *Parastasia* and *Polymæchus*, but without definitely assigning it to either family.

Another genus, *Mesystæchus* of Waterhouse, placed by its founder among the Anoplognathini, seems to belong also to the present group. Its labrum is quite unlike that characteristic of the former group.

### Melolonthidæ.

#### *Dejeania lineata*, sp. n.

Fusco-nigra, supra squamosa, subtus nitidior, pectore pedibusque sparse, abdomine dense, griseo-setosis; clypeo semicirculari, nudo, rugoso, fronte subtiliter rugosa, setosa; prothorace globoso, fusco-squamoso, marginibus lateraliter atque postice griseis; scutello fusco; elytris fusco-squamosis, lincis 4 griseis, externa abbreviata; pygidio dense flavido-squamoso; prothoracis margine postico ante scutelli angulos minutissime inciso; scutello lato; elytris postice ad suturam haud angulatis.

♂. Tarsis intermediis sat brevibus, pedibus posticis validis, trochanteribus longis, paulo spinosis.

Long. 7 mm.

*Hab.* Burma, Shan States.

This species is nearly related to *D.* ("*Hoplia*") *marginatus*, Nonfried, which its author has referred to a wrong group. It is larger than that insect and in addition to the dark margins of the elytra has three dark stripes of equal width to the pale interspaces. The white scales upon the pronotum are more restricted behind. I have seen only males of both

species, which sex, in each, has the hind trochanters very long and spinose. In *D. lineata*, but not in the allied species, the middle tarsi are shortened and thickened also in the male.

### Geotrupidæ.

#### *Ochodæus deceptor*, sp. n.

Rufo-testaceus, breviter ovatus, corpore supra omnino sat dense granulato, subtus læviore, flavo-hirsuto; clypeo parvo, semi-circulari, mandibulis extus regulariter arcuatis; prothorace latissimo, margine laterali recto, angulis anticis rectis, posticis haud late arcuatis; scutello elongato, apice acuto; elytris distincte striatis, interstitiis dense setosis.

Long. 5·5–6·5 mm.

♂. Tibiæ anticæ angulo interno producto, femore postico ante apicem dentato.

♀. Capitis vertice tuberculis duobus geminatis armato.

*Hab.* S. India, Bombay, Madura, Kanara.

This species has a close resemblance to the European *O. chrysomelinus*, F., but the sculpture of the whole upper surface is rather less dense, the side margins of the prothorax straighter, the posterior angles less broadly rounded off, and the scutellum rather narrower and more acute at the apex. The secondary sexual distinctions of the male are the same, but the female is distinguished by a slight crest upon the forehead consisting of two closely approximate tubercles. These are absent in *O. chrysomelinus*, which has instead a single tubercle near the tip of the clypeus.

#### *Ochodæus pallidus*, sp. n.

Pallide testaceus, ovatus, capite prothoraceque minute et dense rugosis, setiferis, elytris subnitidis, minute punctulatis et setiferis; clypeo brevissimo, lato; mandibulis extus sinuatis, apice paulo productis, intus leviter dentatis; prothorace lato, margine laterali recto, angulis anticis fere acutis, posticis haud late arcuatis; scutello medioere, haud acute angulato; tibiæ anticæ dente apicali longo, haud acuto, secundo sat acuto, tertio minutissimo.

Long. 6·5 mm.

*Hab.* N. India.

Two specimens, both females, were collected by Capt. Boys and have been in the Museum since 1848. The species is more elongate than the preceding one and the elytra are paler and more shining, the sculpture being much less dense. In addition the mandibles are more produced, the clypeus shorter and broader and the scutellum less elongate. The hind tibiæ and tarsi are longer and slenderer and the second tooth of the front tibiæ more acute.

Westwood has mentioned an Indian *Ochodæus* to which the MS. name of *O. indianus* was given by Reiche, but which the former did not consider distinct from *O. chryso-melinus*. This is probably one or other of the two species here described.

### Hybosoridæ.

#### *Phæochroops indicus*, sp. n.

Pyriformis, fuscus, undique longe rufo-hirtus, capite prothoracequo densissime punctatis, illo angustato, margine regulariter arcuato; prothorace parvo, transverso, lateribus elevatis, denticulatis, regulariter arcuatis, angulis anticis productis, posticis fere rectis; scutello parvo, angusto; elytris valde convexis, postice fortiter ampliatis, dense variolose punctatis, costis tribus modice distinctis; corpore subtus subtiliter rugoso, metasterni medio pedibusque politis; tibiis anticis extus denticulatis, dentibus tribus validis rectis, posticis longe ciliatis, singulo extus medio minute carinato. Long. 11.5 mm.

*Hab.* S. India, Nilgiri Hills, Anamalai Hills.

Three specimens have been found by Mr. H. L. Andrewes. They are dark olive-brown, clothed all over with long tawny hairs. The head and prothorax are exceedingly densely, and the elytra closely, covered with circular pits. The lower surface is finely rugose, with the middle of the metasternum alone smooth and shining. The labrum is very prominent, quadrate, and coarsely punctured and the clypeus parabolic. The pronotum is very narrow in front and rather broader behind, with the lateral margins raised, denticulate, and gently and uniformly curved, and the posterior angles right angles. The elytra are regularly ampliatis from the shoulders and have each three feebly raised costæ.

The genus *Phæochroops*, with two others, *Phæochridius* and *Pantolasius*, have been placed by their authors, Candèze and Lansberge, amongst the Trogidæ, and excluded from the Hybosoridæ by the presence of five ventral segments only. These forms, however, have certainly a much closer relationship to *Hybosorus*, *Chatodus*, &c., than to *Trox* and appear to me to exhibit no difference of any consequence in the abdomen. A sixth segment is always visible laterally, although partially hidden beneath the hind coxæ, and Lacordaire has observed that this is sometimes the case in *Trox* itself. The form of the antennæ and labrum, however, is very different to that occurring in *Trox*, and if it is considered desirable to retain both families I think the Trogidæ should be restricted by removing the genera *Liparochrus* and *Anaides* to the Hybosoridæ, with which they have most in common.

## BIBLIOGRAPHICAL NOTICE.

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 by Order of the Trustees. Svo. Pp. xiv, 532. Pls. xvi.—cvii.;  
 text-figs. 172.

THE present volume of Sir George Hampson's great work is devoted to the subfamily Cucullianæ, and includes 692 species distributed among 111 genera, many of which are described as new. While the Noctuidæ, as a rule, are smaller and less showy than the moths classed under Sphingæ and Bombycæ, they are more interesting to European entomologists, as a larger proportion inhabit temperate climates. Under the Cucullianæ, as here defined, we find *Cucullia*, *Cleophana*, *Calophasia*, *Aporophyla*, *Cleantha*, *Nylina* (= *Calocampa*, auct.), *Agriopsis*, *Dasyptolia*, *Cosmia*, and other well-known European genera. A series of additional species (uncoloured) are represented, with neurulation &c., in the text-figures. Although many of these moths are dull-coloured, yet the larvæ of some of them (e. g. those of *Cucullia* and *Nylina*) are extremely beautiful, those of *Cucullia* being gregarious and feeding in clusters on *Verbascum* &c. (the larva of *Cucullia verbasci* is figured on p. 2). They are a great contrast to the dull brown subterranean larvæ of the Agrotinæ, called "Cut-worms" by the Americans. The moths of the genus *Cucullia* are popularly called "Sharks" in England. They somewhat resemble small Sphingidæ in their long, narrow, pointed wings, and fly over flowers at dusk in the same manner. Our species are all light brown, grey, or whitish, but several of the Continental and Siberian species are of a most beautiful green, and others brilliant silvery white, none of which, however, are figured in the work before us.

It is less than two years since the publication of vol. v., and vol. vi. is the third volume of Noctuidæ, vols. i.—iii. having been devoted to Arctiidæ &c. Those who are best acquainted with what catalogue and descriptive work means will know best how to appreciate the energy and the industry of the Author, and least inclined to find fault on account of any error or omission which they may be able to discover. For our own part, we may say that the previous high standard of the work seems to be fully maintained in the present volume both as regards the descriptions and tables, and we are glad to see that the larvæ, when known, are also briefly noticed.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 113. MAY 1907.

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

### *Osmia viridior*, sp. n.

♂.—Length fully 12 mm.; anterior wing a little over 8; width of abdomen 4.

Head very dark blue-green; mesothorax and scutellum yellow-green; the rest of thorax black with a greenish lustre; legs black, not at all metallic; abdomen shining blue-green, dark but very decidedly green. Head and thorax densely punctured, clothed above with copious long hair, that of face white, but of sides of vertex and cheeks strongly intermixed with black; head normal, mandibles strongly bidentate; anterior edge of clypeus straight, very smooth and shining; clypeus otherwise dull and densely rugoso-punctate; antennæ black, third joint with a fine reddish tomentum, only noticed in certain lights; flagellum not at all moniliform; thorax above with long creamy-white hair, not at all mixed with black; pleura with long hair, anteriorly dull white, posteriorly black. Legs with black hair, but shining reddish on inner side of anterior tarsi, long and dull white on anterior femora behind, and some dull white at apex of middle femora behind; spurs and tarsi normal; tegulæ shining black. Wings hyaline, the apical margin broadly pale brownish, and a dark streak in marginal cell; first r. n. joining second s.m.

twice as far from its base as second from its apex. Abdomen parallel-sided, first segment with white hair (some black at extreme sides); second with thin white hair and shorter black hairs intermixed, especially at sides, but inconspicuous; remaining segments with black hair, but third with a little silvery white on margin laterally; sixth segment with a broad shallow notch, seventh bidentate; second and third ventral segments shallowly emarginate, with a very little shining reddish hair in the emargination.

Very close to *O. marginipennis*, Cresson, but distinguished by the strongly green mesothorax and scutellum, the paler hair of thorax above, the edge of clypeus not "subsinate," and the apical margin of wings not so dark. It also much resembles *O. cyaneonitens*, Ckll., but differs thus:—

Smaller: hair of pleura all white; middle tibia with conspicuous white hair .....	<i>cyaneonitens</i> .
Larger: hair of pleura partly black; middle tibia with black hair .....	<i>viridior</i> .

*Hab.* Boulder, Colorado, May 20, 1906 (*S. A. Rohwer*).

*Osmia olivacea*, sp. n.

♂.—Length about or nearly 10 mm.; anterior wing  $7\frac{1}{2}$ ; width of abdomen  $3\frac{1}{4}$ .

Olive-green, the sides of the thorax dark blue-green; hair of head and thorax long and abundant, white on clypeus, cheeks below, and lower part of pleura, but otherwise tawny, with very long black hairs intermixed on thorax above, vertex, cheeks, and a few at sides of face; head normal, lower edge of clypeus straight, the bidentate mandibles with their teeth strongly divergent; hair of upper part of face strongly tawny; antennæ long, black; flagellum slightly moniliform or crenulate; vertex and mesothorax rough with exceedingly dense punctures; a little shining space bordering anterior ocellus in front. Legs black, the hind coxæ and femora dark green, and a slight green tint on middle ones; anterior and middle femora with long pale hair behind, hind femora with dusky hair; hair of tibiæ (except anterior ones behind) dark; hair on inner side of hind tarsi golden; spurs normal; tegulæ green. Wings dusky, hyaline before the broad apical area; first r. n. joining second s.m. about  $1\frac{1}{2}$  times as far from its base as second from its apex. Abdomen shining olive-green, the hind margins of segments colorous; first two segments with pale hair, the others with black hair, quite long, and a little pale intermixed; sixth

with a good deal of light hair; sixth segment entire or with the faintest suggestion of a notch; seventh bidentate; first ventral segment subemarginate; third emarginate, with a tuft of orange hair in the notch.

In Robertson's table of genera segregated from *Osmia* this runs to 3, and runs out because of the structure of the sixth abdominal segment. Because of its coloration it could be mistaken for *O. inurbana*, Cress., but it is easily known from that by the coarse black hair on the abdomen &c. It is also exceedingly like *O. Latreillei*, Spinola (which I have from Tangier), but is known from that by the same characters which separate it from *inurbana*\*.

*Hab.* Boulder, Colorado, at flowers of *Pulsatilla hirsutissima*, April 20, 1906 (W. P. Cockerell).

*Osmia pulsatillæ*, sp. n.

♂.—Length about  $7\frac{1}{2}$  mm.; anterior wing about 5; width of abdomen  $2\frac{1}{3}$ .

Green, the head and thorax above rather yellowish green, the abdomen blue-green (Prussian green). Head normal, eyes prominent, mandibles with two widely divergent teeth; face covered with dull white hair, with some long black hairs at sides and many long black hairs on front and vertex; hair of cheeks white, with black hairs immediately adjacent to the eye. Antennæ rather long, black; flagellum normal; hair of thorax long and dull white, dorsally with black hairs intermixed; mesothorax dull, with exceedingly dense punctures; tegulæ largely green. Wings dusky; first r. n. joining second s.m. about  $1\frac{2}{3}$  as far from base as second from apex. Legs dark green, with dull white hair, that on inner side of hind basitarsus dark fuscous; spurs normal. Abdomen with white hair on first three segments, long only on first; the other segments have the hair mixed black and silvery, but short and inconspicuous; sixth segment entire; seventh bidentate; ventral segments normal, second apically with fine white hair.

This is an *Osmia* s. str. in the sense of Robertson. It is very like *O. proxima*, Cresson, but is readily distinguished by the mixture of dark hairs on the thorax above. The abdomen is not so globular as in *proxima*, but is distinctly parallel-sided.

*Hab.* Boulder, Colorado, prox. 5350 ft., at flowers of *Pulsatilla hirsutissima*, April 20, 1906 (W. P. Cockerell).

\* An Algerian male of *O. Latreillei*, also before me, has the hair of the thorax much redder.

*Osmia aprilina*, sp. n.

♂.—Length about 7 mm.; anterior wing about 5; width of abdomen  $2\frac{1}{2}$ .

Similar to *O. pulsatillæ*, but hair of thorax above pale reddish, without black hairs interspersed. Head larger, much wider above. Abdomen broader, more globose, and yellowish green; sixth segment with a conspicuous rounded notch. The antennæ are entirely dark; hair of face pale, white below, yellowish above, without any black; vertex with an admixture of black hairs; cheeks with long black hairs in front, but the hair otherwise white. Wings dusky. Legs with green tints. Abdomen with pale hair, but a good deal of black from middle of third segment on; seventh segment bidentate.

Known from *O. proxima* by the dark flagellum and dark hairs on cheeks and vertex. Similar characters and the structure of the sixth abdominal segment separate it from *O. punila*. It is an *Osmia* s. str. in the sense of Robertson.

*Hab.* Boulder, Colorado, at flowers of *Pulsatilla hirsutissima*, April 20, 1906 (*W. P. & T. D. A. Cockerell*); Boulder, May 1906 (*S. A. Rohwer*). Four specimens.

*Osmia phaceliæ*, sp. n.

♀.—Length 8 mm.; width of abdomen 3.

Blue-green, with yellowish-green tints about the head and thorax. Legs black, the hind femora faintly greenish; scopa black, some white hairs at extreme sides. Hair of head and thorax mainly white, but many coarse black hairs on face and vertex and fewer on scutellum and mesothorax; seen from above, the hair of the clypeus appears short and black and that on each side of face longer and nearly all silvery white; head and thorax very densely punctured; head ordinary, clypeus normal, mandibles 3-dentate, antennæ short and black; hair of legs largely black, that on inner side of middle and hind tarsi nigro-fuscous; tegulæ largely green. Wings dusky, first r. n. joining second s.m. at least three times as far from base as second from apex. Abdomen shining blue-green, hind margins of segments concolorous; hair of second segment white but very short and scanty, with longer dark hairs toward sides; following segments with the usual dark hairs, but the apical one, except at apex, with fine silvery tomentum.

Distinguished from *O. faceta*, Cress., by the smaller size, greener abdomen, and colour of hair on clypeus. It looks

just like *O. atriventris*, but is easily separated by the large amount of black hair on head. *O. albolateralis*, Ckll., is much larger and has not the fine appressed white hairs seen on abdominal segments 4 and 5 in *phacellie*. It is an *Osmia* s. str. in the sense of Robertson.

*Hab.* Ward, Colorado, July 1905, at flowers of *Phacelia* (*W. P. & T. D. A. Ckll.*); also one from Boulder, Colorado, June 17, 1905 (*W. P. Cockerell*).

*Osmia Hendersoni*, sp. n.

♀.—Length 10 mm.; width of abdomen  $4\frac{1}{2}$ .

Robust; head and thorax densely punctured, black, with strong blue and green tints at sides of face, and the pleura, scutellum, and metathorax greenish; abdomen very short and broad, very shiny, with sparse punctures, the segments olive-green, with the hind margins broadly purple, their extreme edge more or less reddish. Head rather large, with broad cheeks, but not otherwise remarkable; clypeus normal, the anterior edge gently concave; mandibles with three large but short teeth; antennæ black; hair of face entirely black; the black hair goes as far back as the ocelli, and behind this the hair of the top of the head is all dull white, except at the extreme sides; cheeks nude; hair of thorax above entirely yellowish white, of pleura black; tegulæ rufo-piceous. Wings hyaline with yellow stains; first r. n. joining second s.m. about twice as far from base as second from apex. Legs black, with black hair; anterior tarsi with long pale hair; first abdominal segment with long white hair, the others with rather long black hair; sixth apically with a little reddish appressed hair; scopa black.

A beautiful species, separated from *O. nigrifrons* by the shining abdomen, the second segment with black hair, &c. The 3-dentate mandibles and long hair of pleura readily separate it from *O. brevihirta*.

*Hab.* Arapahoe Peak, Colorado, Sept. 1, 1906 (*S. A. Rohwer*).

Named after Judge J. Henderson, who was present when it was caught, in recognition of his work on the Arapahoe Glacier and other contributions to the natural history of Colorado. The locality is high alpine.

*Osmia brevihirta*, sp. n.

♀.—Length about 11 mm.; width of abdomen barely over 4.

Dark blue, with green tints; the abdomen brilliant, more

shining than in *O. nigrijrons*, the hind margins concolorous. Head large; clypeus normal; mandibles 4-dentate, the inner two teeth very short; near the interval between the first and second teeth is a little patch of shining orange hair; antennæ black; hair of face black and dull white, the black coarse and mainly on the clypeus and above, the white principally at sides; black hairs about ocelli, but hair on top of head dull white; cheeks with black hair, but anteriorly bare, with a very little short white hair which glistens in certain lights; thorax above with yellowish-white hair, not mixed with black; hair of pleura short and scanty, dark, a little light above posteriorly. Legs black, with black hair; tegulæ black, with a blue spot. Wings broadly dusky on apical margin; first r. n. joining second s.m. about  $1\frac{2}{3}$  as far from base as second from apex. Abdomen with light hair on first segment and middle of second; otherwise the hair is black except that the apex of the last segment is covered with chocolate-brown tomentum; scopa black.

This may prove to be the female of *O. cyaneonitens*, Ckll., which ( $\sigma$ ) was also found at Boulder by my wife, June 4, 9, and 10, 1905.

*Hab.* Boulder, Colorado, June 10, 1905 (*W. P. Cockerell*).

*Osmia hypochrysea Rohweri*, subsp. n.

♀.—Length about 10 mm.

Differs from true *hypochrysea* in being somewhat larger and more robust, the patch of orange hair on the mandibles little developed, the hair on inner side of hind tarsi dark ferruginous (black in type). The clypeus is quadridentate as in the type.

*Hab.* Boulder, Colorado, May 1906 (*S. A. Rohwer*).

The locality is more than 2500 ft. lower than that of the typical form.

*Osmia hypoleuca*, sp. n. (*pentstemonis*, subsp.?).

♀.—Length about  $7\frac{1}{2}$  mm.; anterior wing  $5\frac{1}{3}$ ; width of abdomen about  $2\frac{1}{2}$ .

Head and thorax deep blue; abdomen brilliant purple-blue, the hind margins of the segments broadly olive-green; head and thorax very densely punctured, their hair long and coarse, but not dense, black on head except on occiput and a little on hindmost part of cheeks, dull white mixed with black on thorax above, light on tubercles, black on upper, but white on lower part of pleura. Head oblong, clypeus

normal, mandibles 3-dentate, antennæ black; tegulæ piceous, blue in front. Wings dusky; first r. n. joining second s.m. about or hardly  $1\frac{1}{2}$  times as far from base as second from apex. Legs black, with black or sooty hair; hind coxæ and femora strongly bluish, hind basitarsus flat and rather broad. Abdomen with inconspicuous black hair on segments 3 to 5; scopa black.

Perhaps only a variety of *O. pentstemonis*, Ckll., but that has the hair of pleura all light, and the last dorsal abdominal segment with fine whitish tomentum.

*Hab.* Boulder, Colorado, June 9, 1905, at flower no. 10 (*W. P. Cockerell*).

*O. pentstemonis* occurs at higher altitudes; in Boulder County we have taken it at Ward, about 9000 ft., at flowers of *Pentstemon*, July 1905. In my original account of *O. pentstemonis* I wrote:—"It may prove to be the female of *O. Wheeleri*." It is, perhaps, significant that at Boulder, June 4, 1905, my wife took a male *Osmia* which I have referred to *O. Wheeleri*, Ckll., variety.

#### *Osmia pikei*, sp. n.

♀.—Length about 8 mm.; width of abdomen 3.

A short broad species, with abdomen almost exactly circular in outline. Dark greenish blue, the abdomen shining; hair of head and thorax long and coarse, black on clypeus, cheeks, and pleura, dull white with black intermixed on front, vertex, and thorax above; some white hair also on sides of face; head and thorax densely punctured; head rather large; mandibles with four prominent sharp teeth, the apical one long; clypeus normal, the two orange brushes below its anterior edge well developed; antennæ black, flagellum very faintly reddish beneath; scutellum and hind part of mesothorax yellowish green, contrasting with the blue-black metathorax; tegulæ black, greenish in front. Wings dusky; first r. n. joining second s.m. only a little further from base than second from apex. Legs black, with black hair, fine pale tomentum on underside of hind femora and tibiæ; hair on underside of hind tarsi reddish except at sides. Abdomen very sparsely punctured; first segment with pale hair, second with pale and black, the others with black, the last (except apically) with some appressed pale hairs; scopa black.

Distinguished especially by its comparatively small size, broad form, and 4-dentate mandibles. The colour of the abdomen is the same as in *O. propinqua*.

*Hab.* Halfway House, Pike's Peak, Colorado, at flowers of *Salix*, May 30, 1904 (*Cockerell*).

The locality is 8400 ft. above sea-level.

*Osmia senior*, sp. n.

♀.—Length about 12 mm.; width of abdomen  $3\frac{3}{4}$ .

Abdomen approximately parallel-sided, broadest about the apex of the third segment. Head dark blue below, green above; mesothorax and scutellum green, pleura dark blue. Abdomen blue-green, the margins of segments concolorous, but segments 2 and 3 have an indistinct pinkish-purple band across the middle, while 4 and 5 show coppery-red tints. Head and thorax densely punctured, head rather large; antennæ black; clypeus normal; mandibles with four very distinct teeth, the apical one not very long; hair of clypeus black, of sides of face dull white, of front mixed white and black, of vertex black, of occiput pale, of cheeks pale behind and black in front; hair of thorax above scanty, dull white with black intermixed, of pleura black, but of tubercles abundant and light, conspicuously contrasting; tegulæ rufopiceous, shaded with green. Wings dusky, first r. n. joining second s.m. about  $1\frac{2}{3}$  as far from base as second from apex. Legs black, with black hair, the hind femora and coxæ very faintly metallic; middle femur with a few pale hairs apically beneath. Abdomen with light hair on first segment and short black hair on the others, each with a scarcely noticeable subapical band of shining pale hairs, mostly failing in the middle; sixth with fine pale tomentum; scopa black.

*O. gaillardie*, Ckll., is allied, but larger, and without appressed light hair on cheeks. The white hair at sides of face separates *O. senior* from *O. wardiana*. By the colour and shape of the abdomen *O. senior* is like *O. densa*, but that has light hair on pleura.

*Hab.* Boulder, Colorado, June 12, 1905 (*W. P. Cockerell*).

*Osmia wardiana*, sp. n.

♀.—Length a little over 12 mm.; width of abdomen 4.

Robust; abdomen oblong. Head and thorax black, the sides of face and supraclypeal area green, the scutellum and hind part of mesothorax greenish; middle of mesothorax purplish black, with an area in which the strong punctures are separated, showing the shining ground; head large, the cheeks very full and rounded; antennæ black; clypeus somewhat produced, with the apex shallowly subemarginate;

mandibles 4-dentate, the apical tooth much the largest, the others subequal; face with coarse black hair, cheeks with quite long black hair; vertex with hair mixed black and dull white; thorax above with dull white hair, with long black hairs intermixed; pleura and tubercles with black hair; tegulæ with a large ferruginous spot. Wings hyaline, with reddish stains; first r. n. joining second s.m. about or scarcely  $1\frac{1}{2}$  times as far from base as second from apex. Legs black, with black hair, that on inner side of anterior tarsi reddish. Abdomen quite dark, with tints of purple and green, the hind margins of the segments purple; hair on first segment long and pale, except a tuft of black on each side toward base; hair on remaining segments short and black; scopa black.

Resembles *O. nigrifrons*, Cresson, but that has 3-dentate mandibles, entirely black tegulæ, &c.

*Hab.* Ward, Colorado, 9200 ft., at flowers of *Senecio*, July (*W. P. & T. D. A. Ckll.*).

#### *Osmia Titusi*, Ckll.

Las Cruces, New Mexico, April 10, at flowers of *Dithyrea Wislizeni*; two females collected by Prof. C. H. T. Townsend.

New to New Mexico.

#### *Andrena Hitei*, sp. n.

♀.—Length rather more than 11 mm.; anterior wing about  $8\frac{1}{2}$ ; width of abdomen  $3\frac{1}{3}$ .

Black, the thorax and first four abdominal segments covered dorsally with bright fox-red hair, exactly as in the European *A. fulva*, of which it looks like a small example. Cheeks and face below antennæ with black hair, front and vertex with dull reddish hair, paler and not so bright as that of thorax; antennæ dark, scape with black hair; facial foveæ very broad, not divergent from eye, dark, but with a pale tint in certain lights; clypeus shining, strongly but not very densely punctured, with a broad smooth median band; process of labrum large, truncate, with sloping sides; third antennal joint conspicuously longer than the next two united; mesothorax dull and granular, minutely punctured; area of metathorax triangular, dull and granular, small, defined only by an impressed line; hair of lower part of pleura black, of metathorax red, but at sides are long, curled, black hairs; tegulæ dark. Wings dusky, stigma ferruginous, nervures

fuscous; second s.m. about as broad as high, receiving first r. n. almost at its end. Legs black, with black hair; spurs clear ferruginous; apical fimbria and hair of underside of abdomen black; abdomen very feebly punctured, second segment without any visibly depressed area.

*Hab.* Boulder, Colorado, May 21, 1906 (*Glenn Hite*).

A most unexpected find, like nothing I have seen from America, but closely allied to the European *A. fulva*.

Boulder, Colorado, U.S.A.,

Feb. 3, 1907.

XLIII.—*New Mammals from Lake Chad and the Congo, mostly from the Collections made during the Alexander-Gosling Expedition.* By OLDFIELD THOMAS and R. C. WROUGHTON.

It is hoped that a general account of the zoological collections made during the recent Alexander-Gosling expedition from Nigeria by way of Lake Chad to Shari, Oubangui, and Welle to the Upper Nile will be published later, but in the meanwhile such new mammals as we have been able to distinguish are here described.

Both Capt. Gosling, whose death we have to deplore, and Mr. Boyd Alexander took very great interest in the collection of mammals, and considering the difficulties inseparable from such an expedition the number and condition of the specimens obtained afford striking testimony to the pains they took in this direction. As a result they have discovered a remarkable number of new and interesting forms, one of these, *Colomys Goslingi*, representing a new genus.

We have also included descriptions of a few other mammals from the same area, their characteristics having become evident during the work on the Alexander-Gosling specimens.

The whole of the collections obtained by the expedition have been presented to the National Museum by Mr. Boyd Alexander and the executors of Capt. Gosling.

*Rhynchocyon Claudi*, sp. n.

A white-tailed *Rhynchocyon*, with the usual pattern brightly marked; about the size of *Stuhlmanni*, Mats.

General ground-colour above a rather bright red-brown (darker and less bright in the female), below a bright orange-buff. A patch behind the ears, and the cheeks, a lighter

shade; two dark (almost black) streaks from the shoulders to the tail, broken at regular intervals, from the middle of the back backwards, by whitish-buff spots; outside these on each side two other dark stripes, not extending quite so far forward as the median pair, broken by five and four pale spots (the general effect is that of a rather regular chess-board pattern on the lower back, rump, and haunches). Individual hairs of the back, outside the pattern-area, grey at their bases, then a bright buff (almost orange) with black tips, the black tips varying very much in length, from two thirds the whole length of the hair to 1 or 2 mm. only at the distal end. Fore feet dark-coloured, clothed with short hairs which are black at base and tip, with a median bright buff ring; hind feet still more sparsely clothed with even shorter hairs of the same pattern. Tail at base black for a short distance (30–35 mm.), then white and clothed with sparse, very short, white hairs.

The measurements of the type specimen are as follows:—

Head and body 314 mm.; tail 222; hind foot 80; ear 30.

Skull: greatest length 67 (circ.); length of nasals 19; length of frontal suture 27·5; greatest breadth 35; inter-orbital breadth 22; length of palate 35; length  $p^2$  to  $m^2$  inclusive 20.

*Hab.* Beritio, Welle River.

*Type.* Old male. Original number 58. Collected February 14th, 1906, by Mr. Boyd Alexander. (Four specimens and a young skull examined.)

The present species is at once separable from all others except *Stuhlmanni* by its white tail, and from that it differs by its paler brighter colouring. In the type of *Claudi*, though a very old animal, the chessboard pattern on the back is brightly and clearly marked.

We have named this handsome species and the duiker described further on in honour of Major Claud Alexander, the leader of the Alexander-Gosling Expedition up to the time of his death.

### *Erinaceus spiculus*, sp. n.

A medium-sized hedgehog, belonging to the group with four toes, with the colouring and short slender spines of *albiventris*.

Spines short (15 mm.), slender and absent on the summit of the crown along a band about 5 mm. broad.

Ear of medium size, smaller than in *Adansoni* from Senegal, but larger than in the Soudanese *albiventris*. Hind

foot larger than in either of these species. The claws of the toes (especially of the two inner) exceptionally long and stout, even more so than in *Adansoni*; that of the innermost toe measures  $7 \times 2\frac{1}{2}$  mm.

Skull in size as in *Adansoni*, but that of the latter much stouter and broader: thus, in *Adansoni* the width of the brain-case at the roots of the zygomata is 19.5 mm., against 18.3 in the present species; similarly the breadth at the postorbital constriction and that across the zygomata are 11 and 30 mm., as compared with 10.3 and 26. In *Adansoni* the sagittal crest is strongly defined and carried forward to the middle of the frontals, while in *spiculus* it is much less distinct and cannot be traced beyond the front edge of the parietals. In *Adansoni* the nasals (15 mm.) are longer than in *spiculus* (12.5 mm.), but nevertheless the muzzle is shorter; the distance from the front of  $p^4$  to the front of  $i^1$  in the two species is 10 and 11 mm. respectively.

The following are measurements of the type (those of the body taken in the flesh):—

Head and body 220 mm.; tail 10; hind foot 30; ear 20.

Skull: greatest length 44; palatal length 26; brain-case, breadth 18.3; zygomatic breadth 26; length  $p^4$ ,  $m^1$ , and  $m^2$  10.

*Hab.* Maifoni, near Lake Chad.

*Type.* Old male (skin and skull). Original number 18. Collected by Mr. Boyd Alexander on 17th January, 1905. (Three specimens examined.)

The nearest neighbours of *spiculus* are *albiventris*, Wagn., from the Soudan and *Adansoni*, Rochebrune, from Senegal. It resembles *albiventris* externally by its short fine spines, but is distinguishable from it by its longer hind foot and very much stronger toe-claws. In skull-characters it approximates to *Adansoni* and is easily distinguishable from *albiventris* by its markedly larger molars, broader para- and mesopterygoid fossæ, and especially by the absence of the frontal depression so marked in *albiventris*; the points in which it differs from *Adansoni* have already been noticed.

*Poiana Richardsoni ochracea*, subsp. n.

A paler and more ochraceous form of *P. Richardsoni*.

General characters, so far as can be judged from a native skin, as in *P. Richardsoni*, but the spots are smaller and more scattered, and the ground-colour is nearer "clay-colour," but verging slightly towards tawny. Under surface, instead of being nearly white, of a bright buffy ochraceous colour.

Limbs approximately clay-colour. Ground-colour of tail like body, the dark rings rather narrower than in *Richardsoni*; no trace of the fine intermediate dark rings generally present between the broad ones.

Size apparently rather less than in true *Richardsoni*.

*Hab.* Near Yambuya, Aruwimi River, Congo (about 25° E., 1° N.).

*Type.* Native skin without skull. B.M. no. 7.1.2.4. Obtained by R. B. Woosnam.

This beautiful eastern representative of the West-African *Poiana Richardsoni* may be readily recognized by the marked difference in its general body-colour.

*Crossarchus Alexandri*, sp. n.

Allied to *C. obscurus*, but larger and with much longer skull.

General appearance very much as in *C. obscurus*, the long loose coat and grizzled colour as in that animal, though the general tone is not so dark. Fur, when the animal is in full pelage, very long, the hairs from 50 to 60 mm. in length; an underfur of short woolly hairs present in some specimens. General colour a coarse mixture of black and pale clay-colour, the dorsal hairs pale clay-colour for their basal half (an inconspicuous dark ring present about the middle of their lower half), then broadly black, with a terminal or subterminal band of dull whitish. Wool-hairs pale brown basally, lighter terminally. Under surface similar, but the browner basal part of the pelage more obvious. Crown and middle line of face blackish brown, sometimes sharply contrasted with the grey or buffy cheeks and sides of muzzle. Ears pale brown. Lips and chin pale buffy. Upper surface of forearms, hands, and feet black. Claws very large, the anterior longer than the posterior. Tail long-haired at base, evenly tapering, mixed black and greyish like the body.

In some specimens, taken probably at a different season, the long loose hairs are few or absent, and the whole body is clothed in a short coat of greyish underfur.

Skull conspicuously different from that of *C. obscurus* by its very much greater length, the breadth being about the same. Teeth much longer throughout.

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

Head and body 450 mm.; tail (c.) 290; hind foot (s. u.) 77; longest front claw (above) 14·5; longest hind claw 9.

Skull: condylo-basal length 81; basilar length 74·8; greatest breadth 36·3; length of nasals in middle line 15·3;

interorbital breadth 15; mastoid breadth 31; palatal length 44.5; breadth of palate outside  $p^4$  23.2; greatest diameter of  $p^4$  7.1, of  $m^2$  5.7, of  $m_2$  5.1.

*Hab.* Northern Congo. *Type* from Banzyville, Ubanghi.

*Type* obtained from a trader by Mr. Boyd Alexander. Five specimens examined.

This remarkable species differs widely from any previously known, its nearest ally, *C. obscurus*, being only about two thirds its size.

It is a curiously variable animal, both in colour and in the condition of its pelage, though this latter may be a question of season. A young example obtained by Emin Pasha in Niam-Niam is absolutely without the long hairs characteristic of two of the Alexander-Gosling specimens, while a third is in an intermediate condition.

An example of *Crossarchus Dybowskii*, Pousargues, was also obtained by the Expedition.

#### *Crossarchus Talboti*, sp. n.

A striped *Crossarchus* of medium size and very pale coloration.

Hair of back short (15–20 mm.) and rather harsh.

The usual colour-pattern of the group; ground-colour a dingy white, grizzled with black on the neck and shoulders, and becoming "pinkish buff" when alternating with black in the stripes of the back.

Approximate dimensions:—

Head and body 450 mm.; tail 300.

*Hab.* Bornu, North Nigeria.

*Type.* Adult. B.M. no. 5.5.13.2. Collected by Mr. P. A. Talbot and presented to the Natural History Museum.

A second specimen (young) which had been kept in captivity by Capt. Gosling shows that the pale coloration is quite normal and not an individual characteristic.

The species most resembling *Talboti* is *somalicus*, Thos.; but in that species the dark stripes of the colour-pattern are rather dark brown than black, while the paler are a red-brown approaching "hazel," so that the pattern is obscured, while in *Talboti* the contrast between the black and pale bars is strongly marked, though the general colour is even paler than in *somalicus*. The short hair of *Talboti* serves further to distinguish it from the long-haired (40 mm.) *somalicus*, and, lastly, it has a black tip to the tail which is wanting in *somalicus*.

*Lycaon pictus sharicus*, sp. n.

A medium-sized, bright-coloured *Lycaon* with very short hair.

Size intermediate between typical *pictus* from Nyasa and *pictus lupinus* from British East Africa.

Hair short (15 mm.), but not so short as in *L. p. somalicus*. The hair of neck behind ears, above and below, lengthened (20–25 mm.), suggesting a ruff; that of distal  $\frac{2}{3}$  of tail long (60 mm.).

General colour above ochraceous buff, somewhat irregularly mottled with black and in the type specimen with some white blotches on the back; below mottled white, buff, and dark brown, the hair of the belly, however, so short and sparse that the mottled skin shows through, looking almost naked.

Muzzle black as far as the eyes, behind the eyes as far as the ears buffy similar to the ground-colour of the back, but very much less orange; a black median line on crown, extending along neck and indistinctly along back; tail for first third rich buffy, remainder black except for a conspicuous white patch almost immediately following the buffy basal portion and for the white tip. Chin dark brown, almost black. Anterior throat, corresponding with neck behind the ears above, mottled black and white. All hairs the same colour from base to tip.

Skull resembling that of typical *pictus*, especially in the narrowness between the orbits, but the brain-case distinctly fuller than in that form; pterygoid fossa narrow, greatest width 22 mm. against 25 mm. in *p. lupinus* and 27 mm. in typical *pictus*; bullæ smaller than in typical *pictus*, about as in *lupinus*. Teeth small, much smaller than in *pictus*, smaller even than in *lupinus*.

The following are measurements:—

Head and body 1030 mm.; tail 360; hind foot 212; ear 110.

Skull: greatest length 207; basal length 178; length of nasals diagonally 66; interorbital breadth 38; breadth of brain-case 68; palate length 95; length of upper carnassial 19.5; greatest breadth of same 9; length of bullæ 28.

*Hab.* Maui, Shari River.

*Type.* Adult female. Original number 36. Collected 10th May, 1905, by Capt. G. B. Gosling.

The colour-pattern is more nearly bilaterally symmetrical than in any other specimen in the Museum, but probably this is an individual character. Its smaller size serves to distinguish *sharicus* from typical *pictus*, as its greater size does from

*lupinus*, while its short fur differentiates it from all other forms except *pictus somalicus*, Thos. This last form has still shorter hair than *sharicus* and is very markedly smaller.

*Mellivora concisa*, sp. n.

A medium-sized *Mellivora* with the usual white mantle wanting on the rump and tail.

Size smaller than in typical *ratel*.

Hair of back 30 mm. long.

Colour-pattern as in most of the members of the genus, *i. e.* black with a mantle of white extending from the forehead to halfway down the tail, except that the white begins to die out in the median line from about the middle of the back posteriorly, disappearing completely on the rump and base of the tail.

Skull not differing materially from that of *ratel*, except in its markedly smaller size.

Measurements of the type (those of the body taken in the flesh) :—

Head and body 580 mm.; tail 153; hind foot 94; ear 19.

Skull: greatest length 135; basal length 125; breadth of brain-case 60; interorbital breadth 33; palatal length 63; length of upper carnassial 12.5; greatest breadth of same 11.3.

*Hab.* Yo, Lake Chad.

*Type.* Adult male. Original number 62. Collected 7th December, 1904, by Capt. G. B. Gosling.

The complete absence of white on the rump and base of the tail suffices to distinguish *M. concisa* at a glance from any other form. Even should this modification of the usual colour-pattern prove hereafter to be merely individual, which, however, is most improbable, its marked inferiority in size justifies its separation from typical *ratel*.

*Funisciurus Alexandri*, sp. n.

A small *Funisciurus* of the same pattern as *Emini*, Stuhl., but much smaller.

Fur soft but short (8 mm. on the back).

General colour above a greenish yellow, approaching "olive-buff" of Ridgway; from the shoulders to the base of the tail a broad (5 mm.) median band, reddish orange in colour, flanked on each side by a black band half its width, and outside these again by a narrow pale yellowish band on each side. Colour below the same as the ground-colour of the back, but tinged with bright canary-yellow, especially on

the throat and chest. The ground-colour of the back extends over the whole head and face, except the ears, which are conspicuously white. The hairs of the tail (about 15 mm.) ringed pale and dark and pale tipped, except those at the extreme tip, which are longer and broadly black tipped.

Skull, though smaller in all ways, shaped much as in *Emini*; interorbital area, however, proportionally much broader and distinctly flatter, and postorbital processes very much further back than in *Emini*.

The following are measurements of the type specimen, the body-dimensions being those recorded by the collector:—

Head and body 110 mm.; tail 115; hind foot 26; ear 13.

Skull: greatest length 30; basilar length 22; brain-case 14·5; interorbital breadth 9; length of nasals 8·5; upper tooth-row 5·3; true molars 3·7; bullæ 7. (The measurements of the second specimen scarcely differ from these.)

*Hab.* Gudima, R. Iri, Upper Welle.

*Type.* An adult male. Original no. 122. Collected on 29th August, 1906, by Mr. Boyd Alexander. (Two specimens examined.)

Its small size and conspicuous white ears suffice to distinguish *Alexandri* at a glance from any other species.

*Funisciurus Antonia*, sp. n.

A very small striped species, like *F. Alexandri*, but the ears not white and the striping different.

Size slightly greater than in *F. Alexandri*, with which it forms a special section of the group characterized by small size and the short blunt-nosed skull. General ground-colour pale greenish yellow, paler and greyer than in *F. Böhmi* and *Alexandri*. Striping of back exactly as in *F. Böhmi Emini*, *i. e.* with four distinct black stripes, but the outer narrow pair only running halfway up the body from the loins. Median pale stripe about 5 mm. broad, pale yellowish; outer light stripes 2½–3 mm. broad, yellowish white, whiter than the median. Head of the general ground-colour, a dark mark running through the eye, slight in front of it, distinct behind it, succeeded below by a yellow line from whiskers to ear; upper eyelid also yellow. Ears of the general pale greenish-yellow colour, not conspicuously white as in *F. Alexandri*. Under surface broadly washed from chin to anus with bright yellowish buff. Limbs yellowish grey externally, buffy on their inner aspects. Tail slender, grizzled black and pale yellow, as in the allied species.

Skull larger than that of *F. Alexandri*, but of the same

general shape, much shorter than in *F. Böhmi*. Upper incisors very pale yellow in front.

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

Head and body 104 mm.; tail 126; hind foot 25; ear 12.

Skull: greatest length 31.5; basilar length 24.2; greatest breadth 19.4; interorbital breadth 9.6; palatilar length 12.2; length of upper tooth series (exclusive of the minute  $p^3$ ) 5.1.

*Hab.* Ponthierville, above Stanley Falls, Upper Congo. Alt. 2000'.

*Type.* Adult female. Original number 351. Collected 21st February, 1907, by Douglas Carruthers. Two specimens.

This beautiful little squirrel is no doubt most nearly allied to *F. Alexandri* of the Welle, but in colour it almost exactly mimics the much larger *F. Böhmi Emini* which occurs with it.

*Tatera lacustris*, sp. n.

A *Tatera* of the *Emini* group, paler coloured than that species and with smaller bullæ.

Size about the same as *Emini*; fur long and fine, length on the back 15 mm., against 10 mm. in *Emini*; general colour above a rusty buff, pure on the flanks, much grizzled with black on the back, below pure white. Basal three fourths of dorsal hairs a silvery grey, tips buff, but in a certain percentage of the hairs of the back the terminal fourth is black. Cheeks, a patch above the eye and one behind the ears, and the whole of the under surface and inner sides of the limbs pure white. Tail above coloured like the back, below a silvery buff; hairs of terminal third lengthened to form a tuft, which is markedly darker than the rest of the body.

Skull almost as in *Emini*, but the nasals a shade longer and narrower, giving the skull a lighter appearance, and the interparietal more horizontal, making the skull slightly longer. The bullæ appreciably smaller than in *Emini*.

The following are measurements of some specimens:—

	No. 14, ♂, type.	3 ♀.	6 ♀.	7 ♀.	<i>Emini</i> .
Head and body .....	118	123	119	94	140
Tail .....	153	150	153	138	155
Hind foot .....	30	30	29	29	29
Ear .....	19	19	19	19	..
Greatest length of skull .	37	35	36	34	35
Basilar length .....	27	27	27	25	27
Brain-case, width .....	15	15	15	14	14
Interorbital width .....	6.5	6	6.5	6.1	6
Nasals .....	15	14	..	14	13
Upper molar series ....	5.5	5.5	5.3	5.3	5.2
Bullæ .....	9	9	9.1	9	10.4

*Hab.* Lake Chad.

*Type.* An adult male. Original number 14. Collected by Capt. G. B. Gosling on the 9th February, 1905. (Nine specimens examined.)

Wroughton, in his key to the genus *Tatera* (Ann. & Mag. Nat. Hist. xvii. 1906, p. 477), placed *Emini* by itself at the end of the N.-African forms as the only species with a band of hair across the sole of the foot. Since then Thomas has described *Harringtoni* from Abyssinia (Ann. & Mag. Nat. Hist. xviii., Oct. 1906, p. 303), which has the same character, and the present is a third species to be now added to the group. They may be fitted into Wroughton's key as follows:—

Sect. II.—B. *b. b*<sup>1</sup>. Band of hair across sole of foot.

- |   |  |
|---|--|
| <p><i>a</i><sup>2</sup>. Size larger (head and body 140 mm., hind foot 30). Colour darker; lengthened hairs of tail extending over more than half its length. Length of skull 36 mm.; upper molar series 5·2; bullæ 10·4.....</p> <p><i>b</i><sup>3</sup>. Size larger (head and body 120 mm., hind foot 30). Colour paler; lengthened hairs of tail extending over distal third of tail only. Length of skull 36 mm.; upper molar series 5·5; bullæ 9.....</p> <p><i>c</i><sup>4</sup>. Size smaller (head and body 100 mm., hind foot 28). Colour darker; lengthened hairs of tail extending over more than half its length. Length of skull 30·7 mm.; upper molar series 4·3; bullæ 9.....</p> | <p><i>Emini.</i></p> <p><i>lacustris.</i></p> <p><i>Harringtoni.</i></p> |
|---|--|

COLOMYS \*, gen. nov. (*Murinae*).

Like *Malacomys* and *Deomys* in external form, with similarly elongated feet, but the skull wholly different from that of either. Teeth strictly murine.

General form light and slender. Ears large. Forearms thin; thumb with a somewhat elongated nail. Hind limbs also very slender, the feet much lengthened, especially in the metatarsal region; metatarsi apparently somewhat loosely bound together, as though they might splay out from each other in walking on swampy soil. Tail of medium length, very thinly haired, not pencilled.

Skull of medium proportions, not in the least elongate as it is in *Malacomys*. Supraorbital and parietal regions scarcely ridged. Anterior plate of zygoma-root not projected forward, its front edge barely anterior to that of the bridge above. Palatal foramina large and open, but on the

\* κῶλον, a limb. The Greek term for stilts, κωλόβαθρον, is based on this word.

posterior third of the septum between them there are a pair of horizontal bony expansions projecting laterally and partly closing the foramina below. Palation just a little behind the back of  $m^3$ , level with the front edge of the parapterygoid fossæ; these fossæ are broad and well defined anteriorly, but posteriorly the ectopterygoids soon become obsolete. Bullæ of medium proportions.

Incisors narrow, simple, flat or faintly concave in front, but they cannot be said to be grooved. Molars essentially as in *Mus* (comparison made with *M. rattus*), but the pattern rather more zigzagged, the median and lateral cusps higher and the valleys between them deeper. No trace of postero-internal secondary cusps, but on  $m^2$  there is a small antero-external as well as the usual large antero-internal cusp. Cusps of lower molars very upright, not or but little slanted forwards; minute extra cusps present externally between the second and third laminae of  $m_1$  and the two laminae of  $m_2$ , also mesially at the hinder edge of both  $m_1$  and  $m_2$ ;  $m_3$  distinctly bilaminate, the second lamina rather more than half the breadth of the first.

Type. *Colomys Goslingi*, sp. n.

This striking genus has clearly no real relationship to the other long-footed forms, *Malacomys* and *Deomys*, found in the same region. *Deomys* is a member of the Dendromyinae and *Malacomys* has an elongated skull, different in almost every detail from that of *Colomys*.

We have therefore here a very interesting case of geographical isomorphism, three unrelated genera all showing the same elongated metatarsi, and we trust that some observer on the spot may be able to discover what special form of surroundings has produced their common characteristic.

#### *Colomys Goslingi*, sp. n.

About half the bulk of *Mus rattus*. Fur short, rather crisp and velvety in texture, but not spiny; hairs of back 7-8 mm. in length. General colour above between wood-brown and cinnamon, a posterior dorsal area more blackened. Under surface pure sharply defined white, the hairs white to their bases; line of demarcation very high on cheeks and sides, fully halfway up the body, the white area taking in the whole of the fore limbs, which are white throughout, but the hind limbs have a narrow darker line running down behind them to the ankles. Ears fairly large, practically naked, grey; a prominent white spot on the side of the head below the notch. Upper surface of hands white, of feet flesh-colour. Tail finely scaled, 12 scales to the centimetre,

practically naked, the few hairs at the end about a millimetre in length, uniformly grey above and below.

Skull and teeth as described above.

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

Head and body (c.) 140 mm.; tail 156; hind foot 38·5; ear (c.) 17.

Skull: greatest length 32·5; basilar length 26; zygomatic breadth 15·8; nasals 12·2 × 4; interorbital breadth 4·8; brain-case, breadth 14; interparietal 5 × 10·5; anterior zygomatic plate 2·4; palatilar length 15; diastema 9·1; palatal foramina 7·2 × 3·2; length of upper molar series 5·2.

*Hab.* Gambi, Welle R.

*Type.* Adult male. Original number G. B. G. 92. Collected 31st January, 1906, by Capt. G. B. Gosling. One specimen only.

Monbuttu name "Monbongolo."—*G. B. G.*

We have named this handsome species, the type of a most distinct new genus, in honour of its captor, Capt. Gosling, whose untimely death has deprived science of one who took an intense interest in the collection of Mammalia, and who we had hoped would have taken up their study at home with the same zeal that he devoted to their capture abroad.

#### *Thamnomys kuru*, sp. n.

A *Thamnomys* of the *venustus-rutilans* group, but markedly smaller than either of those species.

Fur of back rather long (10 mm.) and silky. General colour above dark brown, grizzled with yellowish buff, below white, more or less stained with pinkish buff.

Whole upper surface of body a dark brown grizzled with orange-buff (the hairs dark slate-colour, a large proportion, almost all at the root of the tail, tipped with orange-buff, the remainder with very dark brown, almost black), paling rather suddenly at the sides into the white of the belly (the hairs of which are white to their bases), a certain amount of orange- or pinkish-buff suffusion modifying the white colour of the under surface of the body, especially on the chest and on inner side of limbs. Tail dark, regularly but sparsely clothed on proximal half with very short brown hairs, thence distally length of hairs increasing until at tip they measure 5–6 mm. in length; rings of tail 20–21 to the inch.

The skull much smaller than in *rutilans*; comparing with a specimen of that species of like age from the Cameroons the skull is one fifth shorter and proportionally narrower and the upper molar series is 5·5 mm. only, instead of 6·2 mm. The first and second molars show the characteristic third

postero-internal cusp quite as plainly as either *venustus* or *rutilans*.

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

Head and body 135 mm.; tail 160; hind foot 24; ear 15.

Skull: greatest length 29; basilar length 23; greatest breadth 15; nasals 10; interorbital breadth 5·6; brain-case breadth 12·7; palatilar length 12·5; diastema 8; palatal foramina 6·5; upper molar series 5·5.

Mr. Alexander has recorded the body-dimensions of another specimen (skull missing), taken the same day and obviously older, as follows:—Head and body 145 mm.; tail 200; hind foot 35 (?25); ear 15. These measurements agree fairly closely, but for the shorter ear, with those of *rutilans* and *venustus*.

*Hab.* Angu, Welle River.

*Type.* Young adult female. Original number 87. Collected by Capt. G. B. Gosling on the 30th January, 1906.

This species, though undoubtedly closely allied to *venustus* and *rutilans*, and, except for the smaller ears and some small differences of fur, texture, and colour, not easy to distinguish externally, is readily separable by the smaller skull and teeth.

#### *Lophuromys major*, sp. n.

A large *Lophuromys* about the size of *Ansorgei*, de Wint., but with the colouring of *aquilus*, True.

General colour above a very dark brown, minutely speckled with cinnamon, merging without any sharply defined line into "vinaceous cinnamon" below.

Hair of the back &c. rather short (8 mm.), shorter than in *Ansorgei*, rather harsher than in *aquilus* and much more so than in *Ansorgei*; basal  $\frac{1}{2}$  or  $\frac{2}{3}$  of each hair cinnamon, the remainder black, with a subterminal cinnamon ring; on the belly the hairs of one colour from base to tip. Crown of head and face coloured like the back; ears and tail looking almost naked to the unaided eye, but covered with minute black hairs through which the skin-colour shows. Chin, throat, and inner side of limbs coloured like the belly, but in a rather darker shade.

Skull markedly larger than in any other species of *Lophuromys* except *Ansorgei*, with which it closely agrees in size and shape. Teeth as in *Ansorgei*.

Dimensions (those of the body measured in the flesh):—

Head and body 145 mm.; tail 72; hind foot 25; ear 15.

Skull: palatilar length 15; brain-case breadth 13; inter-

orbital breadth 7; length of nasals 14·7; upper molar tooth-row 5·5.

*Hab.* Bwanda, R. Ubanghi.

*Type.* Old male. Original no. 44. Collected by Mr. Boyd Alexander, 25th December, 1905.

The species at present known in this genus fall into three well-marked colour-groups, viz.:—(1) general colour without any speckling, either dark brown, as in *sikapusi* from the West Coast and *Ansorgei* from Lake Victoria, or olive-grey, as in *Woosnami*; (2) general colour a dark brown, finely speckled with dark buff or cinnamon, as in *aquilus* from Kilimanjaro and the present form; and (3) general colour a dark brown, coarsely speckled with pale buff or yellow, as in *flavopunctatus* from the extreme north-east of Africa. By its colouring the present species falls in the *aquilus* group, but is markedly larger than any form in that group, and though it closely agrees in all dimensions with *Ansorgei*, it is sharply differentiated from all the *sikapusi* group by its colouring.

*Lophuromys laticeps*, sp. n.

Near *L. aquilus*; the brain-case broader and lower and the palatal foramina shorter.

External characters very much as in *L. aquilus*, though the speckling may be a trifle stronger. General colour of the same warm vandyke-brown above and dull russet below. In a young specimen the posterior back is unspeckled, as in *L. sikapusi*, and the belly is more strongly tawny.

Skull shorter and broader than in *L. aquilus*, the brain-case peculiarly broad, rounded and low, the height from bulla to crown a millimetre or more less than in that species; ridges practically undeveloped behind postorbital processes; anterior root of zygoma projected forward as in *aquilus*, not narrow and slanting as in *L. Woosnami*; palatal foramina unusually short, widely open.

Dimensions of the type (measured in flesh):—

Head and body 108 mm.; tail (broken, in an immature specimen 54 mm.); hind foot 20; ear 18.

Skull: greatest length 29·3; basilar length 24; zygomatic breadth 15·2; nasals, length 11·5; interorbital breadth 6·3; breadth of brain-case 13·7; height of brain-case including bullæ 10·6; palatilar length 12; palatal foramina 6·2; length of upper molar series 5.

*Hab.* Lake Kivu. Alt. 4900'.

*Type.* Adult female in British Museum. Original number 318. Collected 29th November, 1906, by Douglas Carruthers. A second (immature) specimen from the Mfumbiro volcanoes.

This species is no doubt closely allied to the common *L. aquilus* of British East Africa, but may be distinguished by its differently shaped brain-case and shorter palatal foramina.

*Thryonomys Harrisoni*, sp. n.

A *Thryonomys* of the *gregorianus-Scateri* group, more closely allied to the former; the remarkable postorbital processes so characteristic of the latter entirely absent.

Size, judging from the skulls, rather larger than in *gregorianus*.

As compared with the skull of *gregorianus* that of *Harrisoni* is markedly longer and narrower; the frontal depressions less marked; postorbital processes even less developed; the lacrymal bone smaller and the anterior edge of malar broader, so that the distance between these two bones is very markedly smaller, scarcely more than one third the same distance in *gregorianus*; the nasals longer and the portion of the premaxillary flanking them narrower. The following measurements taken on the type skulls of the two species demonstrate these differences very clearly:—

	<i>Harrisoni.</i>	<i>gregorianus.</i>
Greatest length .....	91	82
Greatest breadth .....	52	54
Nasals, length .....	30	26.5
Frontals, length .....	25.5	23
Interorbital breadth .....	28.5	30
Greatest width of rostrum posteriorly, { across premaxillaries .....	20	24
Posterior breadth of nasals .....	13	13
Distance on the orbit between malar { and lacrymal .....	5.5	2
Upper molar series .....	16	16

*Hab.* Loka, 60 miles S.W. of Fort Berkeley, Lado District.

*Type.* Skull and imperfect skin. B.M. no. 4.9.28.2. Collected and presented by Col. J. J. Harrison.

*Lepus chadensis*, sp. n.

A very pale-coloured long-eared hare of rather large size. Size rather larger than in *athiopicus*, *Hawkeri*, &c.

Fur of back short (15 mm.), but soft and silky.

General colour above a drab-grey, with only a very faint buffy suffusion on the back; below pure white. Eye-ring white; exterior margin of ears white, inner margin fringed with pale buff; fringe at tip of ears black outside, pale buff inside. Chin white; neck, above to half the length of the ears, below to the level of the fore legs, "pinkish buff." The hairs of the back pale grey from their bases for half their length, remaining half about equally black and pale buff.

Measurements of the type (taken in the flesh):—

Head and body 434 mm.; tail 115; hind foot 121; ear 97.

*Hab.* Kadde, Lake Chad.

*Type.* Adult male. Original number 19. Collected by Mr. Boyd Alexander on 29th December, 1904.

The present species very closely resembles *L. Hawkeri*, Thos., from the Soudan, which, however, is smaller, darker, and more sandy-coloured.

*Cephalophus rufilatus rubidior*, subsp. n.

A *Cephalophus* related to *rufilatus*, Gr., from Gambia, of about the same size, but much redder in colour.

Fur rather long and harsh. General colour a dark red-brown, near "burnt-sienna," with a narrow median dorsal patch much darker, with a slight bluish tinge. Below a paler shade of the dorsal colour.

Colour-pattern as in *rufilatus*, the dark dorsal area hardly so sharply defined, the "ochraceous buff" ground-colour of that species replaced by "burnt-sienna," and the "smoke-grey" of the nape, dorsal patch, and feet by "slate-grey." Chin and inner side of thighs white in both forms.

Skull entirely as in *rufilatus*, except that the bullæ are larger.

Dimensions of type:—

Head and body 800 mm.; tail 115; hind foot 65; ear 65.

Skull: greatest length 155; basilar length 135; greatest breadth 68; length of nasals 50; length of rostrum in front of orbit 74; length of frontals 65; bullæ 22.5.

*Hab.* Basin of the Upper Welle.

*Type.* Young adult male. Original number 65. Collected by Mr. Boyd Alexander on 30th January, 1906.

A second specimen, obtained at the same time and place, though a female and younger, is exactly like the type. Considering the great distance separating the habitat of this form from that of *rufilatus* on the Gambia, it is perfectly clear that

it should be distinguished from that animal; but as the Museum contains a specimen (unfortunately quite young) from Nigeria which seems to be intermediate between the two, we prefer for the present to consider it merely as a subspecies.

*Cephalophus Claudi*, sp. n.

A *Cephalophus* allied to and about the size of *nigrifrons*, Gray, from the Gaboon, but much darker and richer in colour.

Fur as in *nigrifrons*. General colour above near "burnt-sienna"; only slightly paler on the haunches and belly.

Colour-pattern of the head and face as in *nigrifrons*, but the actual colours darker; a strong suffusion of black on the shoulders: tail for basal third of its length same colour as back; second third very sparsely covered with long whitish hairs; terminal third forming a well-furnished black tuft, the extreme tip with tendency to show white. Throat, belly, and inner side of limbs only slightly paler than back; the belly with a median dark stripe from the chest to the navel. The fore legs "blue" (as in *nigrifrons* and many others), but the body-colour extending down to the metatarsus, much lower than in *nigrifrons*.

Skull: as compared with that of *nigrifrons* markedly longer in front of the orbit, narrower between the orbits, flatter on the forehead; teeth markedly broader; bullæ larger.

Dimensions of the type (taken in the skin):—

Head and body 920 mm.; tail 150; hind foot 210; ear 85.

Skull: greatest length 185; basilar length 170; greatest breadth 77; length of rostrum in front of orbit 102; length of nasals 75; length of frontals 70; interorbital breadth 38; bullæ 27.

*Hab.* Bambili, Welle Basin.

*Type.* Adult female. Original number 118. Collected by Capt. G. B. Gosling on 15th April, 1906.

*Cephalophus rubidus*, Thos., from Ruwenzori is, equally with *nigrifrons*, closely related to the present form. The presence of a white chin-patch and the complete absence of the dark mantle, belly-stripe, and colouring above the hock suffice to distinguish it from *Claudi*. The skull-characters indicated above as separating the present form from *nigrifrons* differentiate it still more markedly from *rubidus*, as is shown by the following comparative measurements:—

	<i>Claudi.</i>	<i>nigrifrons.</i>	<i>rubidus.</i>
Length of rostrum in front of orbit ..	102	92	85
Length of nasals .....	75	70	60
Breadth between orbits .....	38	40	40
Greatest breadth of $m^2$ at alveolus....	12.5	10	10

*Ourebia Goslingi*, sp. n.

An *Ourebia* of the size of *hastata*, Peters, from Nyasa, larger than *kenyæ*, Meinertzh., of British East Africa, and with longer horns than *montana*, Cretzschm., from the Soudan, with a striking black patch on the forehead between the horns, extending on to the base of the ears.

Colour-pattern and colouring as in other members of the genus, but there is a distinct darkening of the back (even blackish in the type specimen), and a well-marked black patch on the forehead between the horns, extending on to the bases of the ears, curiously recalling the somewhat similar marking in the very distinct *O. oribi* of S. Africa.

Skull only equalled in size by that of *hastata*; distinguished by a marked and characteristic convexity of the rostrum, commencing in front of the frontal depression, and extending to the unusually depressed tips of the nasals. Horns longer than in *montana*, but shorter and slighter than in *kenyæ*.

Dimensions of the type:—

Head and body 940 mm.; tail 94; hind foot 300; ear 107.

Skull: greatest length 182; basilar length 160; greatest width 73; length of rostrum in front of orbit 98; length of nasals 65; length of frontals 56; interorbital breadth 44; bullæ 20.

*Hab.* Niangara, Upper Welle Basin.

*Type.* Adult female. Original number 125. Collected by Capt. G. B. Gosling on 9th June, 1906. (Examined two complete specimens and one head-skin and skull.)

The frontal black patch of this species is a very distinctive character, and is equally distinct in all three of the specimens examined. In the Natural History Museum collection there is a specimen of *montana* (?) from the White Nile which has a distinct dark brown patch on the vertex; this, however, does not extend on to the bases of the ears; in no other form is a black patch like that of the present species to be found except in the South African *O. oribi*, a species geographically barred from any close affinity. The larger skull differentiates *O. Goslingi* from either *montana* or *kenyæ*, and from *hastata* it is separated as well by its geographical position as by the peculiar profile of its skull and its black frontal patch.

XLIV.—*A new Freshwater Gammarid from New Zealand.*

By CHARLES CHILTON, M.A., D.Sc., F.L.S., Professor of  
Biology, Canterbury College, New Zealand.

[Plate XI.]

THROUGH the kindness of Mr. J. Crosby Smith, of Invercargill, I am able to describe a new Gammarid from the surface freshwaters of New Zealand. He obtained it from a small pool near the top of Mt. Anglem in Stewart Island at a height of about 2800 feet above sea-level. Unfortunately only one specimen was obtained; however, this is quite sufficient for me to identify the animal satisfactorily, and as it is undoubtedly different from any Gammarid hitherto described from the freshwaters of New Zealand, I venture to describe it as a new species. It is evidently pretty closely allied to the subterranean species *Phreatogammarus fragilis*, and I am referring it to that genus, though it differs from the definition of the genus as given by Mr. Stebbing in having the first gnathopod distinctly smaller than the second and of distinctly different form, for in his generic diagnosis Mr. Stebbing says "First and second gnathopods equal"\*. His diagnosis was, however, drawn up from the single type species, and where a genus is based on minute points of difference as exhibited by a single species it is easy to restrict the characters of a genus too narrowly. I give a brief specific diagnosis and a fuller description of some points in the single specimen I have examined.

*Phreatogammarus propinquus*, sp. n.

(Pl. XI. figs. 1-6.)

In general appearance, antennæ, peræopoda, and uropoda closely resembling *P. fragilis*, but differing in the gnathopoda. First gnathopod smaller than second and of different form, having carpus longer than propod, the latter widening distally and with palm transverse. Second gnathopod with carpus short, subtriangular; propod twice as long as carpus, ovoid; palm very oblique.

Colour "nearly white."

Length of body 5 mm.

*Hab.* Small pool near top of Mt. Anglem, 2800 ft. above sea, Stewart Island, New Zealand.

\* 'Das Tierreich,' Amphipoda, I. Gammaridea, p. 453.

*Remarks.*—I have given above the points that seem to distinguish this species from *P. fragilis*. The following fuller account is based on the single specimen before me:—

Body rather slender; pleon-segments 4 to 6 with one or two fine hair-like setæ on dorsal surface, the fourth with a stout spine on lower margin. Head without rostrum. First antenna rather more than half as long as the body, first joint with a tuft of small tactile setæ on the upper margin near the base, a few hair-like setæ at the distal end, and a small spine-like one on lower side of distal end; second joint about two thirds the length of first, with some slender setæ at extremity; third joint about half as long as second; flagellum of about twenty joints, about twice as long as peduncle; accessory flagellum of four joints. Second antenna about two thirds as long as first; flagellum shorter than peduncle.

I have not examined the mouth-parts in detail, but they appear to be closely similar to those of *P. fragilis*.

First gnathopod smaller than the second; carpus longer than propod, suboblong, posterior margin densely fringed with setæ, a few on the anterior margin; propod widening towards distal end, where its width is about equal to its length; palm transverse, well defined, with a few small spine-like setæ and some long hairs; dactyl rather stout. Second gnathopod with carpus short, triangular, produced on posterior side into a rounded lobe bearing several fine setæ; propod about twice as long as carpus, ovoid, narrowing distally, palm very oblique, occupying two thirds length of posterior margin, supplied with a double row of spine-like setæ and a few fine hairs; dactyl rather stout, closely serrate on inner margin. The third to fifth peræopoda moderately long, but not greatly increasing in length posteriorly, the last reaching as far as the end of pleon; in each the second joint (basos) is moderately broad, about two thirds as broad as long.

First uropod with peduncle longer than the rami, its upper margin with three small spines and a large one at extremity; rami equal, each with a few spine-like setæ; second uropod similar, but with peduncle only as long as rami; third uropod extending much beyond the others, peduncle only about one half as long as rami, which are equal, not narrowing distally, and each with two groups of three spines and a terminal tuft of setæ. Lobes of telson with the posterior margin rounded and bearing two or three fine hairs.

When alive the animal was, Mr. Crosby Smith says,

"nearly white" in colour; whether it is blind or not I cannot say for certain, but I can find no undoubted indications of eyes in the specimen before me.

#### EXPLANATION OF PLATE XI.

*Phreatogammarus propinquus*, sp. n.

*Fig. 1.* First antenna,  $\times 60$ .

*Fig. 2.* Second antenna,  $\times 60$ .

*Fig. 3.* First gnathopod,  $\times 105$ .

*Fig. 4.* Second gnathopod,  $\times 105$ .

*Fig. 5.* Fourth peræopod,  $\times 60$ .

*Fig. 6.* End of pleon with uropoda,  $\times 60$ .

#### XLV.—*On Barbus aureus*, Cope, from Natal.

By G. A. BOULENGER, F.R.S.

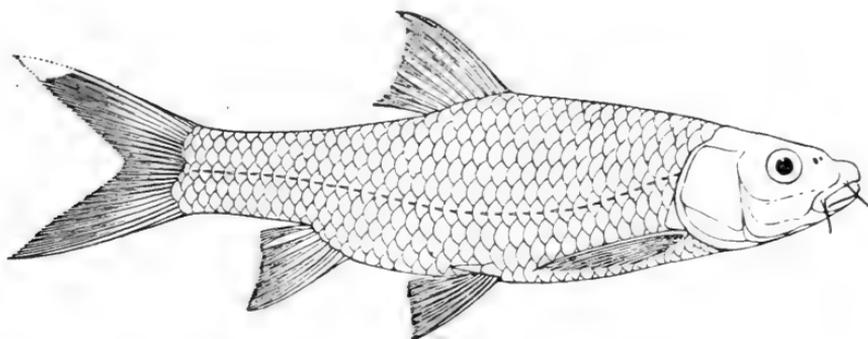
A FISH obtained by Dr. Alden Grout at Umvoti, near the boundary between Natal and Zululand, was described by the late Prof. E. D. Cope in 1869 (Tr. Amer. Philos. Soc. (2) xiii. p. 406) under the name of *Labeobarbus aureus*. The original description was so meagre as to make it impossible to assign the species its position in the system. Having recently had to describe several new Barbels from the eastern parts of South Africa, I felt extremely anxious to know something more of this *Labeobarbus aureus*, the types of which are preserved in the Museum of the Academy of Natural Sciences, Philadelphia. In answer to an application made through my friend Dr. A. Erwin Brown, I have been favoured by the Curator of the Museum with the loan of one of the types, from which I have drawn up the following definition. The other specimen, which I have not seen, has been compared by Mr. W. H. Fowler, who states that he can detect no difference of any importance between the two.

The fish is not referable to the group named *Labeobarbus* by Rüppell. It has the thin lips and the trenchant lower jaw which characterize the genus *Capoëta* as defined by Günther; but its affinities are with *L. Bowkeri*, Blgr., from Natal, which has the edge of the lower jaw rounded and the lower lip continuous across the chin. It affords a further instance of the unsatisfactory arrangement of the species of this genus according to the structure of the mouth and lips, to which I have alluded on previous occasions when describing species from Morocco, Abyssinia, East Africa, and the Transvaal,

which show remarkable agreement in all characters except the mouth and lips.

*Barbus aureus* may be thus defined:—

Depth of body equal to length of head,  $3\frac{2}{3}$  times in total length. Snout rounded, feebly projecting beyond the mouth,  $\frac{1}{3}$  length of head; diameter of eye  $4\frac{1}{2}$  times in length of head, interorbital width 3 times; mouth moderate, evenly curved, its width  $3\frac{1}{3}$  times in length of head; lower jaw with a sharp edge; lips thin, not extending across the chin; two pairs of equal barbels, measuring diameter of eye. Dorsal III 8, third ray not at all enlarged, articulated, smooth; the fin,



*Barbus aureus*, Cope.  $\frac{1}{3}$  nat. size.

which is equally distant from the occiput and from the root of the caudal fin, has the upper border concave, and its longest ray measures  $\frac{2}{3}$  length of head. Anal III 5, longest ray  $\frac{2}{3}$  length of head. Pectoral  $\frac{3}{4}$  length of head. Ventral below origin of dorsal. Caudal deeply forked. Caudal peduncle once and  $\frac{1}{2}$  as long as deep. Scales  $37\frac{6\frac{1}{2}}{5\frac{1}{2}}$ ,  $2\frac{1}{2}$  between lateral line and root of ventral, 16 round caudal peduncle.

Total length 195 mm.

As stated above, *B. aureus* resembles *B. Bowkeri*, differing in the structure of the mouth. In this respect it agrees with *B. rhodesianus*, Blgr., another close ally, in which, however, the barbels are only about half the diameter of the eye and the scales are larger ( $30-32\frac{5\frac{1}{2}}{5\frac{1}{2}}$ ,  $2\frac{1}{2}-3$ , 12). *B. marequensis*, A. Smith, to which Cope regarded *B. aureus* as most nearly allied, has the lower lip continuous, longer barbels, the last simple ray of the dorsal strong and bony, and larger scales ( $33\frac{5\frac{1}{2}}{5\frac{1}{2}}$ , 3, 12).

XLVI.—*Description of a new Cyprinid Fish of the Genus Labeo from the Transvaal.* By G. A. BOULENGER, F.R.S.

*Labeo Ruddi.*

Body strongly compressed, its depth  $3\frac{2}{3}$  to 4 times in total length; length of head  $4\frac{1}{3}$  to  $4\frac{1}{2}$  times in total length. Snout rounded,  $\frac{1}{3}$  length of head; eye perfectly lateral,  $4\frac{1}{2}$  times in length of head; interorbital width half length of head; mouth rather small, its width  $3\frac{1}{2}$  times in length of head; lips without transverse plicæ, with a fringe of conical papillæ; rostral lobe not fringed; no barbels. Dorsal III 9-10, upper edge concave, last simple ray as long as or a little shorter than head; its distance from caudal equals its distance from anterior border of eye. Anal III 5. Pectoral a little shorter than head. Ventral below middle of dorsal. Caudal peduncle once and  $\frac{1}{3}$  to once and  $\frac{1}{2}$  as long as deep. Scales 40-41  $\frac{8\frac{1}{2}}{6\frac{1}{2}}$ , 5 between lateral line and ventral, 18-20 round caudal peduncle. Dark olive-brown above, whitish beneath.

Total length 210 mm.

Four specimens from the Klein Letaba, tributary of the Olifant River (Limpopo System), obtained along with *L. Roseæ*, Stdr., and *L. Darlingi*, Blgr., by Mr. Claud Grant (Rudd Expedition to S. Africa) in August 1905.

XLVII.—*Descriptions of Two new African Lizards of the Genus Latastia.* By G. A. BOULENGER, F.R.S.

*Latastia Johnstoni.*

Head small, rather elongate; snout obtusely pointed. Two superposed postnasals; frontal narrowed posteriorly, grooved anteriorly; two large supraoculars, with a few small shields in front and behind and a series of granules between them and the supraciliaries; interparietal narrow, much longer than broad, in contact with a small occipital; a band-like supratemporal; a curved tympanic; temporal scales granular, smooth; no auricular denticulation; subocular bordering the lip, between the fifth and sixth or sixth and seventh upper labials. Gular scales smooth; collar toothed, with 7 or 8

shields. Dorsal scales small, rhomboidal, feebly imbricate, sharply keeled, 50 to 52 across the middle of the body. Ventral plates in 6 longitudinal and 24 or 25 transverse series; the plates of the two median series narrowest. Two large præanals, one before the other, or three, one in front and two behind. The hind limb reaches the shoulder or the neck. 15 or 16 femoral pores on each side. Upper caudal scales strongly keeled, basal subcaudals smooth. Four black streaks along the back, and a fifth on the nape or on the nape and greater part of the back; sides of neck and body with numerous irregular vertical black bars; lower parts uniform white.

	mm.
Total length .....	220
Head .....	14
Width of head .....	8
From end of snout to fore limb.....	20
"                    "        vent.....	60
Fore limb .....	17
Hind limb.....	34
Tail .....	160

Two male specimens from the Nyika and Masuka Plateaus, British Central Africa (alt. 6000-7000 feet), presented by Sir Harry Johnston, G.C.M.G., K.C.B., in 1897.

#### *Lalastia Burii.*

Head small, elongate; snout acutely pointed. Two superposed postnasals; frontal narrowed posteriorly, grooved anteriorly; two large supraoculars, with a few small shields in front and behind, and a series of granules between them and the supraciliaries; interparietal much longer than broad, separated from the small occipital by a small shield; four supratemporals, first longest; a small tympanic; temporal scales minute, granular, smooth; no auricular denticulation; subocular bordering the lip, between the fifth and sixth or sixth and seventh upper labials. Gular scales smooth; collar toothed, with 9 or 11 shields. Dorsal scales small, hexagonal, juxtaposed, keeled, 42 to 45 across the middle of the body. Ventral plates in 6 or 8 longitudinal and 23 to 25 transverse series; the plates of the two median series a little narrower than the adjacent ones. A large præanal, with a smaller one in front of it. The hind limb reaches between the collar and the ear. 12 to 14 femoral pores on each side. Upper caudal scales strongly keeled, basal subcaudals smooth. Bluish grey in front, pale reddish brown behind; three black

lines along the nape and two black streaks on each side of the head and neck; the median nuchal line and the two lateral streaks continued on the body, fading to reddish brown behind; lower parts uniform white.

	mm.
Total length.....	157
Head.....	13
Width of head.....	7
From end of snout to fore limb.....	19
"                    "        vent.....	52
Fore limb.....	16
Hind limb.....	32
Tail.....	105

Two male specimens from near Berbera, Somaliland (alt. up to 400 feet), collected by Mr. G. W. Bury.

This species comes very near to *L. Bosceæ*, Bedr., which differs in having the dorsal scales smooth (except near the tail) and the dark lines in even number.

XLVIII.—*Description of a new Frog of the Genus*  
*Telmatobius from Brazil.* By G. A. BOULENGER, F.R.S.

*Telmatobius asper.*

Vomerine teeth in two rounded groups behind the level of the choanæ. Head a little broader than long; snout rounded, longer than the eye; no canthus rostralis; nostril nearer the end of the snout than the eye; interorbital space a little broader than the upper eyelid; no tympanum. Fingers moderate, with slightly swollen tips, first not extending quite as far as second; toes with swollen tips, nearly entirely webbed; subarticular tubercles well developed, flat; an oval inner and a rounded outer metatarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin of upper parts closely studded with small warts, each bearing a pearl-like horny tubercle; lower parts smooth. Blackish brown above, with or without large yellowish blotches on the back and a cross-bar between the upper eyelids; limbs with yellowish cross-bars; lower parts brown. Male with an internal vocal sac.

From snout to vent 50 mm.

Four specimens from Theresopolis, Santa Catharina, collected by Mr. J. Michaelis.

XLIX.—*Rhynchotal Notes*.—XLIII. By W. L. DISTANT.

## Fam. Fulgoridæ (continued from p. 295).

## Subfam. DERBINÆ.

During the preparation of these pages my attention was drawn to a 'Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association,' Bull. No. 1, pt. 9 (Honolulu, 1906). This part is entitled "Leaf-Hoppers and their Natural Enemies," by G. W. Kirkaldy, but in fact consists very largely, if not principally, of descriptions of Australian species of Fulgoridæ, with some figures and many indications of new genera. It is singular that, as most of the species described in this fugitive report are from Queensland, there should be so little identity with the species of Derbinæ from the same locality described in this paper. I have, however, carefully studied Kirkaldy's indications of his new genera: those he has figured cause little difficulty; but those without illustration are quite different, as in most instances he has scarcely referred to the tegmina and wings, so important in this subfamily, and thus his publication is left in a rudimentary condition. The figures here given will, however, prevent further confusion, and if any synonymy is found to exist, which I doubt, it may induce Mr. Kirkaldy in future to amplify his generic indications.

## Genus DERBE.

*Derbe*, Fabr. Syst. Rhynch. p. 80 (1803).

Type, *D. hæmorrhoidalis*, Fabr.

*Derbe longitudinalis*, sp. n.

Body pale brownish ochraceous, above with a broad central longitudinal piceous fascia occupying the whole of vertex of head and continued to apex of abdomen; face and clypeus fuscous brown; body beneath and legs pale ochraceous; abdomen above with the lateral margins and apex fuscous brown; tegmina and wings pale luteous, the veins fuscous brown, on basal half of tegmen there are also some intermediate longitudinal fuscous-brown streaks, of which the most prominent are in the subcostal, radial, and claval areas; face concave, with a central incised line, the lateral margins strongly ridged; clypeus centrally and laterally carinate; mesonotum tricarinate; pronotum centrally carinate: scutellum strongly and broadly centrally sulcate.

Long., excl. tegm.,  $7\frac{1}{2}$  mm.; exp. tegm. 26 to 28 mm.

*Hab.* Bolivia (*J. Steinbach*, Brit. Mus.); Ecuador; Cachabé (*Rosenberg*, Brit. Mus.).

In the smaller and varietal specimen from Ecuador the subapical area to the tegmina and the apex of the wings are also fuscous brown.

#### Genus MYSIDIA.

*Mysidia*, Westw. Trans. Linn. Soc. xix. p. 5 (1842).

Type, *M. pallida*, Fabr.

#### *Mysidia nebulosa*.

*Derbe nebulosa*, Germ. in Thon, Ent. Arch. ii. 2, p. 56 (1830).

*Mysidia nebulosa*, Walk. List Hom., Suppl. p. 97 (1858).

Walker (*supra*), evidently with a right determination, described this species as new. Fowler (Biol. Centr.-Am., Rhynch. Hom. ii. p. 73) has followed Walker.

#### *Mysidia Steinbachi*, sp. n.

Body and legs pale stramineous; tegmina and wings creamy white, subhyaline, the first with a fuscous spot extending from costa at about one third from base across radial area, between this spot and apex is another very pale brownish transverse costal spot not reaching middle of tegmen, some of the discal transverse veins also of the same colour; wings with a pale fuscous costal spot at about one third from base which crosses radial area, the discal transverse vein pale brownish; face narrow, broadened towards clypeus, lateral margins strongly ridged; clypeus not or very obsoletely carinate.

Long., excl. tegm., 3 mm.; exp. tegm. 17 mm.

*Hab.* Bolivia (*J. Steinbach*, Brit. Mus.).

From the description apparently allied to *M. puncta*, Fabr.

#### *Mysidia jamaicensis*, sp. n.

Body and legs very pale luteous; tegmina and wings pale creamy, semiopaque, the venation darker, two black spots above clavus, the smallest near its base, the largest near its apex, two black subapical spots, the uppermost smallest, two black dots in basal third of costal area, remaining costal area a little darker with pale spots; wings with a transverse series of three small irregular spots at about one third from base.

Long., excl. tegm., 3 mm.; exp. tegm. 13 mm.

*Hab.* Jamaica; Moneague (Cruise of 'Vallhalla,' *M. J. Nicoll*, Brit. Mus.).

*Mysidia glauca*, sp. n.

Head and pronotum very pale brownish ochraceous; sternum with sanguineous markings; body beneath and legs very pale brownish, somewhat greyishly tomentose; abdomen above pale bluish; tegmina and wings pale bluish, in some lights with a bronzy tint; mesonotum distinctly tricarinate; face and clypeus centrally sanguineous, the lateral margins ridged.

Long., excl. tegm., 3 mm.; exp. tegm. 15 mm.

*Hab.* Lower Amazons; Parana de Buyassu (*E. E. Austen*, Brit. Mus.).

Genus PHENICE.

*Phenice*, Westw. Trans. Linn. Soc. xix. p. 10 (1842).

Type, *P. fritularis*, Boh.

*Phenice australis*, sp. n.

Head and pronotum dark chocolate-brown, the carinations greyish white; metanotum and scutellum greyish white; abdomen above black, with a central longitudinal greyish-white ridge; head and sternum beneath dark chocolate-brown; abdomen beneath black; legs stramineous; tegmina black, a large claval spot extending upward, but not reaching radial vein, a large irregular spot beyond middle extending from radial vein to inner margin, a series of spots to costal area, becoming duplicated near apex, and apical marginal spots greyish white, in the large pale spot beyond middle, but *not* in the claval spot, the veins are black; wings piceous brown, posterior margin broadly greyish white divided by piceous veins.

Long., excl. tegm., 3 mm.; exp. tegm. 17 mm.

*Hab.* Queensland (*P. P. Dodd*, Brit. Mus.).

Allied to the Indian species *P. mæsta*, Westw.

ARFAKA, gen. nov.

Head (including eyes) very much narrower than pronotum; vertex narrow, triangular, widened posteriorly, distinctly produced in front of eyes, centrally longitudinally deflected; face laterally compressed, convex, centrally very narrow, linear, a little widened anteriorly, centrally longitudinally

narrowly sulcate; clypeus about as long as face, tricarinate; antennæ inserted beneath eyes, second joint moderately long and incrassate; pronotum short and strongly laterally emarginate posteriorly, strongly centrally carinate; mesonotum long, tricarinate, anteriorly somewhat strongly narrowed; legs moderately long and slender, posterior tarsi with the basal joint long and moderately thickened; tegmina broadened before middle, a little convexly narrowed to apex, which is truncate, costal area with five transverse veins, upper apical area with four large cells, radial area with a transverse vein near middle, and a broken series of discal transverse veins in longitudinal sequence; wings narrow, less than half the length of tegmina, a transverse vein before middle.

Allied to *Pamendanga*, Dist., but differing by the narrow face, longer clypeus, different shape of the mesonotum, &c.

Type, *A. decisa*, Dist.

*Arfuka decisa*, sp. n.

*decisa*, Walker, MS.

Body and legs stramineous; vertex of head, pronotum, and carinations and posterior margin to mesonotum, greyish white; on each side of pronotum, behind eyes, a testaceous spot; eyes brownish testaceous; apices of the tarsi black; tegmina and wings pale hyaline, with the venation prominent and black.

Long., excl. tegm., 4 mm.; exp. tegm. 16 mm.

*Hab.* New Guinea (*Wallace*, Brit. Mus.).

A specimen of this species in the British Museum is labelled *decisa* in Walker's handwriting, but I cannot trace any publication of a description.

SIKAIANA, gen. nov.

Head (including eyes) very much narrower than pronotum; vertex narrow, triangular, widened posteriorly, its apex a little prominent; face extremely narrow and linear, appearing as a line only between the eyes; clypeus about half the length of face, centrally and laterally carinate; antennæ inserted beneath eyes, very robust, second joint longer than third; pronotum short, very broadly transverse, very strongly centrally carinate; mesonotum tricarinate; legs moderately long and slender; tegmina broadened towards middle, a little convexly narrowed to apex which is rounded, costal membrane with some indistinct transverse veins, radial area short, discoidal areas four, apical areas six, a series of transverse veins

round apical margin; wings much less than half the length of tegmina, discoidal areas long and narrow, a transverse vein near middle of anal area; apical areas four.

Allied to *Pamendanga*, Dist.

Type, *S. hyalinata*, Dist.

By the shape of the pronotum this genus seems to be allied to *Basileocephalus*, Kirk., but the antennae are not "short" as described in that genus, nor are the lateral areas of the pronotum "foliaceous, recurved, practically enclosing the antennae." The only reference to the tegmina and wings given by Kirkaldy is that the first are "elongate, narrow," and the second are not mentioned. It is therefore impossible to locate the position of *Basileocephalus* in the Derbinae.

*Sikaiana hyalinata*, sp. n.

Body and legs very pale tawny yellow, slightly greyishly tomentose; eyes black; tegmina and wings pale hyaline, the venation darker or more ochraceous; tegmina with some pale sanguineous spots on costal area, becoming more numerous

Fig. 1.



*Sikaiana hyalinata*, Dist.

near apex, inner and apical margins a little clouded with pale fuscous; wings with the apical veins and the transverse vein on anal area very slightly and palely fuscous.

Long., excl. tegm., 2 mm.; exp. tegm.  $11\frac{1}{2}$  mm.

Hab. Queensland (F. P. Dodd, Brit. Mus.).

*Sikaiana maculosa*, sp. n.

Head with the margins of vertex greyish white, the eyes dark castaneous; pronotum very pale tawny; mesonotum pale tawny brown, the carinations greyish; abdomen above

and beneath ochraceous, with some castaneous suffusions, especially on the lateral areas; sternum and legs stramineous; tegmina and wings pale hyaline with some opaline reflections; tegmina with the base narrowly pale ochraceous, terminating in a subbasal fuscous spot on costal area, a somewhat large fuscous spot before apex of costal area, another near apex, a series of smaller fuscous spots on apical margin, and a still smaller spot on upper vein of radial area; wings with some subapical marginal spots; antennæ robust, ochraceous, third joint infusate.

Long., excl. tegm., 2 mm.; exp. 10 mm.

*Hab.* Queensland (*F. P. Dodd*, Brit. Mus.).

#### Genus ZORAIDA.

*Thracia*, Westw. Trans. Linn. Soc. xix. p. 10 (1842), nom. præocc.

*Zoraida*, Kirk. Entomologist, 1900, p. 242, n. nom.

Type, *Z. sinuosa*, Westw.

#### *Zoraida nivifera*.

*Thracia nivifera*, Walk. Journ. Linn. Soc., Zool. x. p. 137 (1867).

*Thracia abrupta*, Walk. *loc. cit.*

*Hab.* Batchian, Gilolo.

#### *Zoraida costalis*.

*Thracia costalis*, Walk. Journ. Linn. Soc., Zool. x. p. 136 (1867).

*Thracia dorsalis*, Walk. *loc. cit.* p. 137.

*Hab.* Batchian, New Guinea.

#### *Zoraida scutellaris*.

*Thracia scutellaris*, Walk. Journ. Linn. Soc., Zool. x. p. 135 (1867).

*Thracia anticalis*, Walk. *loc. cit.* p. 136.

*Thracia sexnotata*, Walk. *loc. cit.* p. 139.

*Hab.* Morty, Mysol, Aru.

#### *Zoraida Walkeri*, n. nom.

*Thracia nervosa*, Walk. Journ. Linn. Soc., Zool. x. p. 135 (1867), nom. præocc.

*Hab.* Mysol, New Guinea.

#### *Zoraida borneensis*, sp. n.

Head, pronotum, mesonotum, body beneath, and legs stramineous; abdomen above brownish ochraceous, it and

the scutellum more or less cretaceously sericeous; tegmina hyaline, basal third suffused with ochraceous, the costal area creamy white containing a few brown spots, the subcostal area beyond middle is mostly black, with the veins defining it sanguineous, and beneath the lower vein the black is continued in some prominent angulations, inner and apical margin with small piceous spots at the apices of the veins, the apex has also a subapical transverse line of small spots, most of the transverse veins fuscous; mesonotum prominently tricarinate, the central carination continued through pronotum; clypeus centrally and laterally carinate.

Long., excl. tegm., 5 to  $5\frac{1}{2}$  mm.; exp. tegm. 28 mm.

*Hab.* Borneo; Sandakan (*W. B. Pryer*, Brit. Mus.).

*Zoraida erythraetis*, sp. n.

Body and legs dark ochraceous; vertex of head, lateral margins of pro- and mesonota, abdominal anal segment, longitudinal streaks to femora and sternum, and abdomen beneath sanguineous; tegmina hyaline, crossed by three broad pale fuscous fasciæ, the first about one third from base, the second just beyond middle, and the third at apex; in these dark fasciæ the veins are red, remaining venation yellowish; costal area yellowish, reddish from base to first dark fascia and from second dark fascia to apex; wings hyaline, with the venation darker; second joint of antennæ reddish, longer than head and pronotum together; mesonotum distinctly tricarinate, the central carination continued through the pronotum.

Long., excl. tegm., 5 mm.; exp. tegm. 25 mm.

*Hab.* Borneo; Kuching.

*Zoraida cycnoptera*, sp. n.

Pronotum, mesonotum, scutellum, body beneath, and legs stramineous; abdomen above, posterior disk of pronotum, vertex of head, face, and clypeus testaceous; tegmina hyaline, the venation fuscous, costal area for about one third from base fuscous brown, with creamy-white spots, remaining area ochraceous, with a prominent black spot before apex, costal and subcostal veins testaceous red, upper apical area piceous, apical margin and extremities of apical veins testaceous red in ♂, in ♀ the two central extremities stramineous; wings hyaline, the venation fuscous; mesonotum tricarinate, the central carination continued through pronotum; clypeus centrally and laterally carinate.

Long., excl. tegm., ♂  $4\frac{1}{2}$ , ♀ 6 mm.; exp. tegm., ♂ 24, ♀ 30 mm.

*Hab.* Queensland (*F. P. Dodd*, Brit. Mus.).

Allied to *Z. Essingtoni*, Westw.

*Zoraida eupæcila*, sp. n.

Head, antennæ, pronotum, mesonotum, scutellum, and abdomen tawny brown; sternum and legs stramineous; carinations to pronotum and mesonotum distinctly paler and pale ochraceous in hue; eyes black; tegmina very pale fuliginous, subhyaline, infuscated on basal area, where there is a distinct white spot beneath radial area, veins fuscous, costal area greyish white, with an elongate fuscous spot near middle and another nearer apical area; beneath the costal area the colour is narrowly fuscous, broken with a large creamy-white spot just before the second dark spot in costal area, costal margin at apex testaceous, and the apical margin creamy white, before the latter a transverse series of four small fuscous spots placed on the veins, a large fuscous spot at end of clavus; wings very pale fuliginous, with the veins fuscous; second joint of antennæ robust, as long as head and thorax together.

Long., excl. tegm., 5 mm.; exp. tegm. 22 mm.

*Hab.* Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

*Zoraida consanguinea*, sp. n.

Allied to *Z. eupæcila*, and differing principally by the tegmina, which are very much more broadly and regularly fuscous beneath the costal area, the latter creamy white, with three elongate fuscous spots on basal third, subapical transverse spots obsolete, veins to discoidal areas more transversely and less longitudinally oblique.

Long., excl. tegm., 4 mm.; exp. tegm. 18-23 mm.

*Hab.* Queensland (*F. P. Dodd*, Brit. Mus.).

*Zoraida cydista*, sp. n.

Head (including eyes) ferruginous brown; thorax above stramineous, mesonotum a little transversely piceous near base; scutellum cretaceously white; abdomen above testaceous, basal half of disk cretaceously white; body beneath and legs stramineous; tegmina hyaline, venation fuscous; costa, costal and subcostal veins purplish red, beyond middle the spaces between these veins are piceous; beneath and attached to the lower red veins some piceous spots, of which

the most prominent are one about middle and another nearer apex, apical margin between the veins piceous; wings hyaline, the venation fuscous; antennæ with the second joint stramineous, its apex ochraceous, as long as head and thorax together; mesonotum distinctly tricarinate, the carinations very slightly paler.

Long., excl. tegm., 3 mm.; exp. tegm. 19-21 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

*Zoraida picta*, sp. n.

Above and beneath pale ochraceous; eyes black; pronotum stramineous; abdomen above with angulate fasciate sanguineous markings and with a curved black discal line on each side a little beyond middle; tegmina hyaline, the veins fuscous, costal area pale testaceous, an oblique black spot in subcostal area at about two thirds from base and a black spot at its apex, the veins emanating from the subcostal vein black at their bases; mesonotum faintly tricarinate; second joint of antennæ minutely black-speckled, with its apex darker ochraceous, as long as head and thorax together.

Long., excl. tegm.,  $4\frac{1}{2}$  mm.; exp. tegm. 21 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Genus DRONA.

*Drona*, Dist. Faun. B. I., Rhynch. iii. p. 305 (1906).

Type, *D. carnosa*, Westw.

In describing this genus, founded on the type of Westwood's *carnosa* contained in the British Museum, and a somewhat antique specimen, I could not see any carinations to the mesonotum, nor could the artist who drew the figure. Since then I have been able to examine specimens in better condition, and the mesonotum must be described as tricarinate, even if in some examples faintly so. The male anal armature is a very prominent character.

*Drona lanius*.

*Derbe lanius*, Stål, Öfv. Vet.-Ak. Förh. 1855, p. 94.

*Thracia lanius*, Stål, Hem. Afr. iv. p. 195 (1866).

Hab. Caffraria.

*Drona apicalis*.

*Thracia apicalis*, Hagl. Öfv. Vet.-Ak. Förh. 1899, p. 64.

Hab. Congo.

*Drona Grahami*, sp. n.

Body and legs testaceous red; tegmina subhyaline, slightly fuliginous, veins a little darker, costal margin and subcostal vein piceous; costal area and stigma flavescent; wings flavescent, posterior margin broadly piceous, a somewhat large spot near middle of anterior margin black; male with three long anal appendages, the uppermost deflected from near base and directed downwards, its apex acute, the two lowermost directed strongly outwards and then as strongly directed inwardly and downward; mesonotum tricarinate.

Long., excl. tegm., 3 mm.; exp. tegm. 16 mm.

*Hab.* Ashanti; Obuasi (*W. M. Graham*, Brit. Mus.).

*Drona biclavata*.

*Derbe* (*Phenice*?) *biclavata*, Westw. Ann. & Mag. Nat. Hist. (2) vii. p. 209 (1851).

*Hab.* Congo.

A remnant of the type of this species is in the British Museum collection, which, with the description given by Westwood, leaves no reasonable doubt that it should be included in the genus *Drona*.

## CAMMA, gen. nov.

Vertex of head projecting a little in front of eyes, a little narrowed anteriorly, the margins strongly ridged, the anterior margin notched; face elongate, widest at base, margins strongly ridged, downwardly recurved, shorter than clypeus; antennæ inserted beneath eyes, second joint moderately long and globose; pronotum narrow, its posterior margin strongly concavely sinuate, centrally longitudinally carinate; mesonotum tricarinate, the lateral carinations sinuate, the central carination straight; legs simple; tegmina about three times as long as broad, somewhat narrow at base, the costal area strongly convexly amplified to about one third from base, radial area very long, crossed near middle by a transverse vein, a central longitudinal series of transverse veins defining a series of discoidal areas, apical areas short, four in number; wings little more than one third the length of tegmina, narrow, apically widened.

Type, *C. dilatata*, Westw.

*Camma dilatata*.

*Derbe* (*Phenice*?) *dilatata*, Westw. Ann. & Mag. Nat. Hist. (2) vii. p. 209 (1851).

*Hab.* Sierra Leone (type in Brit. Mus.).

Fig. 2.

*Camma dilatata*, Westw.

## Genus VIVAHA.

*Vivaha*, Dist. Faun. B. I., Rhynch. iii. p. 307 (1906).

Type, *V. facialis*, Dist.

*Vivaha saniosa*, sp. n.

Body and legs very pale stramineous; vertex (excluding margins), upper lateral sides of vertex and front of face, and a central longitudinal fascia to mesonotum and scutellum sanguineous; tegmina pale semihyaline, the venation pale stramineous, inner margin to a little beyond end of clavus and a spot above apex of clavus sanguineous, beyond the red inner margin the apical margin is ochraceous; wings pale hyaline; head produced in front of eyes into a broad flattened laminate process.

Long., excl. tegm., 4 mm.; exp. tegm. 16 mm.

*Hab.* Queensland (*f. P. Dodd*, Brit. Mus.).

*Vivaha delicata*.

*Interamma delicata*, Walk. Journ. Linn. Soc., Zool. x. p. 118, pl. iii. fig. 6 (1867).

*Hab.* New Guinea.

The *Interamma angusta*, Walk., may also belong to the genus *Vivaha*, but the unique typical specimen in the British Museum is without a head.

## ARUNTA, gen. nov.

Vertex of head longly produced in front of eyes, broad, laterally sinuate, apically widened and centrally notched on anterior margin; antennæ inserted at some distance beneath eyes, second joint long and broad; head laterally broad and spatulate, very much compressed, face very long, attenuated centrally, marginally strongly ridged; clypeus short, globose; pronotum moderately triangularly anteriorly produced, its posterior margin equally angularly sinuate; mesonotum tricarinate, apical joint of rostrum very short; legs slender; tegmina elongate, gradually broadening to apex, which is truncate, discoidal areas four, lowermost longest, second shortest and triangular; wings a little shorter than tegmina, but considerably broader, two subapical transverse veins, third apical area short, triangular.

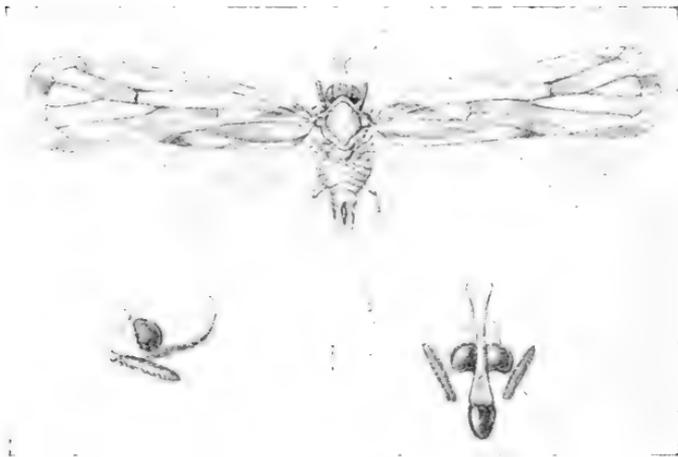
Type, *A. rubrovenosa*, Dist.

Allied to *Phantasmatocera*, Kirk., from which it differs by the different shape and structure of the head, the longer antennæ, apically truncate tegmina, with short and less numerous apical areas. In his short generic indication Kirkaldy does not refer to the wings.

*Arunta rubrovenosa*, sp. n.

Head creamy white, margins of face as far as eyes black;

Fig. 3.

*Arunta rubrovenosa*, Dist.

face before eyes pale ochraceous; clypeus and inner margin of eyes black; eyes and second joint of antennæ fuscous

brown; pronotum creamy white; mesonotum ochraceous, with a black fascia near each anterior lateral margin; tegmina creamy white, subhyaline, interior area from base to lower apical area pale fuscous, the discoidal longitudinal veins sanguineous, the transverse veins fuscous; wings pale creamy white, subhyaline.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm. 8 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

#### KURANDA, gen. nov.

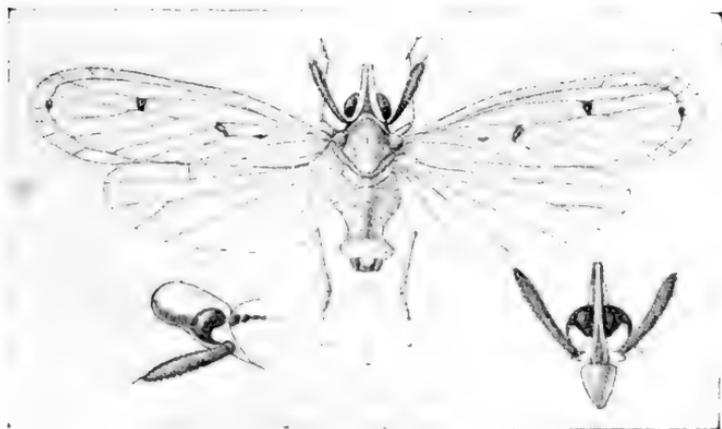
Vertex of head somewhat longly produced in front of eyes, narrowed anteriorly, lateral margins very strongly ridged; head laterally much compressed, face long and slender, slightly widened towards clypeus, which is very much shorter than face; antennæ inserted at some distance beneath eyes, the second joint very long and robust; pronotum very short; mesonotum subelongate, faintly carinate; tegmina more than three times longer than broad, apically round, apical areas short and continued round apex of costal margin, costal area moderately broad; wings broader and shorter than tegmina.

Type, *K. notata*, Dist.

#### *Kuranda notata*, sp. n.

Body and legs pale ochraceous, eyes and antennæ black; tegmina very pale creamy ochraceous, with four piceous spots,

Fig. 4.



*Kuranda notata*, Dist.

the smallest near base, two discal, and one near apical margin; wings pale hyaline.

Var.—Tegmina with an irregular piceous fascia extending from the basal spot to near apex of inner margin.

Long., excl. tegm.,  $3\frac{1}{2}$  mm. ; exp. tegm. 10 mm.

Hab. Queensland ; Kuranda (F. P. Dodd, Brit. Mus.).

MAKULA, gen. nov.

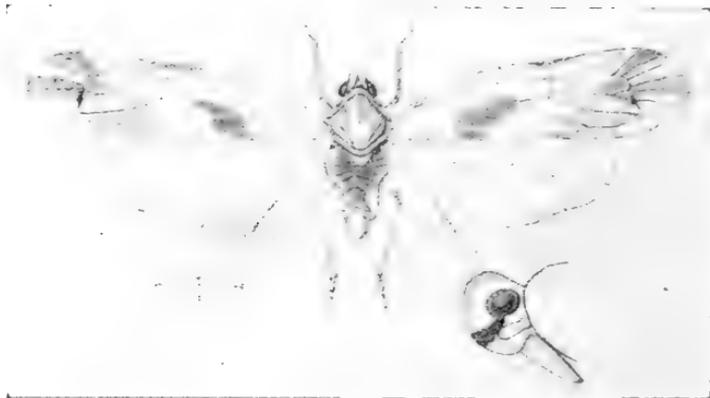
Vertex of head broad, moderately produced in front of eyes, triangularly foveate on disk, lateral areas of head broad, compressed, face narrow, curved downward, not continuous with the clypeus, which is very robust ; pronotum very narrow ; mesonotum elongate, tricarinate, the central carination straight and almost percurrent, the lateral carinations short and curved inwardly ; legs simple ; tegmina about three times as long as broad, costal margin sinuate, apex obtusely rounded, two series of transverse veins, the first a little beyond middle, and non-continuous, defining five discoidal areas, the second series more continuous, subapical, and enclosing the apical areas ; wings shorter and broader than the tegmina.

Type, *M. ornata*, Dist.

*Makula ornata*, sp. n.

Head, pronotum, scutellum, body beneath, and legs stramineous ; abdomen above fuscous, the lateral areas and apex

Fig. 5.



*Makula ornata*, Dist.

stramineous ; tegmina greyish white, subhyaline, a large oblique spot before middle, commencing near inner margin

and terminating at lower margin of radial area, a small streak on costal margin beyond middle, and a broken apical spot which is more faintly continued to inner margin, fuscous or piceous, on the area of these apical fuscous suffusions the veins are sanguineous; wings pale hyaline.

Long., excl. tegm., 2 mm.; exp. tegm. 10 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

*Makula parviceps*.

*Brevia parviceps*, Walk. Journ. Linn. Soc., Zool. x. p. 113 (1867).

Hab. Mysol.

*Makula pictipennis*.

*Brevia pictipennis*, Walk. Journ. Linn. Soc., Zool. x. p. 113 (1867).

Hab. Morty.

*Makula testacea*.

*Brevia testacea*, Walk. Journ. Linn. Soc., Zool. x. p. 115 (1867).

Hab. Mysol.

Genus RHOTANA.

*Rhotana*, Walk. Journ. Linn. Soc., Zool. i. p. 160 (1857).

Type, *R. latipennis*, Walk.

Walker gave a wrong reference to his figure of the type. It should be pl. viii. fig. 1, and the type of *Paricana*, Walk., should be pl. viii. fig. 2.

*Rhotana ramentosa*, sp. n.

Body very pale testaceous, more or less greyishly tomentose; eyes black; legs stramineous; tegmina subhyaline, talc-like, more or less iridescent, the veins ochraceous, the series of transverse veins separating the apical areas, and most of the apical veins, broadly ochraceous, costal area pale, with two dark costal marginal spots, one before and one at apex, a small dark spot on costal margin above the series of transverse subapical veins, and another beneath these veins on inner margin, a similar small spot on apical margin, a transverse creamy-white spot in costal area beyond middle; wings pale hyaline; tegmina with the transverse subapical series of veins posteriorly curved and terminating near apex of clavus; apical areas short.

Long., excl. tegm., 3 mm.; exp. tegm. 12 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

*Rhotana transversa*, sp. n.

Body above ochraceous, beneath with legs paler; scutellum pale sanguineous; tegmina and wings subhyaline, talc-like, the veins more or less ochraceous; tegmina crossed by two narrow very pale fuscous transverse fasciæ, the first at about one third from base and not extending to the costal area, the second subapical, between is a third very short fascia, commencing on costal margin and only extending about one third across tegmen, a spot on costal area above the first fascia and a series of small spots on apical margin.

Allied to *R. ramentosa*, Dist., but to be easily separated from that species by the direction of the subapical transverse fascia, which follows the direction of the subapical transverse veins and is not curved inwardly to apex of clavus as in *R. ramentosa*, but terminates near posterior angle of the inner margin.

Long., excl. tegm., 2 mm.; exp. tegm. 9 mm.

Hab. Queensland (F. P. Dodd, Brit. Mus.).

*Rhotana opalina*, sp. n.

Body and legs pale ochraceous; disk of mesonotum, scutellum, and body beneath sanguineous; eyes black; tegmina subhyaline, talc-like, with opaline reflections, the venation ochraceous, a subapical undulating fascia, preceded by two short fasciæ, extending from costa to near middle of tegmen, the outer half of inner margin, and a series of small apical marginal spots very pale fuscous, a central edge-like spot to costal margin, edge of apical margin, and the apices of the upper apical veins white; wings pale hyaline; tegmina with the costal margin somewhat strongly sinuate beyond middle, the transverse series of subapical veins not posteriorly curved inwards, but nearly straightly transverse.

Long., excl. tegm., 2 mm.; exp. tegm. 9 mm.

Hab. Queensland (F. P. Dodd, Brit. Mus.).

*Rhotana septemmaculata*, sp. n.

Body and legs pale ochraceous, beneath a little paler than above; tegmina and wings pale hyaline, talc-like, the venation ochraceous; tegmina with a broad, outwardly angulate, pale ochraceous fascia at about one third from base, and two narrow, transverse, subapical, pale fuscous fasciæ, a cluster of about seven prominent black spots, which are somewhat arranged in two longitudinal series on inner apical area.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm. 9 mm.

Hab. Queensland (F. P. Dodd, Brit. Mus.).

*Rhotana quadrimaculata*, sp. n.

Body and legs ochraceous; tegmina pale shining ochraceous, with opaline reflections, the subapical transverse veins and the longitudinal veins to apical areas testaceous, a central apical marginal series of four black spots, each placed near the apex of a longitudinal vein; wings pale hyaline, with opaline lustre; the subapical series of transverse veins continued inwardly to apex of clavus.

Long., excl. tegm.,  $3\frac{1}{2}$  mm.; exp. tegm. 11 mm.

*Hab.* Queensland (*P. P. Dodd*, Brit. Mus.).

Kirkaldy (Rep. Exp. Stat. Haw. Plant. Assoc. pl. ix. p. 435) has described two species of *Rhotana* from Queensland. Of the first, *R. chrysonoe*, the British Museum possesses a single carded specimen, which appears to agree with the description and has now been doubtfully labelled as that species in the collection. The description of the second species is inadequate for identification without seeing a typical specimen.

## Genus NISIA.

*Nisia*, Melich. Hom. Faun. Ceylon, p. 53 (1903); Dist. Faun. B. I., Rhynch. iii. pp. 296 & 309 (1906); Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 427 (1906).

Kirkaldy writes: "This genus seems to be but slightly differentiated from *Kermesia*, Melich." On the contrary, the shape of the tegmina is quite divergent and the number of apical areas different, eight or nine in *Kermesia*, five in *Nisia*.

## Genus PHACONEURA.

*Phaconeura*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 427 (1906).

Type, *P. Froggatti*, Kirk.

It is necessary to point out that Kirkaldy, in the short description of his typical species, refers to pl. xxix. figs. 5-6, whereas it should be, as later on correctly stated in the "Description of Plates," pl. xxix. figs. 3-4.

## FENUAHALA, gen. nov.

Vertex of head projecting a little in front of eyes, gradually narrowing to apex, its margins very strongly ridged; lateral areas of head compressed; face long and narrow, medially attenuated; clypeus almost as long as face; antennae inserted nearer base of clypeus than to eyes, the second joint long,

broad, and spatulate; apical joint of rostrum minute; pronotum very short, triangularly sinuate; mesonotum with its anterior margin strongly angulate, discally tricarinate; legs simple; tegmina about three times as long as broad, apically amplified, apical margin subtruncate, a subapical line formed by transverse veins separating a number of short apical areas, which commence at apex of costal margin and are continued to near end of clavus, where they are larger, a transverse vein beyond apex of radial area; wings extending to posterior angle of inner margin of tegmina, a prominent transverse vein beyond apex of radial area.

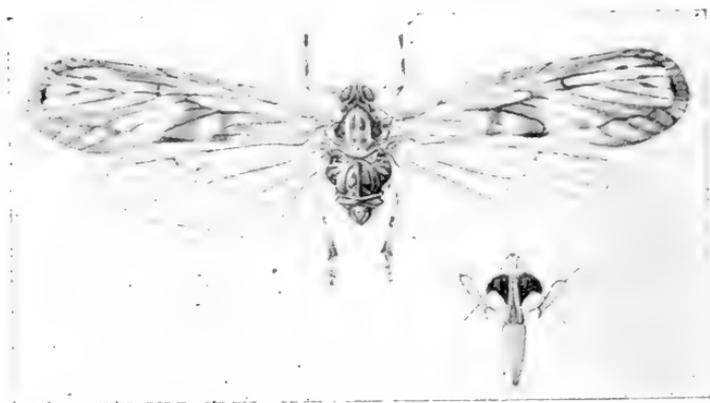
Type, *F. infuscata*, Dist.

This genus appears to have some affinity with *Heronax*, Kirk., but it is impossible to form a definite opinion. In the indications given of that genus Kirkaldy writes: "Allied to *Patara*, Westwood, but the venation is different." He, however, abstains from any description of the venation, nor does he mention the tegmina either as regards shape or breadth, or in relation to the wings, which are also not alluded to.

*Fenuahala infuscata*, sp. n.

Body above pale dull umber-brown, abdomen with darker and paler suffusions; body beneath a little paler than above;

Fig. 6.



*Fenuahala infuscata*, Dist.

legs stramineous, apices of femora and annulations to tibiae fuscous brown; tegmina pale hyaline, talc-like, the veins

fuscous brown, the same colour more or less suffuses the apical areas and irregularly appears on disk and more palely so in clavus, costal area with transverse fuscous spots; near centre of subapical margin is a prominent piceous spot; wings pale hyaline.

Long., excl. tegm., 3 mm.; exp. tegm. 16 mm.

*Hab.* Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

*Fenuahala rubrinervis*, sp. n.

Body above fuscous, more or less greyishly tomentose, lateral margins of the vertex of head greyish white; antennæ, body beneath, and legs very pale ochraceous; eyes dark castaneous; tegmina greyish subhyaline, with dark fuscous markings, the principal greyish areas being costal and claval, three small discal spots, and three large irregular spots on apical area, three small fuscous spots in costal area beyond middle, veins to apical marginal areas sanguineous; wings very pale fuliginous with a slight opaline lustre, veins dark fuscous.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm. 14 mm.

*Hab.* Queensland; Cairns District (*F. P. Dodd*, Brit. Mus.).

*Fenuahala juno*, sp. n.

Body above piceous; body beneath and legs stramineous, lateral margins of sternum and lateral margin and apical area of abdomen piceous; tegmina piceous, the veins to apical marginal areas sanguineous, on under surface the costal margin beyond middle also sanguineous; wings very pale fuliginous, the veins darker.

Long., excl. tegm., 2 mm.; exp. tegm. 12 mm.

*Hab.* Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

A small species, to be recognized by its very distinct coloration.

*Fenuahala pallescens*, sp. n.

Body above pale tawny, more or less greyishly tomentose; vertex of head cretaceous white; eyes piceous; body beneath and legs stramineous, apex of abdomen slightly testaceous; tegmina and wings subhyaline, with a slight opaline lustre, the veins very pale dull ochraceous; tegmina with the inner claval margin pale dull ochraceous.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm.  $12\frac{1}{2}$  mm.

*Hab.* Queensland (*F. P. Dodd*, Brit. Mus.).

## URABUNNA, gen. nov.

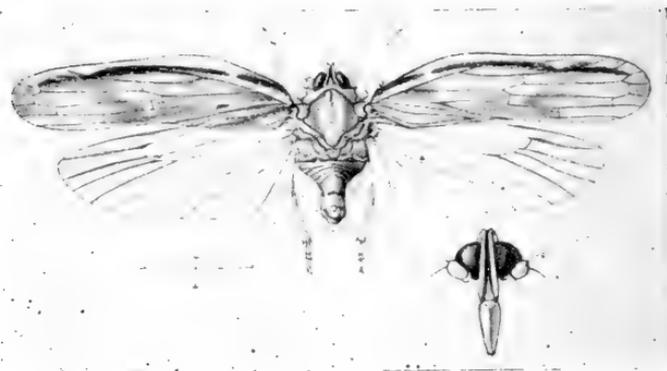
Vertex of head moderately projecting beyond eyes, narrowing to apex, which is angularly sinuate, margins strongly ridged; face narrow, lateral margins strongly ridged, a little widened posteriorly, longer than clypeus; rostrum with the apical joint minute; antennæ short, globose, inserted immediately beneath eyes; pronotum short, concavely sinuate; mesonotum tricarinate; legs simple; tegmina elongate, more than three times longer than broad, costal margin prominently arched a little beyond base, thence somewhat narrowed to apex, which is moderately rounded, two transverse veins near middle, one beyond clavus, another limiting penultimate apical area, and two or three subapical, which help to define a series of short apical areas continued round apex of costal margin; wings ample, much broader than tegmina, about reaching posterior angle of tegminal inner margin, the apical veins very pronounced.

Type, *U. lineata*, Dist.

*Urabunna lineata*, sp. n.

Body and legs dull ochraceous; abdomen somewhat greyish tomentose; tegmina pale greyish subhyaline, much suffused with fuscous brown, costal area pale, traversed by a broken, longitudinal, piceous, linear fascia which almost

Fig. 7.

*Urabunna lineata*, Dist.

reaches apex; wings hyaline, the apical veins prominent and infuscate.

Long., excl. tegm., 3 mm.; exp. tegm. 13-14 mm.

Hab. Queensland (F. P. Dodd, Brit. Mus.).

## APPENDIX.

I have further examined Mr. Kirkaldy's paper describing Australian Fulgoridæ under the title of "Leaf-Hoppers and their Natural Enemies," published at Honolulu, in comparison with the descriptions of some Queensland Fulgoridæ which have appeared in these pages and elsewhere. The following notes are necessary.

Subfam. *EURYBRACHYDINÆ*.*Dardus obscurus*.

*Dardus obscurus*, Dist. Trans. Ent. Soc. Lond. 1892, p. 283.

*Dardus immaculatus*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 446 (1906).

*Hab.* Queensland.

Subfam. *DICTYOPHARINÆ*.*Dictyophara bifasciata*.

*Dictyophara bifasciata*, Dist. Trans. Ent. Soc. Lond. 1892, p. 279.

*Thanatodictya (Lucinda) lucindæ*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 392 (1906).

*Hab.* Queensland.

*Dictyophara insignis*.

*Dictyophara insignis*, Dist. Trans. Ent. Soc. Lond. 1892, p. 279.

*Thanatodictya (Niculda) anadyomene*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 393 (1906).

Subfam. *CIXIINÆ*.

In the genus *Oliarus* Kirkaldy has described nine Australian species, and I have described two from Queensland, which, even by the aid of his tabular synopsis, I cannot decide as synonymic or otherwise. One thing, however, is certain, we have both used *lubra* as a specific name; I therefore alter mine.

*Oliarus incerta*, n. nom.

*Oliarus lubra*, Dist. Ann. & Mag. Nat. Hist. (7) xix. p. 282 (1907).

Subfam. *TROPIDUCHINÆ*.Genus *FICARASA*.

*Ficarasa*, Walk. Journ. Linn. Soc., Zool. i. p. 162 (1857).

*Peltodictya*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 414 (1906).

The species I described as *F. australasiæ* (Ann. & Mag. Nat. Hist., *ante*, p. 287) is apparently closely allied to the one described by Kirkaldy as *P. kurandæ*, but nothing definitely can be decided from Kirkaldy's description, which is simply—"Grass-green. Eyes and genital segments partly brownish. Veins lightly and shortly piligerous"—and is applicable to almost any species in the genus.

*Vanua vitiensis*.

*Vanua vitiensis*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 416, pl. xxvii. figs. 6-7 (1906).

It may be useful to point out that Kirkaldy, in his description, has referred this species to pl. xxvii. figs. 7-9; it should be figs. 6-7.

Subfam. *ACHILINÆ*.Genus *ANEIPO*.

*Aneipo*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 425 (1906).  
*Tudea*, Dist. Ann. & Mag. Nat. Hist. (7) xix. p. 290 (1907).

*Aneipo diva*.

*Aneipo diva*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 425 (1906).

*Tudea picturata*, Dist. Ann. & Mag. Nat. Hist. (7) xix. p. 290 (1907).

*Hab.* Queensland.

I.—*Some new Species and Genera of Lamellicorn Coleoptera from the Indian Empire.* By GILBERT J. ARROW.

## PART II.

## Copridæ.

*Cassolus humeralis*, sp. n.

Rufo-piceus, capite prothoraceque rufo-cupreis elytrorumque humeris flavo-maculatis: breviter ovatus, convexus; capite crebro punctato, antice 4-dentato; prothorace paulo minus crebre punctato,

elytrorum latitudine, lateribus fortiter curvatis, antice vix angustatis, angulis posticis vix perspicuis; elytris profunde punctato-striatis, interstitiis lævibus; pygidio fortiter punctato; tibiis anticis extus minute denticulatis, dentibusque tribus validis acutis armatis, tibiis 4 posterioribus valde curvatis, tarsorum posticorum articulo primo quam secundum distincte longiore.

♂. Tibia antica subtus unispinosa, tibiis posticis gracilioribus femoribusque posticis subtus dilatatis.

Long. 4.5 mm.

*Hab.* Assam, Sudiya, Patkai Mts.

Piceous black, with a slight metallic tinge, and having the head and prothorax coppery and the elytra decorated upon each shoulder with a small round yellow spot.

The form is short and compact. The head is closely punctured and without visible sutures or elevations, but the front margin is armed with four teeth, of which the middle pair are the longest and most acute. The prothorax is moderately closely punctured, but very shining; it is as broad as the elytra and not much narrower in front, with the sides strongly and uniformly curved and the hind angles obsolete. The elytra are strongly punctate-striate and the pygidium strongly and rather closely punctured. The front tibiæ are strongly tridentate and very finely denticulate between and above the teeth. The middle and hind tibiæ are slender and curved, and the tarsi have the first joint nearly twice as long as the second and the remainder nearly equal.

The male has a perpendicular tooth beneath the front tibia, the hind tibia is longer, more slender and more strongly curved than that of the female, and the hind femur is strongly dilated, the flange forming an obtuse angle near the knee.

Several specimens were collected by Doherty.

Although two species of *Cassolus* have already been described by Sharp and Lansberge (*C. nudus*, Sharp, Siam, and *C. sumatranus*, Lansb., Sumatra), the very interesting sexual characters have not yet been noticed. In the appendix to this paper I have described another species in which other sexual differences are found. I have not yet seen either of the previously described forms, but the present insect appears to be like *C. nudus*, Sharp, but sufficiently distinguished by the yellow shoulder-spots and the puncturation of the pygidium, which is closer than that of the prothorax.

*Panelus assamensis*, sp. n.

Castaneus, lævis, nitidus, breviter ovatus, postice latior: *P. parvulus* similimus, sed prothoracis parte posteriore levigata, linea elevata

arcuata distincte demarcata; elytris paulo distinctius striatis et punctatis; metasterno medio antice valde producto, acute angulato; pedibus gracilibus, tibiis omnibus curvatis, tarsis 4 posterioribus longis, robustis, anticis brevibus.

Long. 2.5 mm.

*Hab.* Assam, Sudiya, Patkai Mts.

Three specimens were collected by Mr. Doherty, in which no sexual difference is apparent.

This little insect, one of the smallest Lamellicorn beetles yet known, has a very great resemblance to the Japanese *Panelus parvulus*, Waterh., figured by Mr. George Lewis in the *Ann. & Mag. Nat. Hist.* 1895, (6) xvi. p. 375, figs. 1 & 2, the only species hitherto described, although I have seen several. It is a little smaller and relatively shorter, being a trifle less produced behind. It is similarly sculptured, but the elytra are a little more strongly striated and punctured, and the prothorax has a smooth unpunctured strip at the base, which is separated by a distinct dividing-line from the remaining strongly punctured surface. This smooth area exists in *P. parvulus*, but is not sharply defined. The most pronounced difference between the two forms, however, is found in the lower surface. The metasternum, instead of meeting the mesosternum in a broad lobe, is produced into a very acute angle, apparently almost dividing the mesosternum into two. The sides of this process form quite straight lines extending backwards to the posterior ends of the middle coxæ. These lines are finely raised, and underneath them can be traced another strongly pigmented line, which probably represents the true meso-metasternal suture. This line of dark pigment does not follow the direction of the carinate lines in the posterior part, but branches off to the middle of the intermediate coxæ.

#### Genus ONTHOPHAGUS.

(a) Male with two unconnected cephalic horns.

##### *Onthophagus gladiator*, sp. n.

♂. Enco-niger, opacus, depressus, latus; capite dense punctato, breviter setoso, margine integro, antennis flavis; prothorace producto, angulis anticis haud acutis, posticis distinctis, lateribus basi que medio angulatis, vix arcuatis; elytris planis, subtiliter striatis, interstitiis minute punctulatis; pygidio leviter punctato, metasterni lateribus fusco-hirsutis.

♂. Capite postice cornubus duobus gracilissimis, basi connexis, quam corpore toto parum brevioribus, postice subtus serratis,

armato; prothorace fere impunctato, antice profunde excavato, dorso processu longo, compresso, antice oblique directo, armato.

♀ incognita.

Long. 17-19 mm.

*Hab.* India.

Obscurely bronzy, broad and depressed, with the upper surface opaque. The head is punctured and setose, with the front margin entire and nearly straight in front. The prothorax is rather broader than long, with the margins rectilinear, the hind angles not rounded off, and the base and sides angulated in the middle. The elytra are flat, faintly striated and very finely punctured. The pygidium is lightly punctured, the sides of the metasternum clothed with fine hair, and the abdomen almost smooth.

♂. The sutural carina of the head is strongly angulated and the head is provided behind with a pair of backwardly-directed horns almost as long as the body when well-developed; they are united at the base, gently curved, slender and serrated beneath at the hinder part. The prothorax is excavated beneath, and from the posterior margin of the cavity proceeds a long, compressed, straight horn, directed obliquely forwards and blunt at its extremity.

I have not seen the female.

This species is closely related to *O. Mouhoti*, Har., but is broader and more flattened and has the margins of the prothorax less curvilinear. The cephalic horns differ in being serrated beneath, and the thoracic horn is placed farther back, and in our specimen is more slender. The thoracic cavity extends farther back, but rather less from side to side.

Two specimens, without precise locality, were received with the Bowring collection.

*Onthophagus rubripennis*, sp. n.

Niger, subtus nitidus, supra opacus, capite prothoraceque obscure cupreis, elytris rufo-castaneis; capite rugose punctato, semi-circulari, integro; prothorace fortiter et dense punctato, marginato, angulis anticis paulo productis, haud acutis, posticis obsolete; elytris striatis, striis subtiliter et lineare punctatis, interstitiis planis, fere levibus; pygidio grosse et crebre punctato.

♂. Capite postice cornubus duobus longis curvatis, valde geniculatis et divergentibus, armato; prothorace antice longitudinaliter excavato.

♀. Capite leviter bicarinato, prothorace medio leviter sulcato.

Long. 11-13 mm.

*Hab.* Sikkim, Kurseong.

Black, with the head and prothorax slightly bronzy, the

elytra dull brick-red, and the antennæ red with a pale yellow club.

The form is broad and convex, with the head semicircular, rugosely punctured, and scarcely emarginate in front. The prothorax is coarsely and densely punctured, completely margined, with the base slightly angulated in the middle, the anterior angles rather produced but not sharp, and the posterior angles almost obsolete. The elytra are shallowly striated, the striæ containing very elongate punctures having each a raised margin, and the interstices are flat, opaque, and almost smooth. The pygidium is flat, opaque, and coarsely and densely punctured, and the metasternum is rather closely but not strongly punctured and not prominent in front. The front tibiæ are moderately long and armed with four strong but not sharp teeth.

♂. The head bears behind a pair of long, curved, and widely divergent horns, like those of the European *O. taurus*, but strongly elbowed internally near the point of origin. The prothorax has a slight longitudinal excavation in front.

♀. There are two slight transverse carinæ upon the head and the prothorax is only feebly channelled along the middle.

There are specimens in the British Museum and M. René Oberthür's collection.

Var. *subcibratus*.

The punctures of the prothorax are exceedingly dense and confluent, so that the metallic lustre is scarcely traceable, and the anterior excavation in the male is limited behind by two rather sharp tubercles, the corresponding elevation in the Sikkim form being quite blunt.

*Hab.* Bootan, Khasia Hills, N. Chin Hills.

*Oonthophagus bufo*, sp. n.

Niger, nonnunquam obscure æneus, parum nitidus, ovatus; capite haud producto, clypeo sat crebre punctato, margine leviter elevato, antice paulo inciso; prothorace parum convexo, lateribus valde arcuatis, angulis posticis haud distinctis, basi haud distincte angulato aut marginato; elytris distincte striatis, interstitiis parcissime granulatis; pygidio sat convexo, parce punctato; corpore subtus lævi, metasterno ubique sat grosse punctato, abdomine impunctato.

♂. Capitis carina suturali oblitterata, vertice cornibus duobus, postice directis, fere rectis, basi dilatatis, haud connexis, armato, spatio incluso parcius punctato, antice carina vix perspicua limitato; prothorace antice perparum declivo.

♀. Clypeo rugoso, carina antica recta, parum elevata, alteraque

medio breviter acuminata, vertice leviter excavato, punctato, postico bituberculato; prothorace haud declivo.  
Long. 6-8 mm.

*Hab.* N.W. India, Bannu, Gwalior.

Black, sometimes with a faint bluish or greenish tinge, and not very shining above. It is a small species, elongate-ovate in shape. The head is not produced, but is slightly emarginate in front. The prothorax is evenly and not very finely punctured, with the sides strongly curved, the posterior angles rounded off and the base not angulated or margined. The elytra are moderately deeply striated, with sparsely scattered granules upon the interstices. The pygidium is thinly punctured, the metasternum evenly but not very strongly, and the abdomen impunctate.

♂. The clypeus is moderately punctured, and the vertex armed with two straight horns of moderate length, directed slightly backward and dilated at their bases but not connected together. There is a very slight ridge just in front of the horns, and the enclosed space is concave and thinly punctured. The prothorax is feebly declivous and smooth in front.

♀. The clypeus is finely rugose, with a very fine anterior carina and a well-marked posterior carina acuminate in the middle, and the horns are represented by a pair of short tubercles. The intervening space is concave and punctured.

This species is allied to *O. tragus*, F., and *O. dama*, F., but is smaller and more elongate than either.

*Onthophagus rectecornutus*, Lansb., is an interesting species belonging to the same group which needs further investigation as regards both its variation and geographical distribution. It is stated by Lansberge (Leyden Museum Notes, 1883, p. 50) to inhabit Java, Sumbawa, and Ceylon, and to differ from *O. luridus* (Dej. MS.) only by the curved and diverging horns of the latter. The two forms thus distinguished appear to me to be specifically inseparable, although, in addition to the development of the horns, the *luridus* form has the prothorax more globose and much more contracted in front and the head more narrow. These are all characters peculiar to the male, and in other respects there is so much constancy and individuality that I feel obliged to regard this as a single species with two forms of male. Lansberge remarked that the female was unknown to him, but probably looked for a hornless form and did not notice the real sexual differences, which, contrary to the general rule, are not found in the armature. Male and female of the *rectecornutus* form are alike armed with a pair of erect parallel horns and a

transverse carina upon the clypeal suture; they may be distinguished by the front tibiæ, which, in the male, are elongate, slender, and strongly curved, with the teeth feebler and farther apart. The specimens of the *luridus* form are all males. The three forms have been taken together in Ceylon and Travancore, where they appear to be common. I have only seen a single female from Java, and there is a single male in our collection from Darjeeling, while Dejean gives China as the habitat of the var. *luridus*, so that the species has evidently a very wide range.

*Oonthophagus brevicollis*, sp. n.

Niger, nitidus, antennis tarsisque rufis; prothorace valde convexo, punctato, quam corpore ad humeros multo latiore, margine postico arcuato, marginato, haud angulato; elytris striatis, striis punctatis, interstitiis convexis, politis, vix punctulatis; pygidio parce punctato.

♂. Capite polito, lateribus antice fere recte contractis, margine antico paulo emarginato, carina suturali parum arcuata cornubusque duobus posticis gracilibus, parallelis, erectis; prothorace antice verticali, lævigato, postice leviter punctato, carina dorsali transversa.

♀. Clypeo semicirculari, vix emarginato, punctato-rugoso, carina suturali distincta, valde curvata; capite postice læviore, bituberculato; prothorace antice medio subverticali, carina dorsali transversa.

Long. 9.5–13 mm.

*Hab.* S. India, Nilgiri Hills, Belgaum.

Black and shining, with the antennæ and tarsi reddish. The prothorax is finely but not closely punctured all over, except upon the anterior declivity, and the elytra are sulcate, with the interstices convex and scarcely punctured. The pygidium is sparingly punctured and the median part of the metasternum has only a very few punctures near the sides. The spur of the front tibia is bent at a right angle and acute.

♂. The head is octagonal, slightly emarginate in front and impunctate except just in front of the eyes. There is a distinct carina upon the clypeal suture, and two slender, unconnected horns arise almost vertically from the back of the head, with a slight forward curvature. The prothorax is very short and broad, vertical and smooth in front, very convex and distinctly punctured behind, with the anterior edge of the dorsal part carinated in front and the posterior edge curved, finely margined and not angulated. The front tibial spur is broader than in the female.

♀. The clypeus is curvilinear and very feebly emarginate

in front, and its surface is rather finely rugose. The carina is stronger, and the horns are represented by a pair of conical tubercles. The prothorax is more elongate and only slightly retuse in front.

(b) Male with two connected cephalic horns.

*Onthophagus productus*, sp. n.

Niger, convexus; capite parvo, subtiliter rugoso-punctato, antice rotundato, vix emarginato; prothorace postice ante basin fere carinatum elevato, lateribus valde angulatis, margine postico angulato, angulisque posticis distinctis; elytris striatis, interstitiis convexis, crebre et rugose punctatis, minutissime setosis; pygidio sat grosse punctato; metasterni medio nitido, parce sat grosse punctato.

♂. Capite postice cornubus duobus curvatis, haud longis armato; prothorace nitido, minute haud crebre punctato, lateribus antice vix punctatis, antice valde angustato, angulis anticis acutis, fossulatis, dorso antice medio elevato; tibiis anticis elongatis, sat gracilibus.

♀. Capite carina suturali aliaque frontali medio leviter acuminata armato; prothorace rugose punctato et setoso, carina transversa antica parum elevata.

Long. 10–12 mm.

*Hab.* N. India, Sikkim.

Black, clothed with short dark setæ, except at the middle of the metasternum and the prothorax of the male, which is shining. The head is small, finely and rugosely punctured and scarcely emarginate in front. The prothorax is strongly angulated at the middle of the sides and distinctly at the middle of the base, and the hind angles are not rounded away. The posterior part of the disk is elevated into a blunt-edged carina just before the margin. The elytra are striated, with the interstices convex, finely and rugosely punctured and setose. The pygidium is rather coarsely punctured, and the middle of the metasternum shining and sparingly punctured.

♂. The head is produced behind into a pair of slender but not very long horns, united by a sharp ridge at the base and forming with it rather more than half of a perfect circle. The prothorax is shining, finely and not closely punctured and not setose, except in front, where it is slightly rugose. It is strongly contracted in front, elevated in the median part, and much depressed at the sides, with a round pit in each front angle. The front tibiæ are elongate and slender.

♀. The head bears two transverse carinæ, of which the frontal one is minutely acuminate in the middle. The pro-

thorax is not greatly narrowed in front and is strongly and thickly punctured and minutely setose, with an interrupted transverse carina in front.

*O. productus* is very closely related to *O. rugulosus*, Har., from N. China. It is less densely punctured above, especially upon the prothorax of the male, which is also still more narrowed in front, and the front tibiæ in the same sex are more elongate.

There are examples in the British Museum and in M. René Oberthür's collection.

*Onthophagus (Caccobius) gallinus*, sp. n.

Niger, capite prothoraceque obscure cupreus, subnitidus, crebre et rugose punctatus, ubique breviter setosus; clypeo emarginato, grosse punctato; prothorace dense punctato, marginato, angulis anticis haud acutis, posticis obsoletis; elytris striatis, interstitiis granulatis; pygidio grosse punctato, metasterno sat punctato; tibiis anticis fortiter tridentatis.

♂. Capite nitido, leviter emarginato, carina anteriore arcuata posterioreque recta valde elevata, summa trifida, dentibus duobus externis longioribus, recurvatis; prothorace dorso elevato, antice fere acuminato, parte antica excavata, polita; metasterno postice impresso.

♀. Capite rugose punctato, paulo producto, antice acute bidentato, carina anteriore arcuata posterioreque fere recta; prothorace antice medio minute prominente.

Long. 4-5 mm.

*Hab.* S. India, Nilgiri Hills, Belgaum.

Deep bronzy black, with the head and prothorax generally more distinctly metallic, clothed above and below with greyish setæ. The prothorax is densely punctured, the clytra striated and rugosely granulated, and the pygidium coarsely punctured. The metasternum is strongly but rather sparsely punctured and not prominent in front. The anterior tibiæ bear three strong teeth, above which they are finely denticulated.

♂. The head is shining, thinly punctured, slightly notched in front, with a curved sutural carina and a very strongly elevated frontal one terminating in a triangular median tooth and a pair of short recurved lateral horns. The prothorax is convex behind, slightly excavated and smooth in front, the upper margin of the excavated part forming a slight tooth in the middle.

♀. The head is rugosely punctured and sharply bidentate in front, with two slight carinæ.

This species belongs to the closely connected group of

small Indian *Onthophagi* of which *O. vulcanus*, Fab., is the type. It is most nearly related to *Caccobius tortus*, Sharp, but is more closely sculptured, especially upon the prothorax, and the elytra are without the yellow apical spot distinguishing that species and *O. vulcanus*. It is peculiar also in having the middle of the prothorax angularly instead of broadly prominent in the male. It has been found in numbers by Mr. H. L. Andrewes in the Ouchterlony Valley, Nilgiris (3000 ft.), in April and July.

Another species of the same group, although not hitherto associated with it, is *O. furculus*, Fab., in which the elytra are marked with yellow in front and behind, and the margin of the thoracic excavation is not sharply raised. This is found in the same localities and also in Ceylon.

(c) Head of male produced into a single horn behind.

*Onthophagus ephippioderus*, sp. n.

Niger vel obscure nigro-æneus, robustus, convexus, sat nitidus, antennis flavis; elytris punctato-striatis, interstitiis vix convexis, parce et minute punctulatis, lateraliter fortius; pygidio leviter punctulato.

♂. Capite grosse punctato, antice et postice producto, antice fortiter nasuto, postice acute cornuto, cornu gracili, haud longo, basi late angulate laminato; prothorace sat punctato, antice retuso, lævigato, dorso antice utrinque oblique tuberculato.

♀. Capite antice ruguloso, postice punctato, margine antico integro, leviter producto, carina suturali valde curvata laminaque postica erecta paulo bifida; prothorace crebre punctato, carina antica obsoleta.

Long. 12-14 mm.

*Hab.* Mysore, Bangalore, Nilgiri Hills.

Black or slightly æneous, with pale antennæ. The shape is broad and convex, and the body smooth and beneath almost impunctate. The elytra are shallowly punctate-striate and the interstices very lightly punctured. The prothorax is strongly punctured and margined, but not angulated at the sides or base, the posterior angles being rounded away. The pygidium is finely but not closely punctured.

♂. The head is produced into a blunt point in front, the sutural carina is well curved but not strongly marked, and the posterior part of the head is produced backwards, forming a reflexed angular plate behind each eye and a slender curved horn in the middle. The prothorax is retuse and smooth in front, with the dorsal ridge produced obliquely on each side. The spur of the front tibia is short and blunt.

♀. The head is strongly rugulose in front of the sutural carina, which is more pronounced than in the male, and punctured behind it. The clypeal margin is subangulate and the posterior margin of the head bears an elevated transverse lamina which is emarginate at its upper edge. The prothorax is closely and coarsely punctured. The spur of the front tibia is slender and acute.

This species resembles *O. seniculus*, F., the male of which is without cephalic armature, but the processes upon the prothorax attain a greater development in that insect, and the clypeus is less developed in front as well as behind.

*Onthophagus manipurensis*, sp. n.

Niger, nitidus, corpore lateraliter brunneo-hirto, antennis pallide testaceis; clypeo ruguloso; prothorace haud fortiter punctato, postice leviore, medio obsolete sulcato, antice excavato, lateribus basique marginatis, basi medio angulata, angulis posticis obsolete; elytris striatis, interstitiis planis, subtiliter punctulatis.

♂. Capite antice fere acute angulato, medio sat fortiter bituberculato, postice retrorsum producto, cornu recurvato, acuminato, basi lato quadrato; prothorace antice valde retuso, supra leviter emarginato.

♀. Capite antice arcuato, parum producto, medio fortiter recte carinato, postice breviter producto, processu erecto truncato; prothorace antice paulo excavato, supra bituberculato.

Long. 15-19 mm.

*Hab.* N. India, Manipur.

Black and shining, with testaceous antennæ and reddish-brown hair at the sides of the sternum and abdomen. The form is short and compact and the sculpture fine. The prothorax is smooth and very sparingly punctured above; it is distinctly margined at the sides and base, the base is distinctly angulated in the middle and the hind angles are rounded away. The elytra are distinctly striated and the interstices slightly convex and feebly punctured. The pygidium is moderately punctured. The front tibiæ are broadly quadridentate and the first joint of the middle and hind tarsus is very large and flattened. The tibial spurs are blunt and that of the front tibia is strongly bent.

♂. The clypeus is rather elongate and pointed, with the sides straight. The clypeal suture is marked by two strong tubercles, which divide the width of the head into three nearly equal parts. The posterior part of the head is smooth and produced backwards into a lamina, which narrows into a slender recurved horn. The prothorax is excavated and rugosely punctured in front and scarcely punctured behind,

and the upper edge of the excavated part is slightly emarginate in the middle.

♀. The clypeus is rounded, scarcely produced, with a short, straight, and strongly raised sutural carina, and a small, vertical, and truncated posterior horn. There is a rudimentary excavation at the front of the prothorax and a pair of slight tubercles at its posterior edge.

This species is very closely related to *O. rubricollis*, Hope, but differs from it by its uniform black colour, the feebler sculpture of the elytra, and the presence of the two clypeal tubercles in the male. The basal joint of the antenna has a serrate carina, as in *O. rubricollis*, *diabolicus*, and other allied species.

*Onthophagus cupreiceps*, sp. n.

Obscure cupreus, prothorace, elytris pygidioque fuscis, dense opacis, parce et minutissime setiferis; capite nitenti, lævi, antice leviter punctato, margine antico lævissime exciso; prothoracis lateribus leviter sinuatis, angulis anticis paulo prominentibus, haud acutis, posticis toto obsoletis; elytris sat planis, haud distincte striatis; corpore subtus pedibusque æneo-micantibus, sat grosse punctatis.

♂. Capite postice retrorsum producto, cornu recurvato, acuminato, basi laminato, quadrato; prothorace antice leviter retuso, lævigato.

♀. Capite antice magis punctato, sutura clypeali valde carinata, semicirculari, vertice carina angusta, supra emarginata armato.

Long. 8.5–10 mm.

*Hab.* Sikkim, Khamba Jong, Tungu (13,000–16,000 ft.).

Head, legs, and underside shining coppery, with prothorax, elytra, and pygidium very opaque, pitchy black, and very minutely setose. The head is impunctate except in front, and the front margin is very feebly reflexed and slightly excised in the middle. The prothorax has a barely perceptible angulation at the middle of the base, the hind angles are completely rounded off and the sides feebly sinuated, the front angles being prominent but not sharp. The anterior part is shining and slightly retuse in both sexes. The elytra are faintly striated.

♂. There is a short, sharp, curved horn arising from the posterior edge of the head and forming a quadrate lamina at the base. Only the front margin of the clypeus is punctured.

♀. The horn of the male is represented by a strongly raised truncate carina. There is a curved sutural carina, in front of which the clypeus is rugosely punctured.

This species is very close to *O. concolor*, Sharp, but differs

by its metallic head and underside, and the very opaque sooty prothorax and elytra.

*Onthophagus tibetanus*, sp. n.

Niger, capite, pedibus corporeque subtus micantibus; prothorace, elytris pygidioque sat opacis, minute setiferis; capite antice rugose, postice parce punctato, margine antico minute exciso; prothorace angustissime marginato, basi medio lævissime angulato, lateribus simpliciter arcuatis, angulis omnibus rotundatis; elytris leviter striatis, interstitiis vix convexis; corpore subtus pedibusque sat grosse punctatis.

♂. Capite postice retrorsum producto, cornu recurvato, acuminato, basi laminato, quadrato; prothorace antice leviter retuso, lævigato.

♀. Sutura clypeali valde carinata, semicirculari, vertice carina angusta, supra leviter emarginata armato.

Long. 7.5-10 mm.

*Hab.* Brahmapoutra Valley, Chaksam (12,000 ft.), Gyantse (13,000 ft.).

*O. tibetanus* is exceedingly close to *O. concolor* and *O. cupreiceps*, but is easily distinguished from both by the uniform curvature of the sides of its prothorax, which completely rounds off the front angles. The upper surface is more opaque than that of *O. concolor*, but less so than that of *O. cupreiceps*.

*Onthophagus vividus*, sp. n.

Viridis vel violaceus, capite prothoraceque splendide rufo-cupreis vel viridibus; capite ruguloso, clypeo paulo producto, integro; prothorace granulato, postice medio læviore; elytris planis, subopacis, subtiliter striatis et punctatis; pygidio grosse punctato; metasterni medio polito, antice paulo prominente.

♂. Capite crebre punctato, postice cornu brevi, simpliciter armato; prothorace antice paulo et anguste excavato.

♀. Clypeo rugoso, carina arcuata distincta, capite postice breviter tuberculato; prothorace antice nonnihil excavato.

Long. 11-15 mm.

*Hab.* Bangalore, Trivandrum, Nilgiri Hills.

Deep blue or green, with the abdomen, tibiæ and tarsi, and the front of the clypeus nearly black, the antennæ yellow, and the head and prothorax fiery red, bronzy green, or bright metallic green.

The form is short and compact. The clypeus is slightly produced and pointed. The prothorax is coarsely granulated, except at the middle of its posterior part, where it is nearly smooth; it is finely margined all round and bluntly

angulated in the middle of the base, with a slight anterior excavation in both sexes, which is limited behind by a pair of opaque prominences. The anterior angles are rather acute. The elytra are finely striated and their interstices flat and closely punctured. The pygidium is coarsely and evenly punctured. The front tibiae are stout and the terminal spur strongly bent.

♂. The short cephalic horn is directed backwards with a slight curvature, and is moderately broad at the base and acuminate at the end. The sutural carina is not well-marked.

♀. The sutural carina of the head is distinct and the horn is very short and blunt, generally having the appearance of two coalescing tubercles.

This is allied to *O. igneus*, Vigors, but is generally larger and more convex and the sculpture is stronger. In the male the head is less produced both in front and behind. The sexes of the new species differ little, and the less developed males can only be distinguished from the females by a close examination.

*Onthophagus bronzeus*, sp. n.

*O. vivido* affinis, sed obscure cupreus, elytris haud metallicis, opacioribus, antennis pallide testaceis; capite ruguloso, clypeo vix producto; prothorace ubique dense granuloso; elytris planis, subtiliter striatis, punctatis et setiferis.

♂. Capite carina suturali curvata vix elevata munito, postice breviter cornuto, cornu postice inclinato, basi vix dilatato; prothorace antice paulo excavato et tuberculis duobus minutis armato.

♀. Capite carina suturali curvata distincta antice munito, cornu postico perparum elevato; prothorace tuberculis duobus vix distinctis antice armato.

Long. 12 mm.

*Hab.* Nilgiri Hills (*Hampson*), Kanara (*T. R. D. Bell*).

This is a species very nearly related to the preceding one, but deep bronze-coloured, with the elytra brown and quite opaque. The prothorax is evenly granulated all over and more finely than in *O. vividus*, and the elytra are clothed with a fine but distinct pubescence.

The horn of the male is more abrupt and scarcely widened at the base, and the clypeus is scarcely produced in front.

*O. pollicatus*, Har., is another closely allied species, but it is more elongate and the elytra are granulated and not punctured.

I may note here that Harold's supposition that *O. turbatus*,

Walker, was described from a female of *O. spinifer*, F., is not correct. The types of both are in the British Museum collection and the two species are quite distinct, although nearly related, belonging to the group in which the male has a single very long and slender horn curving backwards. *O. spinifer*, F., is steel-blue, with rugose elytra, and *O. turbatus*, Walker, is coppery, with the elytra finely punctured.

(d) Head of the male without horn.

*Onthophagus cæruleicollis*, sp. n.

Cæruleus, subtus nigro-cæruleus, pedibus piceis vel rufo-piceis; antennis elytrisque flavis, horum sutura fasciisque duabus transversis interruptis nigris; capite plano, dense rugoso, antice producto, haud acuto, margine postico arcuato, medio fere angulato; prothoracæ valde gibboso, ubique dense granulato, postice lobato, fere angulato, lateribus valde arcuatis, angulis anticis rotundatis, posticis obsolete; elytris subtiliter striatis, interstitiis planis, rugose punctatis et minutissime setiferis; pygidio grosse punctato; corpore subtus ubique punctato, parce griseo-hirto.

Long. 5.5-8.5 mm.

*Hab.* S. India, Dharwar, Belgaum.

Metallic blue, darker beneath, with the legs piceous or piceous-red, the antennæ testaceous and the elytra yellow, with the suture and two transverse rows of spots black, the spots of the posterior row sometimes coalescing into an irregular band.

This is a small species, moderately elongate and very convex. The head is small, flat, finely rugose, and without horn or carina, and the clypeus is bluntly produced in the middle. The posterior margin of the head forms a sharp edge, but is not produced. The prothorax is very globose, finely granulated, and without armature or excavation, with the sides strongly rounded, the posterior angles obliterated, and the base lobed but scarcely angulated, the lobe indicated by a slight impression on each side. The elytra are finely striated and the interstices rugosely punctured and very minutely setose. The pygidium and underside are coarsely punctured and clothed with short greyish hairs. The front tibiæ are broad and strongly but very bluntly quadridentate.

The sexes are apparently alike. There is no trace of horn or carina, but a very minute tubercle sometimes traceable near the middle of the head probably indicates the male.

This species and the following one belong to a group of which several have been described from Tropical Africa, and of which *O. maculatus*, F., is the type. The elytra are less rugose than is usual in this group.

*Onthophagus regalis*, sp. n.

Læte rufo-cupreus, subtiliter flavo-setosus, corpore subtus obscure cupreo, elytris ochraceis minute nigro-maculatis, macula una humerali, tribus medianis quatuorque posticalibus, pygidio nigro; capite plano, undique transverso rugoso, antice paulo obtuse producto, margine postico medio minute dentato, sutura clypeali subtiliter carinata; prothorace globoso, undique dense granuloso, lateribus simpliciter arcuatis, angulis posticis obsolete, margine basali lobato, fere angulato; elytris subtiliter rugosis, striatis, interstitiis planis; pygidio corporeque subtus dense punctatis, hujus lateribus flavo-hirsutis; tibiis anticis dentibus tribus robustis munitis.

Long. 8.5 mm.

*Hab.* Ceylon.

Coppery-red, with the legs, pygidium, and underside black or obscurely metallic, the antennæ pale yellow, and the elytra orange-red with about eight minute black spots on each, one of them near the shoulder and the rest forming two transverse lines.

The size and form are almost those of the last species. The head is flat and finely transversely rugose, slightly produced and recurved at the apex, with the clypeal suture feebly carinated and an impression near the middle of the posterior margin, which is slightly toothed. The prothorax is very globose and finely granulated, with a slight impression in front and one on each side of the posterior lobe, the hind margin of which is very obtusely angular. The sides are strongly curved and the posterior angles rounded off. The elytra are finely striated and minutely rugosely punctured, with an almost imperceptible yellow pubescence. The pygidium and underside are closely and deeply punctured and the sides of the body are clothed with yellow hairs.

Specimens have been found by Mr. E. E. Green and Col. J. W. Yerbury. I have found no external sexual characters.

*Onthophagus myrmecophilus*, sp. n.

Breviter ovatus, depressus, politissimus, obscure cupreus; elytris nigris vel picco-nigris, macula humerali plus minusve distincta rufa; corpore subtus æneo-nigro, nudo, pedibus ferrugineis; capite omnino lævi, inermi, margine crebre punctato, paulo reflexo; prothorace subtiliter haud dense punctato; elytris subtiliter striatis, striis punctatis, interstitiis planis, lævissimis; pygidio convexo, polito, minutissime punctato; metasterni medio polito, lateribus crebre punctatis; pedibus brevibus, tibiis anticis fortiter 4-dentatis, et supra minutissime serratis.

♂. Capite aut semicirculari aut paulo aut valde producto, apice minute emarginato; prothorace antice valde retuso, dorso mediotate prominente, antice parum impresso, fossa laterali sat profunda, extus carinata, carina antice plus minusve acute producta.

♀. Capite semicirculari; prothorace æqualiter convexo, inermi.  
Long. 4.5-6 mm.

*Hab.* Nilgiri Hills (Barwood Estate).

Very smooth and shining, slightly coppery, with the elytra black and marked with a more or less distinct reddish patch on each shoulder. The form is broadly oval, rather flat, and the legs are short. The head is very smooth, without horns, carinæ, or visible sutures, and the margin of the clypeus is finely and closely punctured and reflexed. The prothorax is finely punctured, with the sides regularly curved, the posterior angles very obtuse and the base gently curved. The scutellum is invisible. The elytra are very finely punctate-striate, with the interstices flat and impunctate. The pygidium is convex and very finely punctured, and the underside smooth with the sides of the metasternum rather closely punctured. The front tibiæ are armed with four strong teeth and very finely serrated above these. In the four posterior tarsi the first joint is equal in length to the three succeeding joints, but is not very much flattened.

♂. The head is produced in front, rather broad at the apex, and very feebly bilobed. The prothorax has a broad dorsal elevation shallowly impressed in front, and on each side a longitudinal carina more or less acutely produced in front, with a deep lateral cavity on each side between the latter and the dorsal hump.

♀. The head is semicircular and the prothorax quite simple.

There is another male form in which the head is like that of the female, although the thoracic armature may be well-developed.

This little beetle is entirely peculiar both in habits and appearance. It was found in some numbers by Mr. H. L. Andrewes in a nest of the harvesting ant, *Phidologiton diversus*, in a decaying Ficus trunk. The specimens were taken from the débris accumulated near the entrance to the nest, and Mr. Andrewes believes the beetle to breed in the nest, which is probably the case. That its manner of life is quite abnormal is sufficiently evidenced by its appearance, which is entirely unlike that of the typical *Onthophagus*. The round depressed form, very shining surface, and short legs produce, in the female at least, a strong suggestion of a Histerid, but structurally it does not differ in any important particular from the present genus.

## APPENDIX.

I have brought together here a few observations and descriptions relating to certain other Oriental Lamellicornia of the genera dealt with in the foregoing paper.

## Cetoniidæ.

Owing to the first part of this paper being very hurriedly published and the proofs hastily corrected while absent from town, it is necessary to rectify one or two oversights and omissions occurring there.

I find that in re-characterizing the genera of the *Heterorrhina* group I have used the name *Rhomborrhina* in an inadmissible sense. The type of that genus is not, as I at first assumed, one of Hope's species, but is stated by Hope to be *R. heros*, G. & P., one of the forms which I associated under the name of *Anomalocera*. *Rhomborrhina* must therefore replace the latter name, and the group of species for which I proposed to retain Hope's genus must receive a fresh one. These species are *R. distincta*, Hope, with its varieties *flammea*, Gestro, *cariana*, Gestro, *ultramarinea*, Nonfr., &c., *apicalis*, Westw., *hyacinthina*, Hope, *nigra*, Saund., *japonica*, Hope, and *opalina*, Hope. These, called *Rhomborrhina* in my table (p. 350, *supra*), I now propose to call

## TORYNORRHINA, gen. nov.

Type, *Rhomborrhina distincta*, Hope.

Its distinctive characters are:—Head and margin of clypeus entirely without prominences in both sexes, the clypeus widening towards the front and its anterior margin broadly rounded; sternal process short, broad, widened in front of the middle coxæ and broadly rounded in front; front tibiæ simple and unarmed in the male, bidentate in the female; hind legs simple and straight in both sexes; pygidium pubescent.

I will also formulate here in rather more detail the characters of the other new genus established in the table just mentioned:—

## EUCHLOROPUS, gen. nov.

Type, *Cetonia læta*, Fab.

Head and margin of clypeus entirely without prominences in both sexes, the clypeus parallel-sided, with the front margin straight; sternal process slender, recurved, and

pointed; front tibiæ simple and unarmed in the male, bidentate in the female; hind tibiæ of the male strongly curved, with a thick fringe at the inner edge of the posterior part; those of the female simple.

I omitted to include in my description on p. 350 any reference to the sexes of the new species *Macronota gracilis*. This is a form allied to *M. antennata*, Wallace, and was described from a specimen of each sex. These differ very little, but the male has the prothorax rather narrower than that of the female, and the basal lobe more pronounced, and the front tibiæ are rather slenderer and their teeth more equal.

The sexes in this genus often differ considerably both in form and colouring, and have in several cases been described as different species. I am not aware that it has yet been recorded that *Macronota sculpticollis*, Thoms., is the female of *M. 4-vittato*, Schaum, although the insect is common in Ceylon and the fact has long been recognized. Still more dissimilar are the sexes of *M. Oberthuri*, Lansb., of which *M. humilis*, Lansb., described at the same time and from the same place, is the female. I have seen the two forms together in various collections, the male being silky black with white markings, and the female dull ashy brown. It is not common, but I associate the two forms without any hesitation because the closely-allied *M. crucicollis*, Lansb. (= *flavosparsa*, Wat.), of which I have seen a large number, has an exactly similar female. In a work in preparation I hope to give the sexual distinctions of all the Indian species of this genus.

Another genus in which marked differences between the sexes occur, but have not hitherto been noticed, is *Glycyphana*, in which also several so-called species have to be eliminated in consequence. In his description of *G. binotata*, G. & P., Burmeister noted that his examples were females, and all that I have seen of that form are of the same sex. It occurs, however, in conjunction with another form generally regarded (perhaps wrongly) as *G. torquata*, F., and of this our specimens are all males. The two differ only in their coloration, the males having a row of four spots (instead of only two) across the middle of the elytra, while the lateral patches upon the pygidium are generally yellow instead of blood-red.

A still greater difference occurs between the two sexes of *G. regalis*, Voll., of which the female (*G. celebensis*, Wall.) has the pygidium entirely black, while in the male it is entirely orange, and the elytra have two large lateral patches

instead of a row of four. In the male also the scutellum is red and each elytron has a longitudinal red stripe. In *G. Forsteni*, Voll., which is a variety of the male of the same species, these red markings are absent, as in the female, but the yellow colouring is that of the male. *G. bella*, Wall., again, which has a red pygidium and red markings upon the elytra, is the male of *G. 4-guttata*, Voll., which is without these.

*G. andamanensis*, Jans., is another species with a very well-marked colour-dimorphism. A black form was described by Thomson as *G. andamana*, and Kraatz recorded that this was a variety of Janson's species; but it has escaped observation that this is the female form, the male being invariably green, at least in a very large series which I have examined.

The two specimens from which Mr. Janson described *G. subcineta*, another Andaman species, prove to be males, and the type of *G. bimaculata*, Kraatz, which I have also been allowed to examine, is also a male of the same insect. I have seen two females, which appear to me identical in all structural features, but have an additional spot on the anterior part of each elytron, a row of four across the middle, and a patch on each side of the pygidium. I am inclined to regard this as the other sex of *G. subcineta*, Jans. It appears to correspond with the description of *Cetonia torquata*, Fab., but as the locality of Fabricius's insect (now in the Copenhagen Museum) is unknown, only a careful comparison can decide the point.

*Glycyphana lateralis*, Wall., is only a colour-variety of *G. perviridis*, Wall., of which both sexes in normal specimens are green. The single type specimen of the variety is a female, in which sex the pygidium is marked by a broad furrow.

I may perhaps note here that the Australian "*Schizorrhina pulchra*, Macl., is a species of *Glycyphana*.

In describing *Heterorrhina borneensis* and *mitrata* from female specimens, Mr. A. R. Wallace suggested that the male might prove to be similar to *H. dives*, Westw. Both sexes of the first species are now in the British Museum collection and, contrary to expectation, there is no difference in the form of the head, but the male of *H. mitrata* is still unknown. So exactly does the female correspond with the figure of the unique *H. dives* in Gory and Percheron's Monograph, that I regard it as extremely probable that they are the same. Schaum recorded in 1849 that he had seen a female of *H. dives* (apparently *H. mitrata*) in the Linnean Society's collection, but this cannot now be found.

## Melolonthidæ.

The name *Dejeania* has been used in three different orders of Insects, the genus having the priority belonging to the Diptera. The Coleopterous genus should be called *Dichelomorpha*, that name having been given by Burmeister to a Chinese species (*Dichelomorpha ochracea*) placed by him among the Hopliinæ, but allied to the insect I have described in the present paper. The type of Blanchard's genus (*Dejeania alsiosa*) is an insect of very different appearance, but these extreme forms are linked together by the new species (*D. lineata*, Arrow) and others described and undescribed, and all may best remain in one genus until the time comes for a comprehensive study of them.

## Hybosoridæ.

*Phæochroops gigas*, sp. n.

*P. indico* proxime affinis, major, minus grosse punctatus; prothoracis lateribus haud denticulatis, vix arcuatis, medio leviter angulatis, angulis posticis magis acuminatis, elytrorum costis paulo lævioribus, magis elevatis; abdomine magis rugoso; tibiis 4 posterioribus haud transverse carinatis.

Long. 15 mm.

*Hab.* Borneo, Pengaron; Perak.

Specimens were found by Mr. Doherty in both the above localities. They closely resemble the new Indian species, but are larger, the puncturing of the upper surface is a little less dense, the prothorax is less uniformly curved at the sides, which are not denticulated, and the hind angles are more evident. The elytral costæ are a little more elevated and the hind tibiæ are not interrupted at the middle of the outer edge by a transverse carina.

*Phæochroops acuticollis*, sp. n.

Statura præcedentium sed opacior, rugosius punctatus, magis regulariter setosus; prothorace omnino crebre punctato-rugoso, lateribus distincte elevatis, fere rectis, angulis posticis paulo productis; elytris densissime punctatis, singulo fortiter tricostato, costis lævibus, sat parce rufo-setosis; tibiis 4 posterioribus haud transverse carinatis, posticis gracilibus.

Long. 14 mm.

*Hab.* Borneo, Kina Balu.

A single specimen found by Mr. Doherty is in the British Museum collection. It is more densely sculptured than either of the preceding species, the hind angles of the prothorax are

slightly produced, the costæ of the elytra are sharp, and the long reddish hairs are situated at regular intervals upon them.

### Copridæ.

#### *Cassolus peninsularis*, sp. n.

Latus, convexus, nigro-cupreus, pedibus castaneis, capite crebro punctato, quadridentato; prothorace subtiliter punctato, lateribus valde arcuatis, angulis posticis fere obsoletis; elytris immaculatis, striatis, striis subtiliter punctatis; pygidio fortiter punctato; tibiis anticis serratis, dentibus tribus validis, tarsorum posteriorum articulis fere æqualibus.

♂. Tibiis anticis subtus unispinosus, dento apicali lato, truncato; tibiis posticis gracilioribus, sinuatis, intus denticulatis.

Long. 4-5 mm.

*Hab.* Perak, Penang.

This is like the Indian species, but rather broader in form and without the humeral spot. It is also less strongly punctured, and in the structure of the legs peculiar to the males there are remarkably pronounced differences between the two.

#### *Oonthophagus buffalo*, sp. n.

Niger, robustus, clytris corporeque subtus breviter brunneo-setosis; capite sat lato, subtiliter rugoso-punctato, margine reflexo, haud exciso; prothorace fortiter punctato, marginato, postice profunde longitudinaliter sulcato, lateribus sinuatis, angulis posticis valde obtusis; elytris striatis, interstitiis convexis, dense punctatis; pygidio fere rugose punctato; metasterni medio nitido, parce sat grosse punctato.

♂. Capite carinato, postice cornubus duobus curvatis, haud longis armato, cornubus basi carina medio leviter dentata connexis; prothoracis dorso elevato, antice recte truncato, lateribus valde depressis, fere impunctatis, nitidis, marginibus valde sinuatis, antice contractis, haud productis; tibiis anticis paulo elongatis.

♀. Capite carina suturali aliaque frontali medio dentata armato; prothorace carina transversa distincta munito.

Long. 11-13 mm.

*Hab.* Java, Borneo, Labuan.

This is very closely related to *O. rugulosus*, Har., and *O. productus*, Arrow, but the posterior part of the prothorax is less sharply carinated and more deeply sulcated longitudinally in the middle. In the male the prothorax is less narrowed and produced in front, and the anterior angles are not hollowed out. The head in the same sex is less narrow, it has a distinct carina upon the clypeal suture, and the carina connecting the horns (which are of the same form) is

dentate in the middle. The elongation of the front tibiæ of the male is much less marked.

*Onthophagus egregius*, sp. n.

Rufo-cupreus, elytris nigris; capite rugoso, absque carinis transversis, antice producto; prothorace parum convexo, basi medio leviter angulato; clytris sat opacis, subtiliter striatis, interstitiis minute punctulatis; pygidio crebre punctato; metasterno ubique punctato, antice paulo acuminato; tibiis anticis minute serratis, dentibus 4 validis.

♂. Corpore supra et subtus breviter fulvo-setoso; clypeo dilatato, antice excavato, lævigato, profunde emarginato, medio longe et anguste producto, processu late bifido, recurvato, intra oculos tuberculo parvo, compresso; prothorace confertim granuloso, medio antice anguste longitudinaliter carinato, postice medio obtuse angulato; antennis perinsignibus, articulis 4-6 brevibus, latis, 7 cupuliformi, 8 biramoso, 9 multiramato.

♀. Corpore fere nudo, supra et subtus subtiliter punctato; clypeo leviter rugoso, antice paulo producto, integro, inermi; antennis simplicibus; prothorace postice medio dentato.

Long. 10-12 mm.

*Hab.* E. Borneo, Pontianak.

Reddish bronze, with the elytra black, and not very convex or shining. The male has the surface finely setose above and below, and the head broad and rugose, except in front, where it is smooth and hollowed, with a strong emargination



*Onthophagus egregius*, sp. n.

Head and antennæ (seen from above and below): enlarged.

in front, from the middle of which springs a slender process curving upwards and bifurcated broadly at the end. There is a slight longitudinal carina between the eyes. The prothorax is granulated, longitudinally carinated in the middle, with a slight angulation at the middle of the hind margin. The elytra are finely striated, with the interstices closely and

finely punctured, and the pygidium and underside are strongly punctured.

The female is more finely punctured and almost devoid of setæ, with the head simple and slightly pointed in front. The prothorax is minutely and not closely punctured, without a median carina, and is rather more sharply angulated at the middle of the base. The elytra and underside are also more finely punctured than in the male.

The species is remarkable for the extraordinary structure of the antennæ characteristic of the male, which is quite unlike anything hitherto known. The last three joints of the footstalk are broad and close-fitting, and the seventh joint forms a hollow half-hemisphere, covering the two remaining joints as seen from beneath. The eighth joint sends off a slender branch on each side, and each branch is toothed underneath; and the last joint has a slender footstalk, which gives off two similar toothed branches on each side, diminishing in length, and is broad at the end, partly shutting in at the extremity of the antenna the whole complicated apparatus.

The antennæ of the female are quite normal.

A series of specimens, chiefly males, have been obtained by M. René Oberthür's collectors.

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LI.—*On a remarkable Mountain Viscacha from Southern Patagonia, with Diagnoses of other Members of the Group.*  
By OLDFIELD THOMAS.

THE British Museum owes to its generous and indefatigable contributor, Mr. J. A. Wolfssohn, C.M.Z.S., three examples of a fine *Viscaccia*\* from a locality far south of any place where members of this group have been previously recorded. The animal is quite distinct from any hitherto known, and I

\* In his paper on the nomenclature of this group, Dr. F. Lahille (An. Soc. Cient. Argent. lxii. p. 39, 1906) seems to have come to quite correct conclusions, including the allocation of *Viscaccia* to the Mountain Viscachas, formerly known as *Lagidium*. But with the fate that has as yet always befallen writers on this most difficult and complicated subject, he has made a mistake in crediting the name *Viscaccia* to Molina, for although the latter did say in 1810 that the animal ought to have a special generic name, he did not give it one, only using *Viscaccia* in such a way that it cannot be distinguished from the vernacular term. However, fortunately, Oken in 1816 used the term *Viscaccia* in a technically valid manner, with "*Lepus chilensis*" as its type, choosable as such whether by elimination or by the first-species rule.

propose to name it in honour of its donor, to whom the Museum is indebted for series of all the mammals of Central Chili.

*Viscaccia Wolffsohni*, sp. n.

A large species with long fur strongly suffused with orange; tail very bushy.

Size large, form stout and robust, the size appearing even larger than the truth owing to the very long rich fur, of which the wool-hairs are over 35 mm. in length and the long hairs upwards of 50 mm. General colour above of head and body approaching clay-colour (Ridgway), though brighter and clearer; the wool-hairs, which give the predominating colour, brownish slaty for four-fifths their length, their ends creamy buff darkening to clay-colour. Below, on the lower cheeks, throat, chest, and belly, the terminal colour becomes richer and redder, attaining almost to "tawny." A distinct white spot on each axilla and on each side of the inguinal region. Dorsal dark line little marked. Head like back. Ears comparatively short, thickly and closely haired, their backs black, their inner surfaces with whitish hairs, and there is a marked line of creamy-tipped hairs running across their bases above. Arms with tawny-tipped hairs, the tawny or yellowish colour extending to the tips of the toes. Hind limbs duller, more brownish clay-colour; the feet very large and heavy. Tail far finer than in any other form, immensely bushy, the hairs of its dorsal crest attaining over 150 mm.; in colour the upper, crested side is mixed black and buff or ochraceous buff; underside black, finely grizzled with glossy ochraceous buff.

Skull comparatively large and heavy; nasals expanded in front; palatal foramina rather short; bullæ not so much swollen as usual.

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

Head and body 470 mm.; tail 305; hind foot 107; ear 65.

Skull: greatest length 91; basilar length 75.5; zygomatic breadth 50; breadth of brain-case on parietal bones 34.2; length of upper tooth series (crowns) 22.

*Hab.* Sierra de los Baguales y de las Vizcachas, lat. 50° 50' S., long. 72° 20' W., on the boundary between Chili and Argentina.

*Type.* Adult female. B.M. no. 7. 4. 5. 6. Original number 277. Collected 1st February, 1907, by Mr. John A. Wolffsohn. Three specimens.

In the interesting account which Mr. Wolffsohn has sent me of the capture of these specimens, he states that

“Mr. Ferrier, who owns a farm in that district, at the foot of Mount Payne, says that the Sierra de los Baguales is known to be the most southern part in which Viscachas occur, and between that range and much farther north there are none at all.”

The species is readily distinguishable from all other members of the genus by its large size, rich colour, long fur, immensely bushy tail, and short black ears.

With characteristic modesty Mr. Wolffsohn has suggested that the species should be named after Mr. McClelland, the President of his Company, to whom he owed the pleasure of his trip to Patagonia, but in view of the immense amount of help we have received from Mr. Wolffsohn, I have ventured to disregard his request, and to name this fine animal after him.

While working out *Viscaccia Wolffsohni* I have found the different races of this genus, of which the British Museum possesses a large number of specimens, to be both numerous and yet locally so constant as to deserve recognition by name. The fine series obtained by the late Mr. Perry O. Simons during his exploration of the Andes is especially rich in noteworthy forms.

As a preliminary I propose to give short diagnoses of such as I believe to be new, hoping to return to the subject later, when still further material is available.

Of the old names:—

*Viscaccia viscaccia*, Molina, is the large deep grey animal from the Chilian Andes, with a short ill-defined dorsal line, yellow belly, the tail with long grey crest and with its underside, although blackish, not sharply defined black.

*V. Cuvieri*, Benn., and, more doubtfully, *V. pallipes*, Benn., appear both to be referable to a strongly yellowish form found in Northern Chili, localized specimens from Iquique and Tarapacá being in the Museum.

*V. peruana*, Meyen, I cannot certainly identify, as of none of the specimens before me can it be said that “auf dem Bauche, besonders zwischen den hintern Extremitäten, sind die Haare zierlich weiss gefärbt,” all having the belly of a more or less yellow colour, which is generally deepest in the inguinal region. Some form agreeing with Meyen’s description will no doubt yet be found.

In the absence of exact knowledge of the local relationship of the different forms to each other, I provisionally use binomial names for all.

*Viscaccia inca*, sp. n.

Pale grey (between grey no. 8 and smoke-grey), without or with very faint trace of dorsal stripe. Wool-hairs about 30 mm. Belly well-defined pale yellow, the axillary white spots distinct. Feet creamy white. Tail not sharply bicolor, the underside only slightly darkened proximally.

Hind foot (on skin) 85 mm.; skull, greatest length 81.

*Hab.* Junin, Peru. Type from Incapirca, Zeziro.

*Type.* Adult female. B.M. no. 94. 8. 6. 20. Collected by J. Kalinowski, 8th May, 1890. Three specimens.

*Viscaccia arequipæ*, sp. n.

Posterior body grey like *V. inca*, but the fore-back and shoulders more buffy. Dorsal line present, though inconspicuous. Wool-hairs of back about 30 mm. Under surface pale yellow. Feet white. Tail distinctly and sharply bicolor, the under surface and end black.

Hind foot (measured fresh) 92 mm.; skull, greatest length 79.

*Hab.* Sumbay, near Arequipa. Alt. 4000 m.

*Type.* Subadult male. B.M. no. 0. 10. 1. 93. Collected 4th July, 1900, by P. O. Simons. Four specimens.

*Viscaccia subrosea*, sp. n.

The grey distinctly suffused with pinkish buff, the resulting general colour approaching "broccoli-brown." Dorsal line scarcely perceptible. Under surface inclined to pink, nearest to "salmon-buff." Feet pinkish buff. Tail not very sharply bicolor, although more so than in *V. inca*.

Hind foot (fresh) 85 mm.; skull, greatest length 77.

*Hab.* Galera, W. of Oroya, Dept. Lima. Alt. 4800 m.

*Type.* Adult female. B.M. no. 0. 7. 7. 53. Collected 24th February, 1900, by P. O. Simons. Four specimens.

*Viscaccia saturata*, sp. n.

Colour much darker than in the previous species, an olive-grey nearly as dark as Ridgway's "olive," sometimes marbled with black along the dorsal area; no distinct dorsal line. Wool-hairs about 26-27 mm. in length. Under surface cream-buff. Feet white. Tail distinctly bicolor, the under surface glossy black. Skull broader than usual, the nasals much swollen.

Hind foot (fresh) 95 mm.; length of skull 80.

*Hab.* Limbane, Inambari, Dept. Puno. Alt. 3500 m.

*Type.* Adult male. B.M. no. 1.1.1.52. Collected 26th July, 1900, by P. O. Simons. Three specimens.

*Viscaccia punensis*, sp. n.

Size small. Colour more brownish grey, the area across the shoulders specially brown. Dorsal line fairly distinct. Wool-hairs about 24 mm. Under surface dull creamy whitish, the brown basal part of the hairs less hidden than usual. Axillary white spots well marked. Feet white. Tail sharply bicolor, the light part of the crest nearly white; the under surface and end black.

Hind foot (on skin) 90 mm.; length of skull 76.5.

*Hab.* Puno, Lake Titicaca. Alt. 3800 m.

*Type.* Adult female. B.M. no. 97.10.3.51. Collected 1st April, 1896, by J. Kalinowski. Six specimens.

*Viscaccia cuscus*, sp. n.

Size large. Colour deep grey, about grey no. 5; dorsal line very distinct, black, about 300 mm. in length. Wool-hairs about 23 mm. Under surface "buff" or "pinkish buff"; axillary white patches unusually large. Feet cream-colour. Tail grizzled grey, not markedly bicolor, the proximal part of the under surface above blackish.

Hind foot (fresh) 102 mm.; length of skull 91.

*Hab.* Paratani, Bolivia (about 66° W., 17° 5' S). Alt. 2600 m.

*Type.* Adult female. B.M. no. 2.1.1.104. Collected 9th April, 1901, by P. O. Simons. One specimen.

*Viscaccia lutea*, sp. n.

Colour between cream-buff and clay-colour; dorsal line fairly distinct, about 150 mm. in length; wool-hairs about 29-30 mm. Under surface cream-buff; the axillary spots well marked. Feet creamy. Tail bicolor, the upper crest mixed with blackish.

Hind foot (on skin) 95 mm.; length of skull 85.

*Hab.* Esperanza, Sahama, Bolivia. Alt. 4000 m.

*Type.* Adult male. B.M. no. 98.3.16.22. Collected 12th May, 1897, by Gustav Garlepp. Four specimens.

*Viscaccia perlutea*, sp. n.

Like *V. lutea*, but the colour throughout a richer buffy. Face clearer grey. Dorsal line very strong, nearly 200 mm.

in length; wool-hairs about 28 mm. Under surface rich buff instead of cream-buff. Feet cream-buff. Tail bicolor, not sharply defined, the light hairs of the crest yellowish, instead of the usual greyish white.

Hind foot (fresh) 100 mm.; length of skull 82.

*Hab.* Pampa Aulliaga, Bolivia (67° W., 19° 30' S.). Alt. 3800 m.

*Type.* Adult male. B.M. no. 2. 2. 2. 89 bis. Collected 22nd October, 1901, by P. O. Simons. Two specimens.

*Viscaccia tucumana*, sp. n.

Colour clear grey, with scarcely a trace of drab; dorsal stripe short, fairly distinct, rather over 100 mm. in length. Hairs of back about 24 mm. in length. Under surface buff and cream-buff; the axillary white spots distinct. Feet creamy. Tail not markedly bicolor; the crest intermixed black and greyish white, the underside black proximally, greyer distally.

Hind foot (on skin) 91 mm.; length of skull 85.

*Hab.* Cumbre de Mala-Mala, Sierra de Tucuman. Alt. 3000 m.

*Type.* Adult female. B.M. no. 5. 10. 29. 6. Collected 10th April, 1904, by L. Dinelli. Six specimens.

LII.—*On the Occurrence of the Edible Dormouse (Genus Glis) in Sardinia.* By OLDFIELD THOMAS.

UP to the present time no trustworthy record has existed of the occurrence of the edible dormouse either in Sardinia or Corsica, such references to "Ghiri" as have been published possibly, indeed probably, referring to *Eliomys*.

From the palæontological list *Glis* is also absent\*; but Dr. Forsyth Major has been good enough to inform me that he knows of an undoubted *Glis* from the Pleistocene of Corsica, a fact which has an important bearing on the question as to the really indigenous position of the animal I am about to describe.

The British Museum owes to Sr. Giuseppe Meloni, of Lanusei, Eastern Sardinia, a number of examples of a dormouse discovered by him in the neighbourhood of that place, and a careful comparison with a series of *Glis italicus* from various parts of Italy convinces me that the Sardinian form is distinct enough to require a name. I therefore propose to term it

\* With the exception of a reference by Studiati in La Marmora's 'Geology of Sardinia,' and this may, again, be very possibly an *Eliomys*.

*Glis Melonii*, sp. n.

Like *G. italicus*, but greyer in colour and with a different tail.

General characters and size as in the Italian species, the upper premolar small and comparatively simple as in that animal. Colour, instead of being drab or drab-grey as is the case in *italicus*, clear grey, without drab suffusion, approximating to grey no. 6 of Ridgway. Tail very thick and bushy at the base, tapering terminally to the comparatively narrow tip; quite evenly broad throughout in *G. italicus*. In colour, while at least the terminal half, and sometimes more, of the tail in *italicus* is brown or blackish, in *Melonii* only the tip is darkened, the grizzled grey extending for from two thirds to three fourths of the length of the tail; the tip itself is also darker, often really black; under surface with the usual white line along the proximal two thirds.

Skull and dentition as in *G. italicus*.

External dimensions apparently about as in *G. italicus*, but the skins seem to be stretched, and no useful purpose would be served by measuring them.

Skull of type: greatest length 42 mm.; basilar length 34; greatest breadth 35; nasals 13.5; interorbital breadth 5.5; length of upper tooth series 7.6.

*Hab.* (of type). Marcurighè, Urzulei, Ogliastra, Sardinia. Other specimens from Monte Nieddu.

*Type.* Adult male in British Museum. Collected by Sr. Giuseppe Meloni. Twelve specimens examined.

Signor Meloni informs me that this dormouse is only found in the Forests of Urzulei and Orgosolo, while it appears to be quite absent from the other forests of the island.

LIII.—*A new Genus and Species of Phlebotomic Muscidae from Aden.* By ERNEST E. AUSTEN.

STOMOXYDINÆ.

STYGEROMYIA\*, gen. nov.

In some respects intermediate between *Stomoxys*, Geoff., *Hæmatobia*†, Rob.-Desv., and *Lyperosia*, Rond. (*sensu* Bezzi).

\* *στυγερός*, hateful; *μύια*, a fly.

† The present writer cannot agree with Speiser (Zeitschr. f. wiss. Insektenbiol. Bd. i. (1905) p. 461), whom he regrets to see has recently been followed by Bezzi ("Mosche Ematofaghe," Rendiconti del R. Ist. Lomb. di sc. e lett., serie ii. vol. xl. 1907, p. 17 [sep. imp.]; and 'Katalog

In general appearance and form of body similar to *Stomoxys*, but in shape of proboscis and palpi resembling *Hæmatobia*, though with arista feathered only on upper side, as in *Stomoxys* and *Lyperosia*.—Head somewhat flattened from front to rear, with basioccipital region only slightly swollen; proboscis short, stout, and shining, of uniform thickness throughout, not tapering to the tip, chitinous, but terminated by a pair of small fleshy labella; palpi equal to proboscis in length, large, clavate towards the tips, curving upwards, and with stout bristles on the outer side at the distal extremity.

Bristles of thorax:—*Humeral*, 3. *Post-humeral*, 1. *Notopleural*, 2. *Præstural*, 1. *Supra-alar*, 1. *Intra-alar*, 1. *Post-alar*, 2. *Dorso-central*, 6 (1 in front of and 5 behind the suture). *Inner dorso-central*, 1. *Scutellar*, 4 (1 præbasal, 1 basal, 1 discal, 1 apical) \*. *Mesopleural*, 9 or 10, wider apart than in *Stomoxys* or *Hæmatobia*. *Sternopleural*, 1 (posterior, as in *Stomoxys*, instead of 1:1, as in *Hæmatobia*).

*Wings* with first posterior cell narrowly open at the tip, the width of the opening being precisely that seen in the same cell in the wing of *Musca corvina*, Fabr., and less than half

der Paläarktischen Dipteren,' Bd. iii.), in transferring to this genus, from its time-honoured position among the Tachinidæ, Meigen's name *Siphona*. So far from Meigen's diagnosis, published in 1803 (Illiger's 'Magazin für Insektenkunde,' Bd. ii. p. 281), applying just as well to *Hæmatobia*, Rob.-Desv., as to *Bucentes*, Latr. (= *Siphona*, Mg., Syst. Besch. iv. (1824), p. 154, *et auct.*), as erroneously asserted by Speiser, the statements concerning the bare arista and "gebrochen" proboscis show that it does nothing of the kind. On the contrary, it must be evident to any unbiassed investigator that, when writing his diagnosis of 1803, Meigen had in view identically the same genus as that subsequently characterized by him in greater detail in the volume of the 'Systematische Beschreibung' published in 1824, and illustrated in tab. xxxvii. of that work, figs. 18-25. Strangely enough, in view of the course that he has seen fit to adopt, this contention is actually advanced by Bezzi (*loc. cit.* pp. 17-18, sep. imp.)! In dealing his perfectly gratuitous blow at the stability of Muscid nomenclature, Speiser relies chiefly on the fact that Meigen appended to his 1803 diagnosis of *Siphona*, as "type" or "example," the name "*Stomoxys irritans*, Fabr.," which is now admitted to be a synonym of *Hæmatobia* (*Stomoxys*) *stimulans*, Mg. This argument, however, goes for naught in view of the statements in the diagnosis itself, to which attention has already been drawn; and, as Bezzi remarks (*loc. cit.* p. 18, sep. imp.), there appears to have been some mistake as regards the species given as the type of the genus *Siphona*. It may well be that "*irritans*," Fabr., was simply a *lapsus calami* for "*minuta*," Fabr., since in Syst. Besch. iv. p. 155, *Stomoxys minuta*, Fabr., is given by Meigen himself as a synonym of *Siphona* (*Musca*) *geniculata*, Deg., the species which there follows immediately after the detailed description of the genus *Siphona*.

\* For the nomenclature of the bristles of the scutellum, cf. Girschner, "Ueber die Scutellarbeborstung der Musciden," Wiener entomologische Zeitung, xx. Jahrg. (1901), pp. 71-72, Taf. i. figs. 4-7.

of that exhibited by the first posterior cell in the case of *Stomoxys calcitrans*, L.; *apical portion of fourth vein* beyond the bend *perfectly straight*, not bent inwards at the extremity, as in *Stomoxys* and *Hæmatobia*.

Typical species, *Stygeromyia maculosa*, sp. n.

*Stygeromyia maculosa*, sp. n.

♂. Length  $6\frac{1}{4}$  mm.; length of wing  $6\frac{1}{2}$  mm.; width of head  $2\frac{1}{3}$  mm.; width of front at narrowest part  $\frac{1}{2}$  mm., slightly wider at vertex; length of proboscis from base of chitinous portion to tip of labella  $1\frac{1}{4}$  mm.; width of thorax at transverse suture  $2\frac{1}{2}$  mm.; width of abdomen at hind margin of second segment  $2\frac{3}{4}$  mm.

*Entirely smoke-grey*\*, *striped and spotted with brown, bristles and hair entirely black; palpi and tibiæ orange-buff* (anterior surface of hind tibiæ suffused with grey); *wings hyaline*, basal portion of third vein with some 7 or 8 bristles, wide apart and exceedingly minute.

*Head*.—Face and front yellowish silvery, posterior surface grey; ground-colour of face ochraceous; *frontal stripe* walnut-brown, narrow, slightly narrower than orbits in middle, expanding above and below, lower extremity enclosing usual silvery spot above base of antennæ; *antennæ*, first and second joints and base of third joint on inner side below orange-rufous, remainder of third joint and arista dark brown; hairs on upper side of arista long, 11 or 12 in number; *palpi* with short black bristles on outer side on distal two-thirds, three or four bristles at extreme tip of each palpus longer than remainder, and very conspicuous when insect is examined under a lens; middle portion of lower margin of each palpus beset with a series of fine and rather long black hairs; *proboscis* dark chestnut-brown. *Thorax*.—Brown markings on dorsum as follows:—*a pair of narrow admedian stripes* extending from anterior margin across transverse suture and terminating at one-fourth the distance between suture and præscutellar furrow; *a somewhat lighter-coloured median stripe*, which, commencing a short distance in front of the inner dorso-central bristles, disappears close to hind margin, and reappears again as a faintly marked fleck on base of scutellum; *two broader spots on each side near transverse suture*, one in front of suture, immediately behind post-humeral bristle, the other behind suture, between supra-alar bristle and the dorso-central row, and nearer to the latter; the last-mentioned spot is

\* For names of colours see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, and Company, 1886).

somewhat elongate, and all the thoracic markings, except the short posterior median stripe and the fleck on the base of the scutellum, are somewhat shining: the general arrangement of the thoracic markings, except for the presence of a fleck on the base of the scutellum, is similar to that seen in the case of the ♀ of *Hæmatobia stimulans*, Mg. Abdomen rounded, the upper surface strongly arched; first segment unspotted; second, third, and fourth segments with an elongate median spot of mummy-brown, and a lateral spot on each side; the median spots on the second and third segments are guttate, and that on the second segment is in contact with the front margin, but does not quite reach the hind margin; the median spot on the third segment is not in contact with either front or hind margins; the same spot on the fourth segment takes the form of a narrow median stripe extending from the front margin to a point one-third of the length of the segment from the hind margin; the lateral spots on the second segment are the largest of all and transverse. Legs.—Femora greyish, except tips, which are orange-buff; front tarsi cinnamon-rufous, middle and hind tarsi darker, last joint of all tarsi ferruginous.

One specimen. Little Aden, Arabia. 8. ii. 1895. (Lieut.-Colonel Yerbury.) Type in British Museum (Natural History).

The British Museum is indebted to the generosity of Colonel Yerbury, whose remarkable energy as a collector of Diptera is well known, for the enrichment of its collection with the type of the new genus and species described above. Although the donor has unfortunately been unable to find in his diaries any reference to the habits of the insect, there can be no doubt, from its evident affinities and from the shape of its proboscis, that *Stygeromyia maculosa* is a blood-sucker; and it is to be hoped that we may ere long receive, in addition to a series of specimens of both sexes, full details as to the bionomics of this striking addition to the Stomoxydinæ.

#### BIBLIOGRAPHICAL NOTICES.

*Fishes of Japan, an Account principally on Economic Species.* By KEINOSUKE OTAKI, TSUNENOBU FUJITA, and TADASHI HIGURASHI. Text roy. 8vo; plates imper. 4to. Tokyo, 1903-7. (Publishers: Shokwabo, Tokyo.)

THIS work has been in progress for several years. Excellent in its plan, object, and execution, it is characteristic of the thoroughness with which the Japanese Naturalists have mastered western

scientific methods, as well as of their national aptitude for rendering their work generally useful by combining practical instruction with purely technical detail.

The text of each number consists of two separate portions: the first, which is written in English, contains a technical description of each species with an account of its distribution in Japan, its habits, propagation, economic value, and, in a condensed form, of the implements and modes of capture. The second portion is a Japanese reproduction of the former, but in it the authors enter more fully into such details as possess a special local interest; it is illustrated by numerous text-figures of the implements and apparatus employed by the Japanese fishermen, many of which are very ingenious, while a few are admittedly foreign importations. Some spirited sketches of fishing-operations cannot fail to delight the fisherman's heart, and a study of them may be useful or give new ideas to the expert of other lands.

The figures of the fishes have been taken from fresh specimens and are most faithful representations; although every attention is paid to an accurate delineation of structural details, ichthyologists will readily recognize in them an artistic family-likeness to the illustrations in Siebold's 'Fauna Japonica.'

The authors do not hamper themselves with a systematic sequence of the species admitted in their work. Of the four parts that have appeared up to the present, the first (1903) treats of *Lateolabrax japonicus*, *Latilus sinensis*, *Thynnus affinis*, and *Seriola quinqueradiata*. The importance of the last two may be gathered from the fact that in 1899 the catch of the Tunny amounted to 79,124,002 pounds, valued at about £394,000, and that of the *Seriola* in 1901 to 44,731,405 pounds, valued at £209,000.

Of the food-fishes treated of in the second part (1904)—*Scombropro chilodipteroides*, *Scomber colias*, *Trachurus japonicus*, *Caranx muroadsi*, *Paralichthys olivaceus*—the most valuable is the Spanish Mackerel, identical with the European form, its capture being valued on an average at £120,000 a year.

In the third part (1906) *Sparus Schlegelii*, *Thynnus Schlegelii*, *Clupea melanosticta*, *Chatoëssus punctatus*, and two freshwater fishes, *Cyprinus carpio* and *Carassius auratus*, are included. As to the Carp, it is interesting to notice that this fish is regarded as "one of the table dainties," and that its culture has been practised in Japan as far back as the first century. Goldfish are generally distributed over the islands, even the smallest streams being stocked with this species; its culture is known to have been well-developed in the ninth century.

Part 4 (1907) contains descriptions and figures of nine species: *Pagrus major*, *Oncorhynchus keta*, *Plecoglossus altivelis*, *Salmo masou*, *Hypomesus olidus*, *Salanx microdon*, *Anguilla japonica*, *Muraenesox cinereus*, and *Conger anago*. The first of these is of great commercial value, estimated at £326,000 per annum. The small *Plecoglossus* is highly esteemed for the table, and affords principally sport with Cormorants; some places in the Mino

Province have been famous for this mode of fishing since the reign of the Emperor Jimmu, the founder of the nation more than 2500 years ago. A. G.

*The British Woodlice, being a Monograph of the Terrestrial Isopod Crustacea occurring in the British Islands.* By WILFRED MARK WEBB and CHARLES SILLEM. With 25 Plates and 59 Figures in the Text. [Reprinted from the 'Essex Naturalist,' vol. xiv. 1905-6.] Svo. Duckworth & Co., 1906. Pp. x, 54. 6s. net.

HITHERTO the British terrestrial Arthropoda other than the most attractive insects have received comparatively little attention from the general public, and we are glad to welcome a well-executed monograph of one of these neglected groups on which hitherto there has been no popular or easily accessible work. Moreover, as it is a small group, it has been possible to deal with the subject in greater detail than if a great number of species required to be noticed in a limited space. In the present work seventeen species are described and figured from Essex, including *Ligia oceanica*, a sea-shore species, which was very properly included as being closely allied to the terrestrial species and too important and interesting to be omitted. Besides these, eight species are described which have occurred in other parts of the British Islands but have not yet been recorded from Essex, making twenty-five British species in all. Now that attention has been called to the group, others will doubtless soon be added to the list.

The book commences with a well-written account of the position, geological history, and structure of the group, the structure and anatomy being well illustrated. This is followed by remarks on habits, use in medicine, names, collecting and preservation, classification, and tables of genera. Then follows the detailed description of genera and species, and a good Bibliography closes a volume which deserves the attention of all who are interested in the zoology of the British Islands. W. F. K.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

January 9th, 1907.—Sir Archibald Geikie, D.C.L., Sc.D., Sec.R.S.,  
President, in the Chair.

The following communications were read:—

1. 'On the Cretaceous Formation of Bahia (Brazil) and on the Vertebrate Fossils contained therein.' By Joseph Mawson, F.G.S., and Dr. Arthur Smith Woodward, F.R.S., F.L.S., F.G.S.

This paper relates to a series of estuarine and freshwater deposits originally described to the Geological Society by the late Samuel Allport, in 1859. The results of thirty years' collecting of fossils

are summarized, and the distribution of the formation, so far as determined, is marked on a map. The strata are disturbed by numerous dislocations and discordant dips, and no regular succession of zones or horizons can be discovered. All the more important vertebrate fossils collected are now in the British Museum (Natural History). From these a few remains of new species are selected for special description. A mandibular symphysis of a very large crocodile, with a long garial-like snout, belongs to one of the Goniopholidæ. Some Dinosaurian vertebræ seem to belong to the Iguanodont group. A large fish-skull represents a new genus allied to *Macropoma*, and indicates a species five or six times as large as any *Cœlacanth* previously discovered. The discussion of a complete list of the fossil Vertebrata proves that the formation is of Cretaceous age, and suggests that it may be Lower Cretaceous, as supposed by Hartt.

2. 'On a New Dinosaurian Reptile from the Trias of Lossiemouth, Elgin.' By Arthur Smith Woodward, LL.D., F.R.S., F.L.S., F.G.S.

Mr. William Taylor, of Elgin, has recently discovered two skeletons of a small new reptile in the Triassic sandstone of Lossiemouth. Two imperfect skeletons of the same species are also shown on a slab of the same sandstone in the British Museum (Natural History). The head and trunk measure only 4 inches in length, but there is a very long and slender tail. The head is relatively large, and resembles that of *Ornithosuchus* in many respects; but the fossils do not exhibit any teeth. There are about twenty-one presacral vertebræ, of which nine are cervical. There are distinct traces of a plastron of delicate abdominal ribs. The limb-bones exhibit a large internal cavity. The fore-limbs are very small, with a humerus as long as the radius and ulna. The hind-limbs are relatively large, and the ilium is extended antero-posteriorly for the length of four vertebræ. The femur is almost as long as the tibia and fibula; while the metatarsus is especially remarkable, being half as long as the tibia and consisting of four metatarsals of nearly-equal length firmly fused together. The toes are long and slender, with sharply-pointed claws. The Author concludes that this must have been a running or leaping reptile, and that it represents a new genus of Dinosauria related to the American Triassic *Hallopus*.

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## MISCELLANEOUS.

*Modern Helminthological Nomenclature.*  
By Dr. von LINSLOW.

WITHIN the last few years such far-reaching changes have been effected in helminthological nomenclature that it appears well worth while to subject them to a critical examination.

In the first place the principle has been established that the name

that shall be valid is the oldest, and not the one that has hitherto been in use and is well known; the consequence is that the species are quoted under names some of which were never current, and have to be explained by the addition of those previously used, since their meaning is unknown; the oldest name has the right of priority.

On this point Looss remarks in his latest work, 'On New and Previously Described Trematodes from Marine Turtles' ('Über neue und bekannte Trematoden aus Seeschildkröten,' Jena, 1902):—"A name has no right of priority unless accompanied by statements by means of which the species in question can be re-identified. The bare possibility that by an older name a certain species is meant to be understood is not sufficient to justify its re-introduction; the right of priority can be claimed for an old name only when it is recognizably defined, otherwise it is invalid, since the question turns upon the meaning of the name. With an exchange of names there must also be connected an exchange of concepts; the old name must, in order to supersede the later one, be justified by its meaning; the introduction of old names to which no one is able to attach a certain definition could only give rise to differences of opinion."

That this is to be demanded of generic just as much as of specific names is self-evident; generic names that convey no meaning are valueless.

It is sad that there should be any necessity to lay stress upon these self-evident principles; we shall see, however, that it was bound to happen, for modern systematists deal largely in words that are wanting in meaning, and we are involuntarily reminded of Goethe's

"Denn eben wo Begriffe fehlen,  
Da stellt ein Wort zur rechten Zeit sich ein;  
Mit Worten lässt sich trefflich streiten,  
Mit Worten ein System bereiten;  
An Worte lässt sich trefflich glauben,  
Von einem Wort lässt sich kein Jota rauben"\*.

This is the answer that the foolish scholar receives to his objection:—

"Doch ein Begriff muss bei dem Worte sein" †.

The word *Fasciola* is substituted for the well-known and customary *Distomum*; almost all authors loyally write Fasciolidæ instead of Distomidæ, according to the law of priority laid down by the Zoological Congress.

\* For just where ideas are wanting  
Comes in a timely word;  
With words can we raise a rare dispute,  
With words a system institute;  
Belief on words may we well bestow,  
No single jot will a word forego.

† Yet with the word an idea must be.

The "genus" *Fasciola* was founded by Linnæus ('Fauna Suecica,' ed. ii. (Holmiæ, 1746), p. 505, no. 2075) for *Fasciola hepatica ovata*, by which name no fewer than three species are meant:—*Distomum hepaticum*, Abildg.; *Dendrocaelum lacteum*, Oerst.; and *Schistocephalus solidus*, Rud. It follows therefore that a Trematode, a Turbellarian, and a Cestode are equally entitled to be termed *Fasciola*, if under these circumstances *Fasciola* can stand as a generic name. There can, however, surely be no doubt that a generic name which at the same time denotes a Trematode, a Turbellarian, and a Cestode is nonsense from a scientific point of view. No idea is conveyed by the word, but to this modern systematists apparently attach no importance.

Let us see how the name *Fasciola* was subsequently applied:—*Fasciola intestinalis*, Linnæus, = *Ligula digramma*, Creplin; *Fasciola alata*, Rudolphi, = *Hemistomum alatum*, Diesing; *Fasciola excavata*, Diesing, = *Hemistomum excavatum*, Diesing; *Fasciola strigis*, Gmelin, = *Holostomum variabile*, Nitzsch; *Fasciola subclavata*, Schrank, = *Diplodiscus subclavatus*, Diesing; *Fasciola* has been used to designate fifty species of *Distomum*.

*Fasciola hepatica*, Müller, = *Amphistomum conicum*, Rudolphi; *Fasciola verrucosa*, Schrank, = *Monostomum verrucosum*, Zeder; *Fasciola uncinata*, Gmelin, = *Polystomum integerrimum*, Rudolphi; *Fasciola barbata*, Linnæus, = *Rhynchobothrium paleaceum*, Rudolphi; *Fasciola trutta*, Røederer, = *Trienophorus nodulosus*, Rudolphi; *Fasciola marmorosa*, Müller, = *Tetracelis marmorata*, Hempr. & Ehrh.; *Fasciola glauca*, Müller, = *Monocelis glauca*, Diesing; *Fasciola lactea*, Müller, = *Planaria lactea*, Müller.

This is the result of the foundation of the genus *Fasciola* by Linnæus; the definition of *Fasciola* is a flattened worm, which tapers at both ends.

Looss discusses the question whether in applying the law of priority we should go back to Linnæus, 'Systema Naturæ,' ed. x. 1758, or to Rudolphi, 'Synopsis,' 1819, and decides in favour of the latter year, since Rudolphi was to a certain extent the founder of scientific helminthology, and the only means of interpreting the obscure old descriptions correctly is the study of the types. He holds, however, that, as a general rule, the introduction of old and unknown names not hitherto in use is a retrograde step, and that disinterred antiquities should not again be employed.

As a matter of fact, when we, only in accordance with the law of priority, write *Vesicaria trutta* instead of *Tænia longicollis*, *Halysis latus* instead of *Bothriocephalus latus*, *Lumbriæus teres* instead of *Ascaris lumbricoides*, *Gordius medinensis* instead of *Dracunculus medinensis*, *Filaria locustæ* instead of *Gordius aquaticus*, *Cucullanus rane* instead of *Strongylus auricularis*, and *Tænia heruca* instead of *Echinorhynchus angustatus*, satisfaction has been rendered to the right of priority. Not all the species here mentioned are the first and typical ones for which the old genus was founded; but it was only a question of showing what a confusion of ideas is occasioned by the old names, and with the growing modern inclination

to form where possible a special genus for each species the prospect of being obliged to return to the old generic names indicated becomes constantly greater.

It is an arbitrary proceeding to lay down 1758 and 1819 as limits of time from which the law of priority shall commence to apply; what really matters is the signification of the old names.

If investigators of the importance of a Leuckart and others did not resuscitate these old names, they must have had their reasons for the course that they adopted; they, too, must surely have considered such a procedure as a step in the wrong direction.

In strange contrast to the endeavours to replace later names by old ones are the equally frequent attempts to substitute quite recent names for the latter.

The genus *Tetrabothrium*, Rudolphi, with the typical species *cylindraceum*, Rud., and *macrocephalum*, Rud., has been broken up and replaced by *Prosthecocotyle*, Monticelli and Fuhrmann, and *Bothriotænia*, Lönnberg. As a reason for this proceeding it is asserted that Diesing has employed the designation *Tetrabothrium*, Rudolphi, in a sense different from that in which it is used by Rudolphi, but this, however, in no way concerns the latter and his genus.

The old and well-characterized genus *Amphistomum*, Rudolphi, has been broken up by Fischæder, who substitutes his genus *Paramphistomum*. The reason given is that Rudolphi described an *Amphistomum macrocephalum*, which, however, according to the laws of priority must be called *Strigea*. The oldest name for this species is not *Strigea*, but *Planaria teres*, Goeze (1782); it was afterwards termed *Festucaria strigis*, Schrank (1788), and subsequently (1793) *Fasciola strigis*, Gmelin; then for the first time *Strigea*, Abildgaard (1793), later *Amphistoma macrocephalum*, Rudolphi (1801), and finally *Holostomum variabile*, Nitzsch (1819). The latter is the name of the species to-day, and consequently it is not an *Amphistomum*; the typical species of this genus are *conicum*, Rud., and *subtriquetrum*, Rud., but the name *Paramphistomum*, which has not the slightest justification, has been adopted by modern systematists.

*Trichina*, Owen, is now called *Trichinella*, Railliet, since Meigen applied the name *Trichina* to a Dipteron in 1830. Medicine, veterinary science, and agriculture will not employ the terms "*Trichinellæ*," "examination for *Trichinellæ*," and "*Trichinellosis*." For more than thirty years the whole of the educated world has known the meaning of *Trichinæ*, but what *Trichinellæ* are it does not know and will, moreover, not learn; there is no risk of confusion; when we read that someone is suffering from *Trichinæ* or that they have been found in a pig we do not think of flies; I consider it wrong to bring about a change of name that will never be adopted.

The genus *Monostomum*, Zeder, was abolished by the bestowal upon its species of numerous other generic names; afterwards,

when Monostomidæ were spoken of, it was remarked that the genus *Monostomum* had disappeared; it had slipped through our fingers; the only species remaining was *Monostomum prismaticum*, Zeder, which, however, according to Monticelli is a *Distomum*; according to Looss the species is absolutely indeterminable. Thus Zeder's genus *Monostomum* has ceased to exist, and a similar fate is in store for many another old genus if the course adopted is followed further.

While entirely sharing the above-quoted views of Looss with reference to the value of the old names, I cannot approve of the action of this author and others in founding wherever possible a new genus for each new species, nor can I assent to his definition of the idea conveyed by the latter term. Looss declares that, if two different species exhibit anatomical differences, they at least belong to different genera; two species of the same genus must be in perfect agreement as regards their anatomical structure, and may only differ in the relative size and position of their organs and in actual bodily size. If we examine the figures of the six Distomes given by Looss on p. 860 of his work already referred to, which are stated to represent six genera, the conviction takes hold of us that specific differences are here mistaken for generic: in fig. 5 the vitellarium lies beneath and outside the limb of the intestine, in fig. 6 only outside it; otherwise the two figures agree in even the smallest detail; and these are said to belong to two genera. If trivialities of this sort are regarded as generic differences, we shall soon have as many genera as species. Looss asserts that the old generic designation *Distomum* no longer signifies anything whatever.

I consider *Distomum* to be an excellently characterized genus, which, like *Tænia*, only possesses the inconvenience of being too bulky; we shall therefore do well to effect a division into subgenera, and to write, for example, *Distomum (Apoblema) appendiculatum* and *Tænia (Davainea) frontina*. The definition of a genus adopted by Looss is, however, inapplicable to other classes, *e. g.* birds, fishes, and insects. I regard the genus as the aggregate of species united into closer association by means of common characters: thus we have genera such as *Felis*, *Anas*, *Cyprinus*, *Rana*, *Fipera*, *Vanessa*, and in botany *Quercus* and *Ranunculus*; they are not based upon anatomical differences, however; Looss's definition ignores common characters and only takes into consideration the differences; for the concept of a genus, as I apprehend it, it is not the differences but the common features that are decisive.

In ornithology we have got beyond this period of nomenclature; time was when the gulls found on German shores bore the generic designations *Rodostethia*, *Xema*, *Hydrocolerus*, *Gavia*, *Melagavia*, *Cephus*, *Laroides*, *Rissa*, *Chimonea*, *Pagophila*, *Cetosparactes*, *Leucus*, *Glaucus*, *Clupearus*, and *Dominicanus*—fifteen generic names for twelve species; they are now in the majority of cases all called *Larus* once more, the three-toed gull at the most is assigned to *Rissa*.

Owing to the confusion occasioned by modern nomenclature, it has already become impossible to make an alphabetical catalogue of Helminthes; for where, for instance, are we to place *Distomum maculosum*, which has been assigned to five different genera? The species is called *Distomum maculosum*, Rudolphi, *Pasciola maculosa*, Rudolphi, *Dicrocoelium maculosum*, Olsson, *Brachyleimus maculosus*, Stossich, and *Platyorchus maculosus*, Braun; among these genera the reader may make his choice.

The method of writing the names has also been influenced by the modern passion for innovation. The rule has been laid down that specific names are to be written with a small initial letter. *Ascaris linnæi* means Linné's *Ascaris*; the word is a genitive, and whoever writes the name *Linnæus* in the nominative and *linnæi* in the genitive perpetrates an orthographical error; are we, for example, also to write *Tenia van benedeni* instead of *van Benedeni*? Three mistakes are comprised in the specific name of *Ascaris gadi-brandti*, for the nominatives are *Gadus* and *Brandtus*, and a hyphen is unknown in Latin. There is no advantage in this new fashion, since everyone knows that in zoological names the first is the generic and the second the specific name. The disadvantages are manifold: in the first place the modern way of writing is wrong; secondly, we are led to consider words with small initial letters as adjectives, which is not the case; and lastly, when a name has been bestowed by an author, no one has the right to alter it according to his own particular fancy.

On enquiring as to the origin of these interfering changes, we are told that it is a question of the principle of stability in nomenclature; "our first consideration in nomenclature should be stability," says Stiles. In the setting-up and observance of the laws of stability of nomenclature, however, the names, which after all were the end in view, have been entirely forgotten, for the stability of the names has been utterly destroyed. We have now introduced names which are scientifically impossible: in the place of the old well-known names are found new and unknown ones; instead of new and legitimate ones we have old senseless names that are mere words. The attempt is made to cancel the old idea of a genus, and to place almost every new species in a genus of its own; the names are wrongly written, and this is called stability.

Science also has its fashions, and we just go along with them; we do not want to be old-fashioned, but desire to stand on the scientific summit; we swim with the tide.

Science, however, is free, and no one, not even a zoological congress, has the right to give it precepts which injure it. That the course which has been adopted by the prevailing helminthological nomenclature is a serious disadvantage to science I have no doubt whatever.—*Zoologischer Anzeiger*, Bd. xxvi. no. 692 (January 26, 1903), pp. 223-229: from a separate impression supplied by the Author.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 114. JUNE 1907.

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LIV.—*On the Classification of the Decapod Crustaceans.*  
By L. A. BORRADAILE, M.A., Lecturer in Natural Sciences  
at Selwyn College, Cambridge.

IN the following pages proposals as to the classification of the Decapod Crustaceans which I have made in a number of papers during the last few years are stated in a connected form and with certain additions, so as to form a complete conspectus of the higher divisions of the group. I hope that this systematic summary may prove of practical use and that some remarks introductory to those portions of it which have not yet been published will be of service as a contribution to the discussion of vexed questions of phylogeny and classification.

The necessity for keeping the article within reasonable limits has compelled me to choose between the ordinary method of stating the diagnostic characters of the divisions of the classification under headings and that known as a "key." I have adopted the latter as being better suited to bring out the resemblances and contrasts on which a phylogenetic arrangement is based, and because it is of more immediate use to anyone unfamiliar with the group. Questions with which I have dealt elsewhere are not discussed in detail here,

but a fuller treatment of them may be found in the original papers\*, especially those in the 'Fauna of the Maldives.'

## I.

The true position of the order Decapoda in the Crustacean system is very well shown by Dr. Calman's elaboration of Hansen's classification, published in this Journal in 1904 †. To this classification I would give my adhesion, only pointing out that, if the Crustacea be given rank as a subphylum of the Arthropoda, equivalent to the Arachnoidea, Tracheata, and Prototracheata, the Malacostraca become a class and the Eumalacostraca a subclass.

For our present purposes the most important of the points made by Dr. Calman is the close relationship between the Euphausiacea and the Decapoda. We shall assume that the two orders have a common origin and regard the subdivisions of the Decapoda as primitive in proportion as they approach the Euphausiacea, though it will at the same time be necessary to bear in mind that the Decapods with four rows of gills, representing, as we shall see, both epipodite and proepipodite, cannot be descended from the modern Euphausiaceans, which have only one row.

\* "A Revision of the Pontoniidæ," Ann. & Mag. Nat. Hist. (7) ii. pp. 376-391 (1898). [History, affinities, and limits of the (sub-) family, pp. 376-379.]

"On the Stomatopoda and Macrura brought by Dr. Willey from the South Seas," Willey's Zool. Results, iv. pp. 395-428, pls. xxxvi.-xxxix. (1900). [*Palaemonopsis*, a Palaemonid with affinities to Pontoniidæ, p. 410; doubtful validity of Latreutidæ, p. 414.]

"On some Crustaceans from the South Pacific.—Part IV. The Crabs," Proc. Zool. Soc. 1900, pp. 568-596, pls. xl.-xlii. [Primary subdivisions of the Crabs, p. 571; subfamilies of Atelecyclidæ, Cancridæ, and Portunidæ, pp. 575-577.]

"Marine Crustaceans" in Gardiner's 'Fauna and Geography of the Maldive and Laccadive Archipelagoes.'—Part III. The Xanthidæ and some other Crabs, vol. i. pp. 237-271, text-figs. 41-60. [Characters and Classification of Xanthidæ, pp. 237-238.]—Part IV. Some Remarks on the Classification of the Crabs, vol. i. pp. 424-429, text-fig. 110.—Part VI. The Sand-Crabs (Oxystomata), vol. i. pp. 434-439, text-figs. 115-117, pl. xxii. [Characters and Classification of Oxystomata, p. 434.]—Part IX. The Sponge-Crabs (Dromiacea), vol. ii. pp. 574-578, pl. xxxviii. [Characters and classification of Dromiacea, pp. 574-576.]—Part X. The Spider-Crabs (Oxyrhyncha), vol. ii. pp. 681-690, text-figs. 122-126, pl. xlvii. [Characters and classification of Oxyrhyncha, pp. 681, 682.]—Part XI. On the Classification and Genealogy of the Reptant Decapods, vol. ii. pp. 690-698, text-figs. 125, 126, pl. xlvi. —Part XIII. The Hippideæ, Thalassinideæ, and Scyllarideæ, vol. ii. pp. 750-754, pl. lviii. [Characters and classification of the groups.]

"On the Classification of the Thalassinideæ," Ann. & Mag. Nat. Hist. (7) xii. pp. 534-551 (1903).

† Ann. & Mag. Hist. (7) xiii. p. 144 (1904).

## II.

1. The earliest of the surviving classifications of the Decapoda is that established by Latreille in 1806\*, in which the order is subdivided into MACRURA or "tailed" forms and BRACHYURA or Crabs. Roughly speaking, this division depends on the condition of the abdomen, which in the Macrura is carried at length and in the Brachyura is folded under the thorax. In framing a definition, however, it is not possible to rely on the above criterion, for in the Porcellanidæ, the Hippidea, and the Lithodidæ, which are undoubtedly nearly related to tailed forms, the abdomen is carried as in the Crabs. The absence from the Brachyura of the limbs of the sixth abdominal segment is a better character of separation, but even this breaks down in the case of the Lithodidæ, which were, indeed, placed by Latreille with the Crabs. Another criterion which is all but absolute is given by the fusion of the carapace at the side to the epistome. This is found in the Crabs, but only in the Scyllaridea and Eryonidea among the Macrura. No single difference, however, can be found which will absolutely and sharply define the Brachyura from the Macrura.

2. The next important step in the working out of the system was the establishment by H. Milne-Edwards in 1834 of a third suborder, the ANOMURA, intermediate between the two of Latreille. In the new group were placed certain of the higher Macrura (Paguridæ, Hippidæ, Porcellanidæ) and lower Brachyura (Dromiidæ, Homolidæ including *Lithodes*, *Raninidæ*), the abdomen in all these forms being more or less modified from the primitive macrurous condition, but keeping the sixth pair of limbs, except in the last two families. Milne-Edwards's Anomura has had a chequered history in the hands of various authorities, having been alternately added to or reduced, retained or parcelled out again between the Brachyura and Macrura. In a recent paper† I have tried to show that the macrurous members of the original suborder, with the addition of the Galatheinea and Thalas-sinidea, form a natural group, and must be retained as such in the classification.

3. The last important proposal for the modification of the classification of the Decapoda was made by Boas in 1880‡. On the basis of an examination of the anatomy of a number

\* Gen. Crust. Insect. i. Fabricius's two classes Kleistagnatha and Exochnata of "Insects," and Lamarek's Canceri brachyuri and Canceri macrouri, had much the same extension.

† Gardiner's 'Fauna of the Maldives,' vol. ii. p. 690.

‡ Kongl. Danske Vidensk. Selsk. Skrifter, (6) i. p. 23.

of typical genera Boas came to the conclusion that the existing arrangement was unnatural in that it contrasted the Brachyura and Anomura—single branches of the Decapoda—with a heterogeneous assemblage (the Macrura) consisting of the whole of the rest of the tree, some branches of which are more nearly related to the Brachyura and Anomura than they are to the rest of the Macrura. He accordingly proposed to divide the order into two suborders—the REPTANTIA, containing the Crabs, Anomurous forms, Thalassinidea, Homaridea (Nephropsidea), Scyllaridea, and Eryonidea; and the NATANTIA, containing the Penæidea (including Stenopidæ) and the Caridea\*. The names of these suborders indicate the main difference by which, on the whole, they are separated; a more accurate diagnosis will be found below.

4. There can be little question of the correctness of Boas's view that the members of his Reptantia form a natural group. The characters that they hold in common are too numerous and too specialized to admit of doubt on this point. But it by no means follows that the same is true of the Natantia. Unless it can be shown that the former group arose from the Decapod stem before the separation of the forms which constitute the latter, Boas's classification will be open to the objection that he raised against Latreille's—that is to say, it will be based, not on the divergence of two groups, but on the elevation of a branch to the same rank as the parent-stem. This, as it happens, is precisely the impression conveyed by the tree figured by Boas on p. 27 of his paper. The following considerations, however, serve to show that Boas's tree is wrong and his classification true.

A search for the most primitive group of the Decapoda leads, beyond all doubt, to the Penæidea. This is seen, (1) in their primitive life-history, recalling that of the Euphausiacea; (2) in the peculiar copulatory armature of the male, which suggests the same relationship; (3) in the small number of special features, unshared by other Decapoda, which the group possesses, and the number of characters that they have in common with one or other of the remaining groups—thus, with the lower Reptantia they share the shape of the first three pairs of legs, which are fairly alike except sometimes in size, and all chelate †, whereas those of the Caridea often differ much and their third pair is never chelate, the structure of the maxillipeds, which lack special modifications found in the Caridea, and the absence of the Caridean bend in the abdomen, while they share with the Caridea all those

\* *Eukyphotes* of Boas.

† Except in the aberrant *Sergestidæ*.

characters, enumerated below, which separate the Natantia from the Reptantia; (4) in their early appearance in the earth's history (probably in the Trias), though it is true that the remains of Reptantia are found fully as early; (5) possibly in the structure of their gills, if, as Boas thinks, the phyllobranchiæ of the Caridea and the trichobranchiæ of the lower Reptantia be both derived from the dendrobranchiæ of the Penæidea. In any case it is impossible to regard the phyllobranch condition as the original one, but whether dendrobranchiæ or trichobranchiæ are to be regarded as the starting-point of the gills of the Decapoda is much more doubtful. It would be possible to support either theory by cases among the Euphausiacea which might be regarded as substantiating it.

The evidence for the primitive nature of the Penæidea is therefore strong, but it must not be supposed that the *modern* Penæids were the stock from which the rest of the order arose. Their loss of the *appendix interna* of the pleopods\*, which is found in Euphausiacea and in many Reptantia and Caridea, is clear evidence that they do not stand in the direct line of descent of the latter two groups. Moreover, the original Decapoda must have borne the podobranch on the fourth leg found in some of the lower Reptantia and the epipodite on the last leg, of which Coutière has found a vestige in many Caridea. Both these structures have been lost by the Penæidea. The most that can be said is that, of modern Decapoda, the Penæidea more nearly approach the primitive condition than any others.

From the original Decapod stock, whose nearest descendants we have found in the modern Penæids, the Reptantia and Caridea must have arisen separately, for it is impossible to suppose that either of these specialized groups arose from the other. They have no characters in common which they do not also share with the Penæidea, and each, as we have seen, has characters which it shares with the latter group and not with the other. There remains, then, the question, which of the two was the first to leave the early Penæid stem, and that this was the Reptantia is shown pretty clearly by the following facts:—

(1) The Caridea and Penæidea have undoubtedly more in common with one another than either of them has with the Reptantia. This extends to characters which are at least not obviously primitive, such as the "stylocerite" of the first antenna.

(2) The gill-series in the lower Reptantia are fuller than in either Penæids or Carids, so that it seems likely

\* Except on the second pair of the male.

that the stock from which the latter two groups have sprung lost a portion of their heritage in this respect after the differentiation of the former. For, not only have some of the lower Reptants kept the podobranchs on the legs of the fourth pair which all the Penæidea\* and Caridea have lost, but on several segments in the Potamobiidæ we find the full possible branchial equipment. Coutière ('Comptes Rendus,' 1905, p. 64) has elaborated an extremely ingenious theory of the homologies of the several kinds of epipodial structures of the Decapoda with one another and with those of the lower Crustacea. Shortly put, this theory is as follows:—The primitive number of epipodial outgrowths of the thoracic limb of the Crustacea is two—a distal, the *epipodite*, belonging to the coxopodite, and a proximal, the *proepipodite*, belonging to the true basal joint of the limb, which in the Decapoda is taken into the body during development. Both these structures are found in *Branchipus* and in *Anaspides*. In Schizopoda and Decapoda both proepipodite and epipodite divide into two parts. The epipodite forms in the Lophogastridæ ( $\alpha$ ) the oostegite and ( $\beta$ ) a setiferous tubercle which I shall call the *setobranch*. In the Caridea the epipodite forms, when present, ( $\alpha$ ) the "epipodite" (*mastigobranch*) and ( $\beta$ ) on the legs a setobranch of the same form as in the Lophogastridæ, and on maxillipeds 2 and 3 a podobranch and an arthrobranch respectively; in the Penæidea it forms ( $\alpha$ ) the "epipodite" and ( $\beta$ ) the (anterior) arthrobranch, wanting in Caridea and supposed to be there represented by the setobranch. The proepipodite forms in the Lophogastridæ a divided gill. In the Decapoda it forms ( $\alpha$ ) the pleurobranch and ( $\beta$ ) the (posterior) arthrobranch. In the development of *Penæus* this subdivision can actually be seen to take place. The Euphausiacea have lost their proepipodite.

Now, valuable and suggestive as this theory is, it is to some extent invalidated by the fact that, in the case of section  $\beta$  of the epipodite, structures which it regards as alternative developments of the same rudiment can be found coexisting. For it supposes that one arthrobranch (presumably the anterior) and the podobranch and the setobranch are equivalent and alternative structures. But in the Potamobiidæ all these are present together on several segments of the body. In *Dromia* Bohn has discovered what is undoubtedly a setobranch on the third maxilliped, where, though the podobranch is wanting, both arthrobranches are present. On the first leg the setobranch is found on the

\* It is only in certain of the primitive deep-sea Penæids that the first two or three pairs of legs bear podobranchs.

base of the mastigobranh and appears as an outgrowth from it, suggesting strongly that the similar process on the mastigobranh of the third maxilliped of many crabs has the same origin and that the two branches of the forked "epipodite" of some Penæidæ represent the setobranh and mastigobranh respectively. Of course there are also cases in the lower Penæidæ and elsewhere where the podobranh and both arthrobranchs are found together. I would suggest, therefore, that in the primitive Decapoda the epipodite divided not into two but into four structures—( $\alpha$ ) the mastigobranh, ( $\beta$ ) the setobranh, ( $\gamma$ ) the podobranh, ( $\delta$ ) the anterior arthrobranh—just as in the Lophogastridæ the proepipodite has sometimes as many as four branches. At the same time it must be remembered that the connexion of the anterior arthrobranh with the mastigobranh is not a proved fact, as is that of the posterior arthrobranh with the pleurobranh. It seems quite possible that the ancestors of the Decapoda bore not two but three rows of epipodial outgrowths on their limbs, and that the anterior arthrobranchs represent the middle of these three rows. Besides the "epipodite" and "proepipodite," *Branchipus* bears on the outer side of its thoracic limbs a third outgrowth of somewhat different form. This has been doubtfully claimed as the exopodite, but may quite possibly represent the mastigobranh.

(3) Whereas the Reptantia (*Eryonidea* &c.) appear in the Trias, the geological record shows no trace of Caridea till late Jurassic times. This group, in fact, is a late and somewhat specialized offshoot from the Penæid stem. The lower Reptantia have, perhaps, evolved further than the lower Caridea, but they are still in some respects more primitive and they took origin much earlier. Boas's arrangement is therefore justified. The Natantia are as natural a group as the Reptantia, and into these two suborders the order must be divided.

### III.

In considering the subdivision of the Natantia it will be evident from what has been said that the Penæidea and the Caridea must stand as two tribes of the suborder. To these, however, must be added a third whose position needs some examination. The little family Stenopidæ was placed by Boas with the Penæidea, which it resembles in its three chelate legs and in other respects; but other authorities have very

\* It is quite possible that the trichobranchiate nature of the gills of the lower Reptantia is another primitive feature lost by the Penæidea and Caridea.

rightly removed it to an independent division, the STENOPIDEA. The position of this group is extremely doubtful. It has clearly no relationship to the Caridea, for it differs from them and agrees with the Penæidea and lower Reptantia in all respects in which the Caridea are peculiar, but its penæid and reptant affinities are more evenly balanced. On the one hand, like most of the Penæidea it has lost all the podobranchs behind the second maxilliped and the *appendices internæ*, and has legs of the natant form; on the other hand, like the lower Reptantia, it is trichobranchiate, has a curved mandibular palp and short endopodite to the first maxilliped, and lacks the copulatory apparatus of the male penæids and the spine (stylocerite) on the stalk of the antennule which is so characteristic of the Penæidea and Caridea.

There would be much to be said for placing this group by itself as a suborder, but, on the whole, its affinities with the Natantia seem strong enough to justify its being included with them.

Since the termination *-idea* is used below for groups of a lower rank, the names of the tribes of the Natantia have, in the key which follows, been made to end in *-ides*.

#### IV.

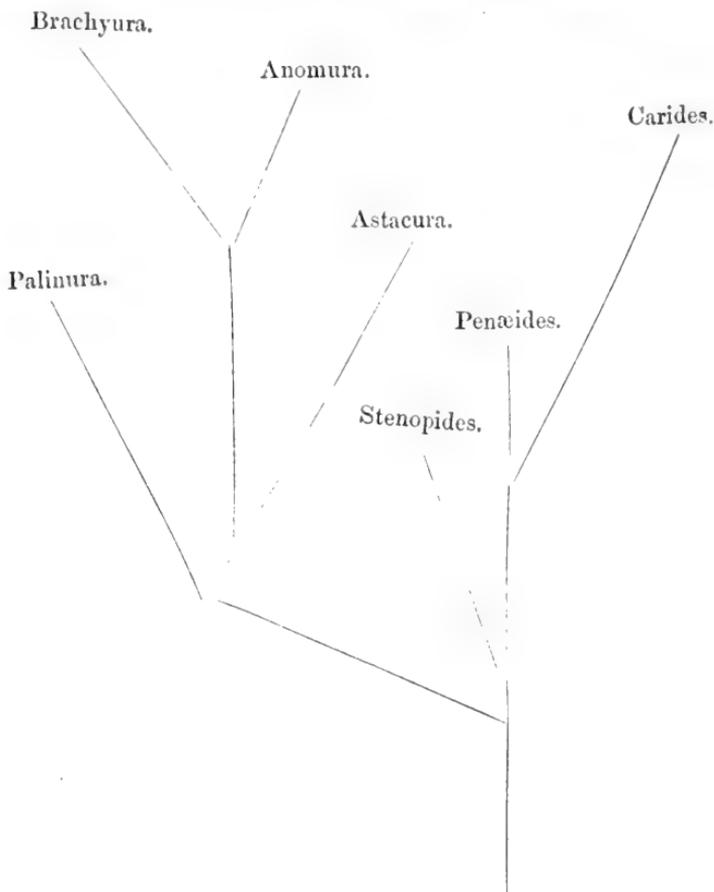
Within the Reptantia, the Brachyura and the Anomura stand out as natural groups. With these I have already dealt elsewhere\*. There remain for consideration the Nephropsidea, Scyllaridea, and Eryonidea. The latter two of these divisions are closely related. They differ widely from the Nephropsidea in the fusion of the carapace to the epistome, the reduction of the rostrum † and of the inner lobes of the second maxillæ and first maxillipeds, the retention of *appendices internæ* on some of the limbs at least, and the lack of sharp sutures on the tail-fin, and are very ancient, whereas Nephropsidea, at least of the modern type, do not appear till somewhat later. I propose therefore to class the Scyllaridea and Eryonidea as a single tribe of the Reptantia, giving to this tribe the name PALINURA, which has the same ending as those of the other tribes of the suborder, and recalls the fact that the Palinuridæ are among its members and the position in which the abdomen is carried. For the sake of uniformity, the Nephropsidea may take the name ASTACURA, which will indicate that the tail-fin in all the members of the group is like that of *Astacus*, one of its most common representatives. Thus the old Macrura are completely dispersed.

\* Gardiner's 'Fauna of the Maldives,' vol. ii. p. 690.

† Except in *Palinurellus*.

## V.

The following tree illustrates diagrammatically the relationship between the groups which have been discussed :—

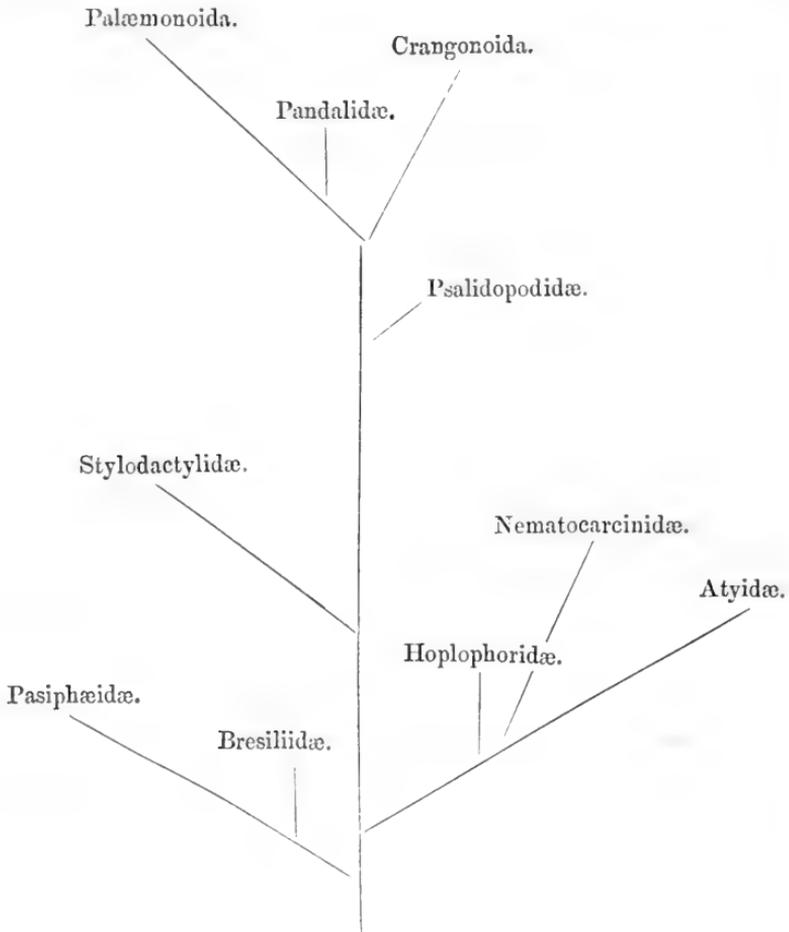


## VI.

I have grouped the families of the Carides into "super-families," based on, but not quite the same as, the extremely suggestive "alliances" proposed by Major Alcock for the Indian deep-sea families. The shape of the mandible should not be followed too implicitly as an indication of affinity in this group. It shows a tendency to division into "molar" and "cutting" halves throughout the order. In the higher Carides this division is greatly accentuated, but in some cases a secondary simplicity is reached by the loss of one of the halves, and this has happened independently in *Latreutes* and the Crangonoida (cutting-edge) and, I think, Pasiphæidæ

(molar process). The palp comes and goes from genus to genus.

The following tree is an attempt to represent diagrammatically the course of the evolution of the Carides :—



## VII.

In discussing the classification of the crabs, I have elsewhere \* suggested, among other changes, the abolition of the distinction between the groups Cyclometopa and Catometopa. The families gathered under the latter name have probably genetic affinity, at least in some cases, but they pass into the

\* Gardiner's 'Fauna of the Maldives,' vol. i. p. 425.

Cyclometopa by such easy transition and, even in typical genera, differ from them so little that their separation is a needless and misleading complication of the system. It would, in fact, be logically necessary, if a group Cyclometopa were to be retained, to balance it by dividing the other brachyrrhynchous crabs into equivalent sections somewhat as follows:—(1) Corystidæ, (2) Portunidæ, (3) Potamonidæ, (4) Atelecyclidæ and Cancridæ, (5) Xanthidæ and Gonoplacidæ, (6) Pinnotheridæ, (7) ? Ptenoplacidæ and Palicidæ, (8) Hapalocarcinidæ.

## VIII.

*A Table of the Classification of the Crustacea Decapoda.*

## Suborder NATANTIA.

## Tribe PENÆIDES.

Families: Penæidæ (subfamilies: Cerataspinae, Aristæinae, Sicyoninae, Penæinae), Sergestidæ (subfamilies: Sergestinae, Amphioninae, Leuciferinae).

## Tribe CARIDES.

Superfamily *Pasiphæoidea*.

Families: Bresiliidæ, Pasiphæidæ.

Superfamily *Hoplophoroidea*.

Families: Hoplophoridæ, Nematocarcinidæ, Atyidæ.

Superfamily *Stylodactyloidea*.

Family Stylodactylidæ.

Superfamily *Psalidopodoidea*.

Family Psalidopodidæ.

Superfamily *Pandaloidea*.

Family Pandalidæ (subfamilies: Thalassocarinae, Pandalinae).

Superfamily *Palæmonoidea*.

Families: Alpheidæ, Hippolytidæ, Rhynchocynetidæ, Palæmonidæ (subfamilies: Hymenocerinae, Pontoniinae, Palæmoninae).

Superfamily *Crangonoidea*.

Families: Gnathophyllidæ, [Autonomæidæ?], Processidæ, Glyphocrangonidæ, Crangonidæ.

## Tribe STENOPIDES.

Family Stenopidæ.

## Suborder REPTANTIA.

## Tribe PALINURA.

Superfamily *Eryonoidea*.

Family Eryonidæ.

Superfamily *Scyllaridea*.

Families: Scyllaridæ, Palinuridæ.

## Tribe ASTACURA.

Families: Nephropsidæ, Parastacidæ, Potamobiidæ.

## Tribe ANOMURA.

Superfamily *Galatheidea*.

Families: *Ægleidæ*, *Chirostylidæ*, *Galatheidæ* (subfamilies: *Galatheinæ*, *Munidopsinæ*), *Porcellanidæ*.

Superfamily *Thalassinidea*.

Families: *Axiidæ*, *Laomediidæ*, *Callianassidæ* (subfamilies: *Callianassinæ*, *Upogebiinæ*), *Thalassinidæ*.

Superfamily *Paguridea*.

Families: *Pylochelidæ*, *Paguridæ* (subfamilies: *Pagurinæ*, *Eupagurinæ*), *Cœnobitidæ*, *Lithodidæ* (subfamilies: *Hapalogastrinæ*, *Lithodinæ*).

Superfamily *Hippidea*.

Families: *Albuneidæ*, *Hippidæ*.

## Tribe BRACHYURA.

## Subtribe DROMIACEA.

Superfamily *Dromiidea*.

Families: *Homolodromiidæ*, *Dromiidæ*, *Dynomeriidæ*.

Superfamily *Homolidea*.

Families: *Homolidæ*, *Latreillidæ*.

## Subtribe BRACHYGNATHA.

Superfamily *Brachyrhyncha* (*Canceridea*).

Families: *Corystidæ*, *Atelecyclidæ* (subfamilies: *Thiinæ*, *Acanthocyclinæ*, *Atelecyclinæ*), ? *Trichiidæ*, *Canceridæ* (subfamilies: *Cancrinæ*, *Pirimelinæ*), *Portunidæ* (subfamilies: *Carcinidinæ*, *Portuninæ*, *Catoptrinæ*, *Carupinæ*, *Portuninæ*, *Caphyrinæ*, *Thalamitinæ*, *Podophthalminæ*), *Potamonidæ* (subfamilies: *Potamoninæ*, *Deckeniinæ*, *Potamocarcinidæ*, *Trichodactylinæ*), *Xanthidæ* (subfamilies: *Xanthinæ*, *Carpilinæ*, *Etisinæ*, *Menippinæ*, *Trapeziinæ*, *Eriphiinæ*, *Oziinæ*), *Carcinoplacidæ* (subfamilies: *Carcinoplacinæ*, *Gonoplacinæ*, *Prionoplacinæ*, *Rhizopinæ*, *Hexapodinæ*), *Pinnotheridæ*, *Grapsidæ* (subfamilies: *Grapsinæ*, *Varuninæ*, *Sesarmidinæ*, *Plagusinæ*), *Gecarcinidæ*, *Ocypodidæ* (subfamilies: *Ocypodinæ*, *Macrophthalminæ*, *Mictyrinæ*), *Palididæ*, *Ptenoplacidæ*, *Hapalocarcinidæ*.

Superfamily *Oxyrhyncha* (*Maidea*).

Families: *Parthenopidæ* (subfamilies: *Parthenopinæ*, *Eumedoninæ*), *Maiidæ* (subfamilies: *Inachinæ*, *Acanthonychinæ*, *Pirinæ*, *Maiinæ*), *Hymenosomidæ*.

## Subtribe OXYSTOMATA.

Families: *Calappidæ* (subfamilies: *Calappinæ*, *Orithyiné*, *Matutinæ*), *Leucosiidæ* (subfamilies: *Leucosinæ*, *Ilinæ*), *Ranidæ*, *Dorippidæ* (subfamilies: *Dorippinæ*, *Tymolinæ*).

## IX.

*A Conspectus of the Classification of the Crustacea Decapoda.**Key to the Suborders.*

- I. Rostrum seldom reduced or absent, if well developed almost invariably compressed. Body almost always compressed. First abdominal segment not much smaller than

- the rest. First antennæ generally bear a stylocerite. Second antennal scale generally large. Legs slender (except sometimes a stout chelate limb or pair which may be any one of the first three pairs), with basipodite and ischiopodite never fused, only one fixed point in the carpo-propodal articulation, sometimes exopodites, and podobranchs hardly ever present on the first three pairs and never on the last two. Male genital opening almost always arthro-dial. Abdominal limbs 1-5 always present in full number, well developed, and used for swimming.
- II. Rostrum often reduced or absent, depressed if present. Body not compressed, generally depressed. First abdominal segment distinctly smaller than the rest. No stylocerite. Second antennal scale never large, generally small or absent. Legs strong, the first usually, the others never, stouter than their fellows, basipodite and ischiopodite almost always fused in the first pair, generally also in the others; two fixed points in the carpo-propodal articulation, exopodites never present, podobranchs fairly often present on some of the first four pairs. Male genital opening coxal or sternal. Abdominal limbs 1-5 often reduced or absent, not used for swimming . . . . .

**NATANTIA.****REPTANTIA.***Key to the Tribes of the Natantia.*

- I. Third legs chelate, except in genera in which the legs are much reduced. Third maxillipeds 7-jointed. Second maxillipeds with normal end-joints. First maxillipeds without the caridean lobe on the base of the exopodites. Pleura of first abdominal segment not overlapped by those of second. Abdomen without sharp bend. Not phyllobranchiate (except Amphioninæ).
1. One or both legs of third pair longer and much stouter than those of first two pairs. Trichobranchiate. Endopodites of first maxillipeds short. Mandibular palps curved. First antennæ without stylocerites. First abdominal limbs of male not as in Penæides . . . . . **STENOPIDES.**
2. Legs of third pair not stouter than those of first two pairs. Dendrobranchiate (except Leuciferinæ and Amphioninæ: see below). Endopodites of first maxillipeds long. Mandibular palps straight. First antennæ generally with stylocerites. First abdominal limbs of male bear a sexual apparatus . . . . . **PENÆIDES.**

- II. Third legs not chelate. Third maxillipeds 4-6-jointed. End-joint in second maxillipeds nearly always lies as a strip along end of joint before it. First maxillipeds have a lobe on the base of the exopodites. Pleura of second abdominal segment overlap those of first. Abdomen has generally a sharp bend. Phyllobranchiate ..... *CARIDES.*

*Key to the Families of the Penæidæ.*

- I. Last two pairs of legs well developed. Gills many ..... *Penæidæ.*  
 II. Last one or two pairs of legs reduced or lost. Gills few (up to 8) or wanting ..... *Sergestidæ.*

*Key to the Subfamilies of the Penæidæ.*

- I. Carapace covers legs. Exopodites well developed. [Podobranchs on some legs.] ..... *Cerataspinæ.*  
 II. Carapace of normal size. Exopodites reduced or lost.  
 1. Well-developed podobranchs on some legs. [Exopodites on maxillipeds and sometimes on some legs. Arthrobranchs in double series. First antennæ without leaf-like appendage on first joint.] ..... *Aristæinæ.*  
 2. No podobranchs on legs (vestige on first legs of *Haliporus*).  
 i. No exopodite behind first maxillipeds. Arthrobranchs in single series. No leaf-like appendage on first joint in first antennæ ..... *Sicyoninæ.*  
 ii. Exopodites on all maxillipeds and usually some legs. Arthrobranchs in double series. A leaf-like appendage on inner side of first joint in first antennæ .... *Penæinæ.*

*Key to the Subfamilies of the Sergestidæ.*

- I. All the thoracic limbs biramous. Gills present and resemble phyllobranchiæ ..... *Amphioninæ.*  
 II. Last seven thoracic limbs uniramous. Gills, if present, are dendrobranchiæ.  
 1. Head not greatly elongated. Gills present. *Sergestinæ.*  
 2. Head greatly elongated. No gills ..... *Leuciferinæ.*

*Key to the Superfamilies of the Carides.*

- I. Second maxillipeds normal. [Exopodites on some or all legs. Mastigobranchs on none. First two pairs stouter than the rest, with normal chelæ and undivided wrist-joints. Mandibles without or with distinct but small molar process, with or without palps.] ..... *PASIPHÆOIDA.*

II. Second maxillipeds with the sixth and seventh joints articulating separately on fifth. [No exopodites on legs. Mastigobranchs on first to fourth pairs. First two pairs of good size, chelate, with very long fingers and undivided wrist-joints. Mandibles imperfectly cleft, with palp.] . . . . .

STYLODACTYLOIDA.

III. Second maxillipeds with short seventh joint, usually applied as a strip to the end of the sixth.

1. Mandibles imperfectly cleft. Exopodites usually present on all or some legs. First two pairs of legs substantially similar, of moderate size, chelate, with undivided wrist-joint. [Mastigobranchs present on some legs (except *Limnocaridina*).] . . . .

HOPLOPHOROIDA.

2. Mandibles either deeply cleft or simple, apparently owing to the loss of the cutting-edge. No exopodites on legs (except in a very few cases on the first pair). First two pairs of legs more or less unlike.

i. At least the basipodites of the second maxillæ well developed. Mandibles rarely simple (*Latreutes* &c.). First legs not subchelate.

(1) First two pairs of legs slender. First pair simple or minutely chelate. Second chelate, with wrist divided into two or more joints. [Mastigobranchs generally present on legs.] . .

PANDALOIDA.

(2) First legs with both fingers movable, second with last joint replaced by a tuft of bristles and undivided wrist-joint. [No mastigobranchs on legs.]

PSALIDOPODOIDA.

(3) First two pairs of legs not both slender (one often very large), chelate. Wrist of second pair often subdivided. [Mastigobranchs present or not.] . .

PALÆMONOIDA.

ii. Inner lobes of second maxillæ reduced. Mandibles simple. First legs often subchelate. [Second wrist divided or not. No mastigobranchs on legs.] . . . . .

CRANGONOIDA.

*Key to the Families of the Pasiphæoidea.*

I. Rostrum small or wanting. No molar process on the mandibles. Inner lobes of second maxillæ and first maxillipeds reduced. Exopodites on all legs . . . . .

Pasiphæidæ.

II. Rostrum well developed. Mandibles with a distinct molar process. Inner lobes of second maxillæ and first maxillipeds not reduced. Exopodites on first two pairs of legs only . .

Bresiliidæ.

*Key to the Families of the Hoplophoroidea.*

I. Both fingers of chelæ spoon-like and ending in tufts of bristles. Exopodites may be

- wanting on some or all legs. Freshwater forms . . . . . **Atyidæ.**
- II. Chelæ not as in Atyidæ. Exopodites on all legs. Deep-sea forms.
1. Last three pairs of legs abnormally long. A lash on the exopodite of the first maxillipeds. . . . . **Nematocarcinidæ.**
2. Last three pairs of legs not abnormally long. No lash on the exopodite of the first maxillipeds . . . . . **Hoplophoridæ.**

*Key to the Subfamilies of the Pandalidæ.*

- I. Second wrists undivided . . . . . *Thalassocarinæ.*
- II. Second wrists subdivided . . . . . *Pandalinæ.*

*Key to the Families of the Palæmonoida.*

- I. Second wrists subdivided.
1. First legs much stronger than rest. Eyes usually covered by carapace. [Mastigobranchs of legs and mandibular palps present.] . . . . . **Alpheidæ.**
2. First legs not much stronger than rest. Eyes not covered by carapace. [Mastigobranchs of legs and mandibular palps present or absent.] . . . . . **Hippolytidæ.**
- II. Second wrists undivided.
1. Rostrum movable. Mastigobranchs on legs. [Mandibular palp present.] . . . . **Rhynchocinetidæ.**
2. Rostrum not movable. No mastigobranchs on legs . . . . . **Palæmonidæ.**

*Key to the Subfamilies of the Palæmonidæ.*

- I. First antennæ with two flagella (one usually cleft for some distance from the tip). Third maxillipeds have third joint flat and often broad.
1. Mandibles with palps. Propodites of second legs, third maxillipeds, and one branch in first antennæ broad and flat . . *Hymenocerinæ.*
2. Mandibles without palps. Limbs not broadened as in Hymenocerinæ . . . . . *Pontoniinæ.*
- II. First antennæ with three flagella (owing to cleavage of one almost or quite to the base). Third maxillipeds pediform. [Mandibular palps usually present.] . . . . . *Palæmoninæ.*

*Key to the Families of the Crangonoida.*

- I. One or both legs of first pair chelate. Rostrum short, compressed.
- [1. Second legs simple . . . . . **Autonomæidæ.]\***

\* The only ground for placing here the very obscure genus *Autonomæa* is that Risso, who described it, thought it related to *Processa*.

- 2. Second legs chelate.
  - i. Both legs of the first pair chelate. Second wrists undivided. Third joint in the third maxillipeds very broad. Rostrum toothed ..... **Gnathophyllidæ.**
  - ii. One leg of the first pair simple. Second wrists subdivided. Third maxillipeds pediform. Rostrum not toothed .... **Processidæ.**
- II. Both legs of the first pair subchelate. Rostrum long or short, not compressed.
  - 1. Second wrists subdivided. Inner lobes of first maxillipeds not reduced. Rostrum long ..... **Glyphocrangonidæ.**
  - 2. Second wrist undivided. Inner lobes of first maxillipeds reduced. Rostrum short. **Crangonidæ.**

*Key to the Tribes of the Reptantia.*

- I. Third legs like first, either chelate or simple and subcylindrical. Abdomen macrurous (straight, symmetrical, well armoured, with good pleura and strong broad tail-fin, lobes on the first segment clipping the carapace). Gnathobases of second maxillæ narrow. Basipoditic lobes of first maxillipeds usually deep. Exopodites of maxillipeds with lash directed forwards. Gills numerous. [Last thoracic segment with legs not differing greatly from the rest and sternum rarely free.]
  - 1. Carapace fused at the sides to the epistome. Rostrum small or wanting (except *Palinurellus*). Inner lobes of second maxillæ and first maxillipeds reduced. An *appendix interna* on some of the abdominal limbs, at least in the female, but the exopodites of the last pair without sharp suture. Body often depressed. .... **PALINURA.**
  - 2. Carapace free from the epistome. Rostrum of good size. Inner lobes of second maxillæ and first maxillipeds not reduced. No *appendix interna*, but the exopodites of the last abdominal limb divided by a suture. Body subcylindrical ..... **ASTACURA.**
- II. Third legs unlike first\*, never chelate. Abdomen rarely macrurous. Gnathobase of second maxillæ typically broad. Basipoditic lobes of first maxillipeds broad but shallow, their inner edge usually in a line with that of the coxopodite. Exopodites of maxillipeds with lash, when present, nearly always bent inwards. Gills usually few.
  - 1. Carapace not fused with epistome. Last thoracic sternum free, its legs differing

\* *Gebicula* nearly forms an exception to this.

always clearly in size and position and nearly always in size and shape from the third pair. Abdomen anomurous (reduced in some of its features, but showing clear traces of some function other than that of reproduction, and almost always carrying biramous limbs on the sixth segment) or, rarely, macrurous. A movable antennal scale often present. Third maxillipeds usually narrow .....

**ANOMURA.**

2. Carapace fused with epistome at sides and nearly always also in middle. Last thoracic sternum fused with rest, its legs often like the others. Abdomen brachyurous (small, straight, symmetrical, bent under the thorax, showing no traces of other function than reproduction, and without biramous limbs on the sixth segment). Never a movable antennal scale. Third maxillipeds broad .....

**BRACHYURA.**

*Key to the Superfamilies of the Palinura.*

- I. Carapace gripped by the first abdominal segment alone. First joint of second antennæ not fused with epistome; a scale present on this limb. All the legs, except sometimes the last pair, chelate; the first larger than the rest. Unbranched limbs on the first abdominal segment. Tail-fin not softer behind than before, without sutures. Telson pointed .....

**ERYONIDEA.**

- II. Carapace gripped between a lobe on the first abdominal segment and a knob on the side of the last thoracic. First joint of second antennæ fused with epistome; no scale on this limb. None of the legs much longer than the rest, or, except sometimes the first pair, chelate. No limbs on first abdominal segment. Tail-fin divided by indistinct sutures into a soft hinder half and a harder front half. Telson roughly square behind..

**SCYLLARIDEA.**

*Key to the Families of the Scyllaridea.*

- I. Cephalothorax subcylindrical. Eyes not enclosed in separate orbits formed by the edge of the carapace. Second antennæ with flagella .....
- II. Cephalothorax depressed. Eyes enclosed in separate orbits formed by the edge of the carapace. Second antennæ with flat scales in place of the flagella .....

**Palinuridæ.****Scyllaridæ.**

*Key to the Families of the Astacura.*

- I. Podobranchs not united with the mastigobranchs. Last thoracic segment fixed. [Sexual appendages in male. Four pleurobranchs.]..... **Nephropsidæ.**
- II. Podobranchs united with the mastigobranchs. Last thoracic segment free.
1. Gills have a lamina, but no hooks at the end of the filaments. Sexual appendages in male. One pleurobranch or none . . . . **Potamobiidæ.**
2. Gills have no lamina, but hooks at the end of the filaments. No sexual appendages in male. Generally four pleurobranchs.. **Parastacidæ.**

*Key to the Superfamilies of the Anomura.*

- I. Second to fourth legs with last joint curved and flattened. First pair styliform or subchelate. [Tail-fin not adapted for swimming. Abdomen bent under thorax. Rostrum small or wanting. Third maxillipeds have no mastigobranchs.]..... **HIPPIDEA.**
- II. Second to fourth legs with last joint not curved and flattened. First pair not styliform, rarely subchelate.
1. Sixth abdominal limbs adapted for swimming (except in *Thalassina*, where they are styliform). Pleura usually well developed. Abdomen symmetrical.
- i. Body depressed. Pleurobranchs to last legs. Often a transverse suture on telson. Abdomen more or less bent .. **GALATHEIDEA.**
- ii. Body compressed. No pleurobranch to last leg. No transverse suture on telson. Abdomen straight. .... **THALASSINIDEA.**
2. Sixth abdominal limbs, when present, with branches neither broad nor styliform, but adapted for holding the body into hollow objects. Pleura very rare. Abdomen nearly always asymmetrical, and either soft and twisted or bent under the thorax. **PAGURIDEA.**

*Key to the Families of the Hippidea.*

- I. First legs subchelate. Carapace flattened, without wings to cover the legs. Third maxillipeds narrow, with exopodites . . . . **Albuneidæ.**
- II. First legs simple. Carapace subcylindrical, with wings which cover the legs. Third maxillipeds broad, without exopodites . . . **Hippidæ.**

*Key to the Families of the Galatheidea.*

- I. Trichobranchiate. Eight arthrobranchs. No limbs on second abdominal segment of male. [Abdomen not folded against thorax. Second antennæ with 5-jointed stalk, but no scale.] **Ægleidæ.**

- II. Phyllobranchiate. Tenarthrobranchs. Limbs on second abdominal segment of male.
1. Arthrobranchs stand on side of thorax. Second antennæ have 5-jointed stalk and usually a spiniform scale. [Abdomen not folded against the thorax. Third maxillipeds without mastigobranch.] . . . . . **Chirostylidæ.**
  2. Arthrobranchs normally placed. Second antennæ have 4-jointed stalk and no scale (or vestiges only).
    - i. Abdomen not folded against thorax. Third maxillipeds with mastigobranchs. . . . . **Galatheidæ.**
    - ii. Abdomen folded against thorax. Body crab-like. Third maxillipeds without mastigobranchs . . . . . **Porcellanidæ.**

*Key to the Subfamilies of the Galatheidæ.*

- I. Eyes well developed. Exopodites of third maxillipeds with 1-jointed "flagella" . . . . . *Galatheinæ.*
- II. Eyes reduced. Exopodites of third maxillipeds without flagella . . . . . *Munidopsinæ.*

*Key to the Families of the Thalassinidea.*

- I. No *linea thalassinica*. Both movable and fixed antennal thorns present, though sometimes minute (? absent in *Scytoleptus*). Abdominal pleura large. [Last endopodite without suture. Second legs chelate.] . . . . . **Axiidæ.**
- II. *Linea thalassinica* present (except *Callianidea*). Fixed antennal thorn wanting; scale reduced to a flattened vestige or wanting. Abdominal pleura usually small.
  1. Sutures on endopodite and exopodite of sixth abdominal limbs. Abdominal pleura of a good size. . . . . **Laomediidæ.**
  2. No sutures on sixth abdominal limbs. Abdominal pleura small.
    - i. Second leg chelate or simple. No podobranchs on legs. Abdominal limbs 3-6 broad. A vestige of antennal scale remains . . . . . **Callianassidæ**
    - ii. Second leg subchelate. Podobranchs on legs 1-3. Abdominal limbs all narrow. No vestige of antennal scale. . . . . **Thalassinidæ.**

*Key to the Subfamilies of the Callianassidæ.*

- I. Rostrum large. Legs of first pair equal. No *appendix interna* on abdominal limbs 3-5 . . . . . *Upogebinæ.*
- II. Rostrum small. Legs of first pair unequal. An *appendix interna* on abdominal limbs 3-5. . . . . *Callianassinæ.*

Key to the Families of the Paguridea.

- I. Abdomen straight or twisted. Carapace firm and more or less compressed in the fore part, soft in the hinder part, at least at the sides. Fourth legs unlike third. Rostrum almost or quite wanting. Sixth abdominal limb present.
  - 1. Abdomen macrurous and symmetrical, with all the limbs present. Trichobranchiate. **Pylochelidæ.**
  - 2. Abdomen more or less unsymmetrical, some of the limbs lost. Generally phyllobranchiate.
    - i. Antennal scale well developed (thorn-like). First antennæ with stalk of moderate length and flagella ending in a filament. Marine forms . . . . . **Paguridæ.**
    - ii. Antennal scale reduced. First antennæ with very long stalk and flagella ending bluntly. Land forms . . . . . **Cænobitidæ.**
- II. Abdomen bent under thorax. Body crab-like. Carapace firm all over. Fourth legs like third. Rostrum spiniform. Sixth abdominal appendages lost . . . . . **Lithodidæ.**

Key to the Subfamilies of the Paguridæ.

- I. Third maxillipeds approximated at base. Chelipeds equal or subequal, or the left much the larger . . . . . *Pagurinæ.*
- II. Third maxillipeds wide apart at base. Right cheliped usually, left never, much the larger. *Eupagurinæ.*

Key to the Subfamilies of the Lithodidæ.

- I. Third to fifth abdominal segments imperfectly calcified. Rostrum short and broad . . . . . *Hapalogastrinæ.*
- II. Third to fifth abdominal segments well calcified. Rostrum generally narrow and pointed. *Lithodinæ.*

Key to the Subtribes of the Brachyura.

- I. Mouth-field (endostome) prolonged forwards to form a gutter. [Last pair of legs normal or abnormal. Female openings generally sternal. First abdominal limbs of female wanting. Gills few.] . . . . . **OXYSTOMATA.**
- II. Mouth-field roughly square.
  - A. Last pair of legs abnormal, dorsal. Female openings coxal. First abdominal limbs of female present. Gills usually many . . . **DROMIACEA.**
  - B. Last pair of legs normal, rarely reduced, not dorsal, except in *Palicus* and *Ptenoplax*. Female openings sternal. First abdominal limbs of female wanting. Gills few . . . . . **BRACHYGNATHA.**

*Key to the Families of the Oxystomata.*

- I. Body of the shape usual in crabs. Abdomen hidden under thorax. Antennæ small. Legs normal in position.
- A. Afferent openings to gill-chambers lie in front of first legs (chelipeds). Gills 9 on each side. Male openings coxal. . . . . **Calappidæ.**
- B. Afferent openings to gill-chambers lie on either side of the mouth at the base of the third maxillipeds. Gills less than 9 a side. Male openings sternal . . . . . **Leucosiidæ.**
- II. Body more or less abnormal in shape. Abdomen not hidden under thorax. Antennæ large. Last one or two pairs of legs in a more dorsal position than the rest.
- A. Carapace short. Last two pairs of legs subprehensile, with hook-like end-joints. . . . . **Dorippidæ.**
- B. Carapace long. Legs usually have the last two joints very broad . . . . . **Raninidæ.**

*Key to the Subfamilies of the Calappidæ.*

- I. Last three joints in third maxillipeds not hidden by the meropodite. Orbits not separated from the antennular sockets.
- A. Meropodites of third maxillipeds not elongate nor acute. Exopodites of same limbs with flagella. Legs not adapted for swimming . . . . . **Calappinæ.**
- B. Meropodites of third maxillipeds elongate and acute. Exopodites of same limbs without flagella. Legs adapted for swimming . . . . . **Orithyinae.**
- II. Last three joints in third maxillipeds hidden by the meropodite. Orbits more or less separated from the antennular sockets. [Exopodites of third maxillipeds with flagella. Meropodite in same limbs elongate and acute. Legs may be adapted for swimming or not.] . . . . . **Matutinæ.**

*Key to the Subfamilies of the Leucosiidæ.*

- I. Meropodites of third maxillipeds more than half the length of the ischiopodites. Fingers stout, gradually narrowing from base to tip, usually shorter than the palm . . . . . **Leucosiinæ.**
- II. Meropodites of third maxillipeds never more than half the length of the ischiopodites. Fingers slender, of even width from the base to near the tip, usually longer than palm . . . . . **Ilinæ.**

*Key to the Subfamilies of the Dorippidæ.*

- I. Third maxillipeds leave a good part of the mouth uncovered. Inward openings to the gills near the base of the chelipeds. . . . . **Dorippinæ.**

- II. Third maxillipeds almost completely cover the mouth. Inward openings to the gills may or may not be near the base of the chelipeds ..... *Tymolinæ*.

*Key to the Superfamilies of the Dromiacea.*

- I. Sternum of female with longitudinal grooves. Vestiges of sixth abdominal limbs usually present. Gills 14-20 on each side. Eyes usually completely sheltered by orbits when retracted. No *lineæ homolicæ* ..... DROMIIDEA.
- II. Sternum of female without longitudinal grooves. No vestiges of sixth abdominal limbs. Gills 8-14 on each side. Eyes incompletely or not at all sheltered by orbits when withdrawn against the body. *Lineæ homolicæ* usually present ..... HOMOLIDEA.

*Key to the Families of the Dromiidea.*

- I. No vestige of sixth abdominal limbs. Carapace longer than broad, with ill-marked side-edge. [First three legs with mastigobranchs, fourth and fifth small, subdorsal, and prehensile.] ..... Homolodromiidæ.
- II. Vestiges of sixth abdominal limbs present (except in *Hypoconcha*, where also no mastigobranchs). Carapace usually not longer than broad, with well-marked side-edge.
- A. Mastigobranchs on first legs (chelipeds) only or on none. Fourth and fifth legs small, subdorsal, and usually prehensile. . . . . Dromiidæ.
- B. Mastigobranchs on all the first three pairs of legs. Fifth legs only small and subdorsal ..... Dynomenidæ.

*Key to the Families of the Homolidea.*

- I. Gills 13 or 14 on each side. Mastigobranchs on first one or three pairs of legs. First joint of eye-stalks not much longer than second. . . . . Homolidæ.
- II. Gills 8 on each side. Mastigobranchs not found on any legs. First joint of eye-stalks much longer than second. . . . . Latreillidæ.

*Key to the Superfamilies of the Brachygnatha.*

- I. Fore part of body narrow, usually forming a distinct rostrum. Body more or less triangular. Orbits generally incomplete ..... [(MAIIDEA).  
OXYRHYNCHA
- II. Fore part of body broad. Rostrum usually reduced or wanting. Body oval, round, or square. Orbits nearly always well enclosed. . . . . [(CANCRIDEA).  
BRACHYRHYNCHA

*Key to the Families of the Oxyrhyncha.*

- I. Carapace thin and flat. First legs (chelipeds) not long or specially mobile or with fingers bent at an angle with the hand. Male opening sternal. [No orbits. Second joint of antennal stalk slender, fused with epistome but not with front. No hooked hairs.] . . . **Hymenosomidæ.**
- II. Carapace not thin and flat (except *Ocinopus*). First legs either mobile or powerful, with bent fingers. Male opening coxal.
- A. Chelipeds specially mobile, rarely much greater than the other legs, or with fingers bent at an angle on the hand. Second joint of antenna well developed, generally fused with epistome and often with front. Orbits generally more or less incomplete. Hooked hairs almost always present . . . **Maiidæ.**
- B. Chelipeds not specially mobile, usually much longer and heavier than the other legs, and with fingers bent on the hand at an angle towards the side on which the fixed finger is set. Second joint of antennæ small, short, and not fused with epistome or front. Orbits well made. Hooked hairs almost always wanting . . **Parthenopidæ.**

*Key to the Subfamilies of the Maiidæ.*

- I. Second joint of antennæ very slender throughout its length. [No orbits. Eye-stalks generally long.] . . . **Inachinæ.**
- II. Second joint of antennæ not very slender.
- A. No true orbits (eye-stalks hidden under a supraocular spine or sunken in the sides of a great rostrum). Second joint of antenna truncate-triangular. Eye-stalks very short . . . **Acanthonychinæ.**
- B. True orbits, containing both supra- and postocular elements sheltering the eyes, are more or less completely formed, except in a few genera where the eye-stalks are long and slender. Second antenna-joint broad, usually not truncate-triangular. Eye-stalks long or short.
1. A large, cupped, usually blunt postocular process present. Eye-stalks short. Cornea of eyes not completely hidden when they are folded back . . . **Pisinæ.**
2. Postocular process, if present, usually sharp and not cupped, but if not so, then cornea hidden (as also in most other cases). Eye-stalks usually long . **Mainæ.**

*Key to the Subfamilies of the Parthenopidæ.*

- I. Carapace usually triangular, sometimes sub-oval or subpentagonal. Rostrum simple.

- Chelipeds much bigger than the other legs. Branchial regions of the body deeply separated from cardiac . . . . . *Parthenopinæ*.
- II. Carapace usually sharply pentagonal. Rostrum cleft into two. Chelipeds of moderate size. Branchial regions of the body not deeply separated from cardiac . . . . . *Eumedoninæ*.

*Key to the Families of the Brachyrhyncha.*

- I. Orbits formed, but more or less incomplete. Second antennal flagella, when present, long and hairy. Rostrum present. Body elongate-oval. Fore edge of the mouth indistinct . . . . . **Corystidæ.**
- II. Orbits complete (though fissures may remain), except in the Mictyrinæ, where the eyes are almost or quite unprotected. Body rarely elongate-oval. Rostrum often wanting. Second antennal flagella usually short, not hairy.
- A. Carpopodites of third maxillipeds articulate at or near antero-internal angle of the meropodites. Body usually round or transversely oval. Male openings nearly always coxal. In many species the right chela is always larger than the left.
1. Legs more or less distinctly adapted for swimming. Usually a small lobe on the inner angle of the endopodite in the first maxillipeds. [First antennæ fold slanting or transverse.] . . . . . **Portunidæ.**
2. Legs not adapted for swimming, or, if so modified, then the vas deferens opens sternally or runs in a sternal groove (certain *Macrophthalmus* and *Libystes*). Inner lobe on the endopodite in the first maxillipeds wanting.
- a. Freshwater crabs with the branchial region much developed and swollen. [Body often squarish, but male opening coxal.] . . . . . **Potamonidæ.**
- b. Marine crabs, with the branchial region not greatly swollen.
- i. First antennæ fold lengthwise.
- (a) Carapace subcircular. Second antennal flagella either long and hairy or wanting . . . . . **Atelecyclidæ** \*.
- (b) Carapace broadly oval or hexagonal. Second antennal flagella present, short, not hairy . . . . . **Cancriidæ.**

\* *Trichia*, de Haan, is somewhere in the neighbourhood of this family.

- ii. First antennæ fold slanting or transversely.
- (a) Body usually transversely oval. Male openings rarely sternal. Not sharply separated from the following family . . . . . **Xanthidæ.**
- (b) Body usually square or squarish. Male ducts open on the sternum, or, if coxal, pass along a groove in the sternum. Not sharply separated from the foregoing family . . . . . **Gonoplacidæ.**
- B. Carpopodites of third maxillipeds do not articulate at or near the inner angle of the meropodites. Body usually square or squarish. Male openings sternal, except in *Ptenoplax*, where the duct passes along a sternal groove to the coxopodite. In no species is the right chela always larger than the left.
1. Small symbiotic crabs, with very small eyes and orbits. Body usually more or less rounded . . . . . **Pinnotheridæ.**
2. Free-living crabs, with eyes not specially reduced and usually a square body.
- a. Last pair of legs dorsally placed and weaker than the others. Interantennular septum very thin. [No distinct epistome. Exopodites of third maxillipeds not hidden.]
- i. Front narrow. Female opening in normal position. Third maxillipeds subpediform, not covering the mouth . . . . . **Ptenoplacidæ.**
- ii. Front moderately broad. Female openings on the sternal segment corresponding to first pair of walking-legs. Third maxillipeds cover the mouth ventrally and have very small meropodites. . . . . **Palicidæ.**
- b. Last pair of legs not dorsally placed nor markedly weaker than the rest. Interantennular septum not very thin, except in *Macrophthalminae*.
- i. A gap of greater or less size is left between the third maxillipeds. Front broad or moderately so.
- (a) Sides of the body either straight or very slightly arched. Shape square. Rarely true land-crabs. **Grapsidæ.**
- (b) Sides of the body arched. Shape transversely oval. Land-crabs. **Gecarcinidæ.**
- ii. Third maxillipeds almost or quite close the mouth. Front moderately or very narrow . . . . . **Ocypodidæ.**
- C. Meropodite in third maxillipeds small, bearing terminally a carpopodite of

nearly its own width. Ischiopodite very broad. [Body somewhat oblong. First antennæ not retractile into sockets. Parasitic on corals.] . . . . .

**Hapalocarcinidæ.**

*Key to the Subfamilies of the Portunidæ.*

- I. Eye-stalk and orbits normal.
- A. Basal joint of second antennæ narrow. [Flagella of second antennæ not shut out from orbits.]
- i. First antennæ sloping. Front with a median tooth. Generally at least one pair of walking-legs as long as chelipeds.
1. Last pair of legs not distinctly natatorial. *Carcinidinæ.*
2. Last pair of legs distinctly natatorial. *Portuninæ.*
- ii. First antennæ transverse. Front with a median notch. Chelipeds longer than walking-legs.
1. Last joint of fifth legs lanceolate . . . . *Catoptrinæ.*
2. Last joint of fifth legs rounded . . . . . *Carupinæ.*
- B. Basal joint of second antennæ broad. [Chelipeds longer than walking-legs.]
- i. Flagella of second antennæ not shut out from orbits by processes of the basal joints . . . . . *Portuninæ.*
- ii. Flagella of second antennæ shut out from the orbit by processes of the basal joints.
1. Last joint of fifth legs sickle-shaped . . *Caphyrinæ.*
2. Last joint of fifth legs flattened . . . . . *Thalamitinæ.*
- II. Eye-stalks enormously long, orbits extend across the whole fore edge of the carapace. [Chelipeds longer than legs. Antennæ free; basal joint short; flagella not shut out from orbits.] . . . . . *Podophthalminæ.*

*Key to the Subfamilies of the Potamonidæ.*

- I. Outward channels from gill-chamber covered by first maxillipeds, reaching to front. [Third maxillipeds with meropodites not longer than broad, subtriangular, bearing carpopodites at apex, with good exopodites.] *Deckeniinæ.*
- II. Outward channels from gill-chamber not as in Deckeniinæ.
1. Endostome ridges project on fore edge of mouth. Exopodites of third maxillipeds more or less reduced. [Meropodites of same subtriangular, not longer than broad, with carpopodites at apex.] . . . . . *Potamocarcinina.*
2. Endostome ridges do not project on fore edge of mouth. Exopodites of third maxillipeds not reduced.
- i. Meropodites of third maxillipeds not longer than broad, subquadrate, with carpopodites at inner angles . . . . . *Potamoninæ.*

- ii. Meropodites of third maxillipeds longer than broad, bearing carpopodites on fore edge, which slopes inwards . . . . . *Trichodactylinæ*.

*Key to the Subfamilies of the Atelecyclidæ.*

- I. Antennal flagella absent. [Mouth covered by third maxillipeds. Front unclenft.] . . . *Acanthocyclinæ*.  
 II. Antennal flagella present.  
 A. Regions not defined. Third maxillipeds cover the mouth. Front entire or lobed . . . *Thiinæ*.  
 B. Regions more or less clearly marked out. Third maxillipeds do not cover the mouth. Front toothed . . . . . *Atelecyclinæ*.

*Key to the Subfamilies of the Cancridæ.*

- I. Carapace broadly oval. Epistome not sunken. *Cancrinæ*.  
 II. Carapace hexagonal. Epistome sunken . . . *Pirimelinæ*.

*Key to the Subfamilies of the Xanthidæ.*

- I. Endostome ridges wanting. Shape of body transversely oval or round.  
 1. Flagella of second antennæ not shut out of orbital gaps.  
 i. Second joint of second antennal stalk cylindrical, reaching front but not entering orbital gap . . . . . *Xanthinæ*.  
 ii. Second joint of second antennal stalk as in *Xanthinæ*, but not entering orbital gap . . . . . *Carpilinæ*.  
 2. Flagella of second antennæ shut out of orbital gaps by part of second joints of stalks . . . . . *Etisinæ*.  
 II. Endostome ridges present. Shape of body often square or squarish.  
 1. Front less than  $\frac{1}{2}$  and fronto-orbital edge (front and orbits together) not more than  $\frac{2}{3}$  the greatest breadth of the carapace. Front usually makes an arch with antero-lateral edge. Flagella of second antennæ usually not shut out of orbital gaps.  
 i. Second joint of second antennal stalk cylindrical and may or may not reach the front, with which it is not broadly in contact. Endostome ridges vary in shape and size . . . . . *Menippinæ*.  
 ii. Second joint of second antennal stalk somewhat irregular in shape and broadly in contact with front. Endostome ridges strong and project on fore edge of mouth . . . . . *Oziinæ*.  
 2. Front at least  $\frac{1}{2}$  and fronto-orbital edge more than  $\frac{2}{3}$  the greatest breadth of the carapace. Front makes an angle with the antero-lateral edge. Flagella of second antennæ always shut out of orbital gaps.

- i. Endostome ridges strong and project on fore edge of mouth ..... *Eriphiinæ*.  
 ii. Endostome ridges moderate and make no projection on fore edge of mouth .... *Trapeziinæ*.

*Key to the Subfamilies of the Gonoplacidae.*

- I. Last pair of legs present.  
 1. Male openings sternal. Eye-stalks almost invariably fixed. Eyes often reduced. Front usually narrow. [Male abdomen does not nearly cover space between last two legs.]  
 2. Male openings coxal. Eye-stalks generally movable. Eyes normal. Front broad.  
 i. Front occupies whole breadth of carapace.  
 (1) Male abdomen does not cover space between last pair of legs ..... *Prionoplacinæ*.  
 (2) Male abdomen covers space between last pair of legs ..... *Gonoplacinæ*.  
 ii. Front does not occupy whole breadth of carapace. [Male abdomen covers space between last pair of legs.] ..... *Carcinoplacinæ*.  
 II. Last pair of legs wanting. [Male openings sternal. Male abdomen does not cover space between last pair of legs. Eyes small. Front narrow.] ..... *Hexapodinæ*.

*Key to the Subfamilies of the Grapsidae.*

- I. First antennæ placed in clefts of the front and visible from above. [No oblique line on the third maxillipeds and no wide gap between them. Male abdomen covers the space between the last pair of legs.] ..... *Plagusinæ*.  
 II. First antennæ not visible from above.  
 1. Third maxillipeds have an oblique hairy line along the ischiopodite and meropodite, and leave a wide gap between them. *Sesarminæ*.  
 2. Third maxillipeds have no oblique line.  
 i. Front strongly deflexed. A wide gap between the third maxillipeds. Male abdomen covers the space between the last pair of legs ..... *Ocypodinæ*.  
 ii. Front not strongly deflexed. The gap between the third maxillipeds, if present, is rarely wide. Male abdomen rarely covers space between last pair of legs. . *Varuminæ*.

*Key to the Subfamilies of the Ocypodidae.*

- f. First antennæ transverse, separated by a narrow septum. Front of moderate breadth. Body shallow, usually quadrilateral and broader than long. [No opening between the bases of the legs.] ..... *Macrophthalminæ*.

- II. First antennæ oblique or vertical, separated by a broad septum. Front narrow. Body deep.
1. Body subquadrilateral. Openings fringed with hairs between the bases of the third and fourth pairs of legs. . . . . *Ocyrodinae*.
  2. Body more or less globose. No openings between the legs . . . . . *Myctirinae*.

LV.—*Descriptions of new Lizards in the British Museum.*  
By G. A. BOULENGER, F.R.S.

*Gecko palmatus.*

Head large, oviform, much depressed; snout a little longer than the distance between the eye and the ear-opening, once and one third the diameter of the orbit; forehead concave; ear-opening oval, oblique, its greatest diameter about one third that of the orbit. Body and limbs moderately elongate; digits strongly dilated, half-webbed. Snout and supraocular region covered with very small granules, the granules minute on the rest of the head; rostral and first labial entering the nostril; 11 upper and 10 lower labials; symphyseal triangular, followed by a pair of chin-shields which are three times as long as broad. Body and limbs covered with minute granules; back with scattered, enlarged, round, flat tubercles, which are about as large as the feebly imbricate ventral scales. Greyish above, mottled with brown, and with brown markings, viz. a dark streak from the eye to the ear and three wavy cross-bars on the body; lower parts white, dotted with brown.

	mm.
Total length . . . . .	150
Head . . . . .	22
Width of head . . . . .	17
Body . . . . .	58
Fore limb . . . . .	27
Hind limb . . . . .	36
Tail (reproduced) . . . . .	70

A single female specimen from the Man Son Mountains, Tonkin, altitude 3000–4000 feet, collected by Mr. Fruhstorfer.

*Prionodactylus Ockendeni.*

Snout short; nostril between two nasals; fronto-nasal single; præfrontals forming a median suture; interparietal narrower than the parietals; two rows of occipitals, three in

the first row; three supraoculars, first largest; a single loreal and a freno-orbital; a series of small infraorbitals; temple with large shields above; 7 upper and 4 to 6 lower labials; chin-shields, one anterior and 3 or 4 pairs, the last separated by a pair of large gulars; a double longitudinal series of transversely enlarged gulars in front of the collar, which is composed of 7 or 9 plates. Dorsal scales elongate, hexagonal, strongly keeled, imbricate, not mucronate; lateral scales small, keeled; 36 to 38 scales round the body (including ventrals), 35 to 38 from occiput to base of tail. Ventral plates quadrangular, in 8 longitudinal and 18 to 20 transverse series, outer smallest and keeled, median largest. 3 or 4 large anal plates in a transverse series. Male with 8 to 10 femoral pores on each side. Pale brown above, dark grey on the sides; a more or less distinct dark brown vertebral line; a dark brown lateral band, light-edged above, fading into the grey of the sides below, from the eye to the tail, usually bearing a series of small black ocelli with white centres; a white, dark-edged streak from below the eye to the side of the neck, lost before reaching the collar; belly white, with grey dots or round black spots.

	♂.	♀.
	mm.	mm.
Total length .....	?	189
Head .....	16	14
Width of head .....	10	8
From end of snout to fore limb ....	23	22
"                    "        vent .....	60	61
Fore limb .....	19	18
Hind limb .....	26	26
Body .....	14	14
Tail .....	?	128

Several specimens from Carabaya, E. Peru, altitude 6000-7000 feet, collected by the late Mr. G. Ockenden.

*Amphisbana Slateri.*

Snout rounded, prominent. Rostral small, triangular, not visible from above; nasals forming a suture; a pair of præfrontals, the suture between them nearly twice as long as that between the nasals and a little longer than that between the frontals, which are much smaller; a pair of occipitals; eye distinguishable under the ocular, which is situated between the præfrontal and the second and third upper labials and followed by two superposed postoculars; four upper labials, fourth very small, second largest; symphyial fused with a large chin-shield; four lower labials, second largest.



snout and the fore limb is contained twice and a half in the distance between axilla and groin. Snout very short, obtuse. Lower eyelid scaly. Nostril pierced between two nasals; no supranasal; fronto-nasal broader than long, broadly in contact with the rostral and with the frontal; præfrontals minute; frontal not much larger than frontoparietals, in contact with the first and second supraoculars; four supraoculars; five supraciliaries; frontoparietals distinct, larger than the interparietal; parietals forming a suture behind the interparietal; a pair of nuchals; fifth upper labial below the centre of the eye. Ear-opening minute. 22 smooth scales round the middle of the body. Median præanals scarcely enlarged. The length of the hind limb equals the distance between the anterior border of the eye and the fore limb; third and fourth toes equal. Tail long and thick. Upper surface of head and back blackish brown, with small round white spots; sides of body, belly, hind limbs, and base of tail uniform orange; a black streak on the temple and along the side of the neck; throat black; greater part of tail brown above and white beneath, spotted with black.

	mm.
Total length.....	166
Head.....	10
Width of head.....	7
Body.....	51
Fore limb.....	10
Hind limb.....	15
Tail (reproduced).....	105

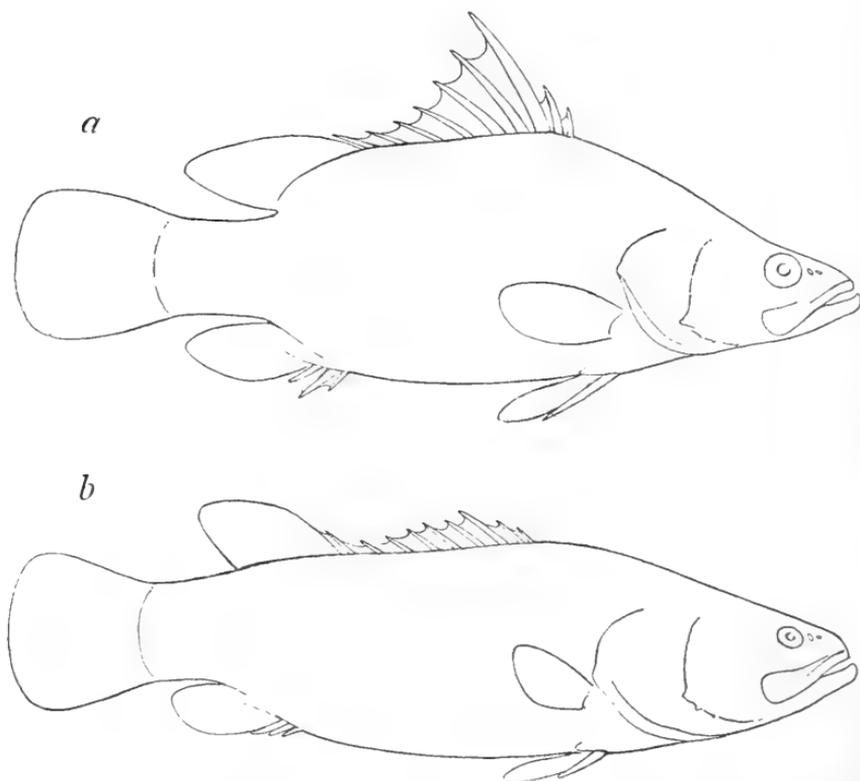
A single specimen from Mount Ruwenzori, altitude 7000 feet. Presented by the Subscribers to the Ruwenzori Expedition Fund.

LVI.—*On the Variations of Stereolepis gigas, a great Sea-Perch from California and Japan.* By G. A. BOULENGER, F.R.S.

WHEN preparing a revision of the Sea-Perches for the 'British Museum Catalogue of Fishes,' vol. i., published in 1895, a comparison of the descriptions and figures given of *Stereolepis gigas*, Ayres, from California, and *Megaperca ischinaga*, Hilgendorf, from Japan, failed to bring out any tangible difference between the two, which I accordingly proposed to unite under the former name. A comparison of

an adult Californian specimen with a photograph of Hilgendorf's types in the Berlin Museum, which I made soon after (P. Z. S. 1897, p. 917, pl. lii.), confirmed me in this opinion.

Dr. D. S. Jordan, although accepting the generic identification of the two fishes, could not be convinced of their specific identity; and in a paper which he published last year (P. U.S. Nat. Mus. xxx. p. 841, fig.), in conjunction with Mr. J. O. Snyder, he emphatically declares the Japanese fish to be "well separated from *Stereolepis gigas*, Ayres, of the coast of California, by the larger scales, and especially by



*Lates niloticus*, young and adult.

the form of the spinous dorsal fin, the spines in *Stereolepis gigas* being very much lower. The nominal genus *Megaperca*, however, differs but slightly from *Stereolepis*, the only tangible character resting in the marked elevation of the dorsal spines, the first dorsal being low in *Stereolepis*. The scales are a shade thicker and rougher, but the difference is

not one of importance." This latest description, accompanied by a figure, is taken from a specimen 14 inches long, although the species is known to grow to five times that length. Had Dr. Jordan not overlooked my description and figure in 1897, as he courteously informs me he inadvertently did, he could not have stated that the spinous dorsal fin is appreciably more elevated in the adult *Megaperca* than in the adult *Stereolepis* (young specimens of the latter are, I believe, still unknown). It seems hardly credible that so experienced an ichthyologist as Dr. Jordan should overlook the enormous changes in the comparative depth of the spinous dorsal which take place with age in all Bass-like fishes, and in order to emphasize this point I here give outline-figures (*a*) of a small (1 foot long) and (*b*) a large (4 feet long) Nile Perch (*Lates niloticus*).

I have specially selected the Nile Perch as an example, because, having been able to study a large number of specimens, I have no fear of having confounded two species.

In the young *Megaperca* the longest spines measure about half the depth of the body, in the adult (photograph of the type) exactly one fourth. I therefore cannot accept the differences in the dorsal spines as being due to anything more than the usual changes which take place with age, and until the young of the Californian fish is known we may safely assume that its first dorsal is much more elevated than in the adult. In a letter addressed to me a short time ago Dr. Jordan adds that the Japanese fish has "much larger scales." I have, I think, disposed of the supposed distinction in the dorsal fin; I will now give some facts against the second distinctive character, which, so far as I know, is the only one that would stand after a comparison of the figures given by me in 1897. In 1895 I gave the scale-formula, compiled from different sources (Japanese and American specimens), as  $80-100 \frac{15}{35}$ . In the Californian specimen examined by me in 1897 I counted  $115 \frac{15}{40}$ . In their young Japanese specimen Jordan and Snyder counted  $87 \frac{14}{31}$ . In two specimens from Japan (Sagami Bay), now preserved in the British Museum, and measuring 19 and 15 inches respectively, I find  $90 \frac{14}{33}$  in the first,  $105 \frac{16}{40}$  in the second, and my counting has been verified by my colleague Mr. Regan. These numbers seem to me to dispose entirely of the alleged difference in the size of the scales as a specific character.

LVII.—On an African Barbel hitherto confounded with *Barbus trimaculatus*, Peters. By G. A. BOULENGER, F.R.S.

FOLLOWING the lead of Günther \*, Steindachner †, and Max Weber ‡, I have hitherto referred to *Barbus trimaculatus* a small barbel common in British Central Africa, Rhodesia, Portuguese East Africa, Angola, the Transvaal, and Zululand. Having recently had an opportunity of examining great numbers of these fishes, I have come to the conclusion that they cannot possibly be identified with the species so carefully described and figured by Peters §. As suggested by the latter author, *B. trimaculatus*, established on a single example from the Rovugo River, Mozambique, is very closely related to, if not identical with, *B. trispilus*, Bleeker, of which I have recently given a description ||. The species for which I now propose the name *B. decipiens* differs from *B. trimaculatus* and *B. trispilus* in its strong ossified last simple dorsal ray, shorter barbels, and more numerous scales in the lateral line. It would never have been confounded with *B. trimaculatus* but for its deceptive markings, which, moreover, are by no means constant. I append a description based on the following series of specimens:—

- 2, R. Ruo, Brit. Cent. Africa.—Sir H. H. Johnston.
- 1, between Kondowe and Karonga, Brit. Cent. Africa.—Sir H. H. Johnston.
- 6, near Salisbury, Rhodesia.—Guy A. K. Marshall.
- 13, Mazoë R., Rhodesia.—J. ff. Darling.
- 6, Beira, Portug. E. Africa.—C. Grant.
- 2, Groot Olifant R., Transvaal.—Capt. G. E. Bruce.
- 5, Klein       "       "       "       "
- 2, near Komati Poort,       "       "
- 2, Potchefstroom, Transvaal.—Stenning.
- 28, E. of Pietersburg, Transvaal.—C. Grant.
- 4, Umfulosi, Zululand.—C. Grant.
- 1, Elcheleselwane, Zululand.—Dr. E. Warren.
- 9, Mossamedes, Angola.—Dr. W. J. Ansorge.

*Barbus decipiens.*

Depth of body 3 to 4 times in total length, length of head  $3\frac{2}{3}$  to  $4\frac{1}{4}$  times. Snout rounded, as long as or a little longer

\* Proc. Zool. Soc. 1893, p. 619.

† Sitzb. Ak. Wien, ciii. i. 1894, p. 452.

‡ Zool. Jahrb., Syst. x. 1897, p. 151.

§ Reise n. Mossamb. iv. p. 55, pl. xi. fig. 4 (1868).

|| Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 33.

than the eye in the adult; diameter of eye 3 to  $4\frac{1}{2}$  times in length of head, interorbital width  $2\frac{1}{2}$  to  $2\frac{2}{3}$  times; mouth slightly inferior, with feebly developed lips, interrupted on the chin; barbels two on each side, anterior about as long as eye, posterior 1 to  $1\frac{1}{2}$  diameters of eye, the distance between them about  $\frac{1}{2}$  diameter of eye. Dorsal III 7-8, last simple ray strong, bony, not serrated, nearly straight, or feebly curved,  $\frac{2}{3}$  to once length of head; free edge of the fin feebly emarginate; its distance from the occiput less than its distance from the caudal fin. Anal III 5, longest ray about  $\frac{2}{3}$  length of head. Pectoral  $\frac{2}{3}$  to  $\frac{3}{4}$  length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle  $1\frac{2}{3}$  to 2 times as long as deep. Scales 32-36  $\frac{5\frac{1}{2}-6\frac{1}{2}}{5\frac{1}{2}}$ , 3-4 between lateral line and ventral, 14-16 round caudal peduncle. Brown above, silvery on the sides and below; three more or less distinct round blackish spots often present on each side, the first and second just above the lateral line, one in front and one behind the vertical of the base of the dorsal, the third at the base of the caudal fin and traversed by the lateral line; these spots may be absent or reduced to the one at the base of the caudal fin; fins whitish, without spots.

This fish grows to a length of 125 mm., but is usually smaller, about 100 mm. long.

LVIII.—Spirochaeta (Trypanosoma) Balbianii (*Certes*), *its Movements, Structure, and Affinities; and on the Occurrence of Spirochaeta anodontæ (Keysselitz) in the British Mussel, Anodonta cygnea*. By H. B. FANTHAM, B.Sc., Derby Research Scholar, University College, London; and St. Mary's Hospital Medical School.

(Preliminary Account.)

#### *Introduction.*

THERE are few more interesting organisms at present under investigation than those microscopic yet most active forms known as Spirochaetes, which lie near the border-line of plants and animals. They are, indeed, veritable members of Hæckel's kingdom Protista, and it is still a disputed point whether they are really Protozoa or Bacteria.

### Historical.

*Spirochæta (Trypanosoma) Balbianii* was first recorded by Certes from French oysters in 1882 [1], though Möbius, writing in 1883 [7], stated that he observed the parasite in 1869 in oysters from Schleswig-Holstein. It was found in the crystalline style and intestine of the host. Lustrac [6], in 1896, gave particulars of longitudinal division. In 1901 the famous protistologists Laveran and Mesnil [5] briefly described the main features of the organism, and stated that it was really a Bacterium allied to the Spirilla and Spirochætes. In 1905-06 Perrin [8, 9] described the life-history of the organism, but still retained it in the genus *Trypanosoma*, although it lacks a flagellum, Certes having placed it in this genus years before because it possessed an undulating membrane; but at that period the genus *Trypanosoma* was ill-defined. Short notes have since appeared by Swellengrebel [10], Vlès [11], and Fantham [3].

*Spirochæta anodontæ* was recorded from the crystalline style of *Anodonta mutabilis* (which is not a British species) by Keysselitz in 1906. It has not before been noted in *A. cygnea*, so far as I am aware.

### Material and Methods.

*Spirochæta Balbianii* has been studied by me in oysters at Roscoff last summer, and in this connexion I would especially thank Professor Delage and M. Fred Vlès. The further studies on this organism were continued in London, on more living material, though infected oysters were only procured with much difficulty.

As regards *Spirochæta anodontæ* from the crystalline style of *Anodonta cygnea*, after repeated attempts, during which only a few parasites were found, I obtained an infected strain in Anodons from Godalming, very kindly supplied to me by Mr. O. H. Latter, to whom my best thanks are tendered.

I have spent much time examining both these Spirochætes in the living condition, in their natural medium as far as possible. I am convinced that too much stress cannot be laid on the necessity for this careful examination of living material; it is not sufficient to rely on stained preparations alone.

As regards fixed and stained material, best results were obtained from thin smears of gut-contents or solutions of the crystalline style (in a little sea-water in the case of *Ostrea*, in fresh water in the case of *Anodon*), the preparations being

*fixed wet* with osmic vapour. Other fixatives used were Flemming's solution, corrosive sublimate and alcohol, and in the case of some dried smears pure methyl and ethyl alcohols. The preparations were usually mounted in cedar-wood oil or balsam.

The most useful stains were gentian violet (Ohlmacher's formula), iron-alum hæmatoxylin, thionin, Billet's modification of the Giemsa stain, and Delafield's hæmatoxylin, while dilute methylene-blue was best for *intra vitam* staining. Too much reliance must not be placed on the various modifications of the Romanowsky stain, for the structure of the membrane is often only poorly revealed thereby.

#### *Movements of these Spirochætes.*

Previous accounts of these phenomena are most meagre, and yet descriptions of such movements would be of the utmost importance. At this juncture it is necessary to state that a typical Spirochæte possesses an undulating membrane. The type species of the genus, *S. plicatilis*, Ehrenberg, recorded in 1833 from muddy water, was shown by Schaudinn in 1905 to possess such a membrane.

The movements of each of the two Spirochætes in question are most complex and difficult to resolve and interpret. A Spirochæte moves *very* rapidly, especially *S. anodontæ*—indeed, so rapidly that it is almost impossible to analyze its motion when travelling at full speed. Its path may be either in a straight line or more or less in a circle. In the case of slowly moving specimens it is seen that the organism moves forward while turning on its long axis. The motion, then, appears to be resolvable into at least two components—(i.) a vibratory motion of flexion of the body, mainly for progression, and (ii.) a spiral or corkscrew movement of the body as a whole, due to the winding of the membrane. The corkscrew motion is especially well seen in the case of *S. anodontæ*, which has pointed ends.

Waves can be seen travelling down the thread-like body in a direction opposite to that in which the organism is progressing. Many waves or sinuosities, some eight or ten, can be seen along the body of rapidly moving forms, while only some two to four may occur in more slowly moving ones. The outline of the sinuosities is sometimes a little irregular—that is, the contour is somewhat broken by much smaller waves.

The movements occur in jerks. The organism may suddenly come to a dead stop or just as suddenly proceed

more slowly. It is a matter of indifference which end of the body is directed forwards, for the parasite is capable of suddenly reversing its direction of movement and returning on its own path, apparently even in an almost exact straight line or circle. I do not consider this retracing of its path to be due to unfavourable environment, as suggested by Novy in the case of *S. Obermeieri*, for I have observed it constantly taking place inside the crystalline style. The organism can then travel with or against the current indifferently. A very great deal of energy seems to be used in the motion of the animal. The body of the organism can be distinguished during motion in the case of *S. Balbianii* with some difficulty, but sometimes *S. anodontæ* moves too rapidly for its outline to be clearly discernible.

Sometimes the organism appears suddenly from a deeper level of the liquid under examination, and swims, or, rather, spirally bores its way more or less vertically upwards. In this condition it twists itself into various peculiar shapes, and so resembles a Catherine wheel as described by Perrin.

Parasites are sometimes noticed anchored by one end to a separated or shed epithelial cell (from the gut of the host) lying in the gut-contents. The free end of the parasite then executes violent lashing movements or intermittent flickers. The free end also in such specimens may coil itself over and over. *S. Balbianii*, with its rounded ends, often has some difficulty, apparently, in boring its way through débris or obstacles in its path. It often tries to get through these instead of changing its direction of motion. However, I have seen it penetrate free epithelial cells and occasionally appear to come out of such cells.

*S. anodontæ*, with its pointed ends, is capable of rather more rapid motion and more easily bores its way through the débris of cells floating in the gut-contents of the host.

Spirochætes may at times be seen vibrating in two halves about their central points as nodes; they then resemble, to some extent, two tuning-forks joined by their single ends and in vibration.

Slowly moving specimens of *S. anodontæ* may curl up one end, usually the hinder end, judging by the direction of motion.

These Spirochætes seem to move more quickly than Trypanosomes, and with an added corkscrew motion. Also the body of a *Spirillum* seems more rigid than that of a Spirochæte in motion, and of course flagella are present in the case of true *Spirilla*.

Various scientific workers—both zoologists and bacteriolo-

gists—to whom I have shown these Spirochætes alive, have compared their motion to that of an eel, or the embryo of *Filaria*, or to that of *Nereis*, but with the spiral movement in addition.

### General Structure.

The general shape of each of these Spirochætes is that of a long narrow thread. *S. Balbianii* varies from  $50 \mu$  to  $150 \mu$  in length, and is  $2 \mu$  to  $3 \mu$  broad. Its breadth is almost uniform and its ends are rounded. *S. anodontæ* is about  $35 \mu$  to  $40 \mu$  long and about  $0.7 \mu$  broad. Keysselitz [4] did not give the dimensions of his parasite from *A. mutabilis*. The ends of *S. anodontæ* are pointed and prolonged into a filament-like process, which some observers might be disposed to call a flagellum, though it seems to me to be stiff.

The body is bounded by a well-marked periplast which encloses a homogeneous cytoplasm. There is no marked differentiation of this cytoplasm into ectoplasm and endoplasm, though I think the periplast represents an ectoplasm. The periplast is not composed of cellulose (as tested by iodine and sulphuric acid), but might be composed of "fungus-cellulose" so far as negative evidence goes. Perrin, judging from macerated specimens, considered the periplast to be fibrillar in structure. This is very difficult to corroborate, but is probably correct, for these fibrillæ might equally belong, in macerated specimens, to the membrane, to be described in the next section.

In the centre of the thread-like organism is a core of chromatin, the nuclens, stretching nearly from end to end, which consists of a filament on which are arranged transverse bands or rodlets of deeply staining chromatin at more or less regular intervals. These rodlets may be perhaps termed "chromosomes," as by Perrin; many are irregularly dumbbell-shaped, while some are thinner than others. Perrin considered the connecting spiral or zigzag-shaped filament to be a karyosome. He figures various nuclear changes in connexion with gamete formation, which are, however, open to varied interpretations. In preparation for longitudinal division the dumbbell-shaped rodlets divide, and leave two rows of "chromosomes," one on each edge, along the periphery of the parasite. I have not seen definite evidence of reducing division.

The nucleus was not observed by the earlier writers on these parasites. It is of a diffuse character, and there is no definite blepharoplast, facts first noted by Laveran and Mesnil, the significance of which is of the highest importance

There is a cap or nodule attached to each end of the periplast in *S. Balbianii* which stains pinkish with Giemsa's solution, and which may be a "basal granule."

The chromatin granules of *S. anodontæ* are difficult to see, the whole organism being much smaller, but the nucleus seems to conform to the general arrangement of that structure in *S. Balbianii*.

#### *The Undulating Membrane.*

This structure does not extend quite to the ends of the organism. There is some difference of opinion as to its nature, but its presence is a characteristic feature of the genus *Spirochæta* as now defined.

It is, I believe, a spirally wound membrane or lateral outgrowth of the ectoplasmic periplast, and is composed of longitudinally arranged fibrillæ. These fibrillæ are contractile and may be termed "myoneme fibrillæ," though the term "myoneme" is perhaps not a happy one. There appear to be some eight or nine principal fibrils, and many less evident ones parallel therewith, all of them apparently longitudinally arranged. The border of the membrane is thickened and stains well with chromatin stains. I agree with Perrin that the membrane possesses a chromatic border.

In slowly moving parasites the edge of the membrane, and even the membrane itself, is easily seen (Zeiss DD and ocular 2) in life. Such forms are curved into about two or three sinosities only, and the membrane can be seen in the troughs of these, loosely arranged and not contracted close to the body.

It has been suggested by Laveran and Mesnil that this structure is not really a membrane, but a sheath, only loosely attached, if at all, to the body of the organism. This matter is most difficult to settle, and is certainly not to be passed over lightly by mere dogmatic assertion either one way or the other. However, one can see in preparations the spiral arrangement of the membrane in many cases, and its actual crossing over the body from one side to the other, both above and below. And, furthermore, the organism possesses a distinct spiral motion, evidently guided by the spiral arrangement of the membrane. Again, if the body moved more or less freely inside a sheath one might expect to see some signs of differential motion between the organism and its sheath. I have never seen such during my investigations.

It seems to me, then, that this structure is a membrane, spirally wound round the body, and is an outgrowth of the periplast. It is composed of elastic fibrils and is contractile,

and is probably the locomotor agent of the organism. Its own vibrations are very slight, and by its alternate contraction and expansion it appears to control the movements of the organism. The structure and function of this "organella" are *most difficult* to interpret. The myonemes, I think, set up *transverse movements* in the surface of the body, manifested as waves passing down the body in a direction opposite to that in which the organism progresses.

It has been stated that the nuclear core is contractile (Swellengrebel [10]). I am rather inclined to the view that it is only flexible.

It has been suggested [11] that there is a ciliate stage in the life-history of *S. Balbianii*—in other words, that the membrane is built up from the agglutination of cilia ("flagella" of English bacteriologists), or even that the membrane may be decomposed into these flagella. I have myself preparations of this character made both at Roscoff and in London. It seems to me that these apparent flagella or cilia are really elastic fibrils, staining pink with Giemsa's or Leishman's stain, "myoneme fibrils" in fact, split off from the membrane during its rupture, which sometimes occurs during the violent contortions and death-struggles of the organism, especially in a damp atmosphere like that of Roscoff. It may be that the membrane, as suggested in a private communication, is really a "ciliated membrane." I have never seen these flagella during life.

The fibrillar nature of the membrane is none too well shown by the various modifications of the Romanowsky stain. It is best revealed by gentian-violet or iron-hæmatoxylin.

In life, during active movements, the membrane is closely contracted round the body, and is not easily seen except as a halo round the organism.

The membrane of *S. anodontæ* is most difficult to discern, but it can be seen in favourably placed specimens both in life and when stained. It appears to conform to the structure described for *S. Balbianii*.

#### *Division.*

Longitudinal division has been described before in the case of these Spirochætes. I have seen such during life and in stained preparations.

However, I believe transverse division also occurs, for in the case of *S. Balbianii* both long and short forms are seen. In some stained preparations there were somewhat long forms

with the membrane discontinuous in the centre, where a vacuole-like space occurred; the edges of this space were sharp, not torn, while the periplast appeared just continuous over the gap. Laveran and Mesnil [5] have described transverse fission. I think this mode of division naturally occurs, and such cases are not to be explained away [8, 9] as merely two forms which, having divided longitudinally, are now separated by  $180^\circ$ , just before complete separation. Further, in living specimens one sometimes sees forms vibrating about a node, possibly not central, but I have never seen in life division about such a point.

#### *Affinities.*

Spirochætes are Protists: doubtless all will agree to this. Next arises the vexed question, Are they Protozoa or Bacteria?

Their diffuse nuclei and transverse fission rather suggest Bacteria; while, on the other hand, the presence of an undulating membrane, longitudinal fission, and even definite "chromosomes" suggest Protozoa. Perhaps, too, their size is great for Bacteria, though too much importance must not be attached to questions of size probably.

I am not at all sure about the presence of male and female forms [8, 9] or of encystment [8, 9]. I think these appearances can be otherwise interpreted, the male and female forms being possibly the extremes from a more or less continuous series.

On the whole, I somewhat incline to the Protozoal nature of these organisms, but prefer to leave further discussion of this and other points for my longer illustrated memoir, which will, I hope, appear in the Quart. Journ. Microsc. Sci.

POSTSCRIPT.—To this preliminary account it might be of interest to add that *Spirochæta Balbianii* was found moving about freely in a basin of sea-water in which specimens of infected English oysters were kept, the shells of these oysters being still partly covered by mud from their native beds. I was able to demonstrate this, with living specimens, to some of my friends.

I have also examined specimens of the Acarid, *Atax Bonzi*, Clap., found in the mantle-cavity of *Anodonta*, but have not yet succeeded in finding any Spirochætes in the Acarids, although *Spirochæta Duttoni* occurs in ticks.

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LIX.—On *Pterocyon*, *Rousettus*, and *Myonycteris*.

By KNUD ANDERSEN.

THE present paper is a brief summary of notes written down during a revision of the fruit-bats of the genera *Pterocyon*, *Rousettus*, and *Myonycteris* in the collection of the British Museum.

*Synopsis of the Genera and Species.*

Common characters: tongue normal; molars well developed; occipital region of skull not elongated and tubular; incisors  $\frac{2}{2}$ — $\frac{2}{2}$ ; postcanine teeth  $\frac{5}{6}$ ; second digit clawed; a short tail.

a. Cranial rostrum longer: front of orbit vertically above posterior half or middle of  $m^1$ ; basicranial axis markedly deflected.

a'. Premaxillaries separated in front; tympanics forming a bony auditory meatus;  $p^2$  in cross section twice the size of an upper incisor;  $m_1$  equal in length to  $m_2$  and  $m_3$  together. General size large: forearm 114-132 mm. Ethiopian . . . . *Pterocyon*.

- a*<sup>2</sup>. Rostrum relatively longer: front of orbit to tip of nasals equalling or exceeding maxillary tooth-row; fur longer, more woolly, not closely appressed; colour darker. Forearm 127-131 mm. Madagascar . . . . . *Pt. Dupreanus*.
- b*<sup>2</sup>. Rostrum relatively shorter: front of orbit to tip of nasals less than maxillary tooth-row; fur very short, closely appressed; colour lighter.
- a*<sup>3</sup>. Skull larger: total length 54.5-62.5 mm.; tooth-rows longer: *c-m*<sup>2</sup> 21-23.8; molars narrower. Forearm 117.5-132. African continent. . . . . *Pt. helvus*.
- b*<sup>3</sup>. Skull smaller: total length 51.5-55 mm.; tooth-rows broader: *c-m*<sup>2</sup> 19.2-20.8; molars broader. Forearm 114-127. S.W. Arabia . . . . . *Pt. sabaeus*.
- b*<sup>1</sup>. Premaxillaries in contact or co-ossified in front; no bony auditory meatus; *p*<sup>2</sup> reduced: subequal in size to an upper incisor; *m*<sub>1</sub> shorter than *m*<sub>2</sub> and *m*<sub>3</sub> together. General size moderate: forearm 69.5-99 mm. Ethiopian, Oriental, Austro-Malayan . . . . . *Rousettus*.
- c*<sup>2</sup>. Wings from back of 1st toe.
- c*<sup>3</sup>. Pollex (with claw) 30-37.5 mm.; 2nd phalanx of 3rd digit 50.5-61.5.
- a*<sup>4</sup>. Ears not attenuated at tip; lower leg 40-45.5 mm.
- a*<sup>5</sup>. Skull smaller: total length 40.5-43.8 mm.; rostrum slenderer; palate ridges normally 3+4+1\*. Forearm 89-99. S. Africa . . . . . *R. Leachi*.
- b*<sup>5</sup>. Skull larger: total length 43.6-46.7 mm.; rostrum heavier; palate ridges 4+4+1. Forearm 88-99. Angola to Palestine . . . . . *R. aegyptiacus*.
- b*<sup>4</sup>. Ears attenuated at tip; lower leg 37-39.5 mm.; forearm 87-96. Arabia to Sind . . . . . *R. arabicus*.
- d*<sup>3</sup>. Pollex (with claw) 24-30 mm.; 2nd phalanx of 3rd digit 36-47.2.
- c*<sup>4</sup>. Molars not unusually narrow; fur short; notopatagium naked.
- c*<sup>5</sup>. *m*<sub>2</sub> elliptical in outline; width of ears (flattened) 14.5-15.8 mm.
- a*<sup>6</sup>. *p*<sup>2</sup> not deciduous; fur on nape and shoulders not unusually scarce. Forearm 80.5-87.5 mm. India, Himalayas, to S. China . . . . . *R. Leschenaulti*.

\* 3 anterior, undivided; 4 middle, interrupted in the median line; 1 posterior, at palation border.

- b*<sup>6</sup>. *p*<sup>2</sup> deciduous; nape and shoulders seminaked. Forearm 79-85.5 mm. Ceylon . . . . . *R. seminudus*.
- d*<sup>5</sup>. *m*<sub>3</sub> subcircular in outline; width of ears (flattened) 10-13 mm.
- e*<sup>6</sup>. *p*<sup>2</sup> not deciduous. Forearm 77-87.2 mm. Indo-Malayan. . . . . *R. amplexicaudatus*\*.
- d*<sup>8</sup>. *p*<sup>2</sup> deciduous. Forearm 69.5-75 mm. Austro-Malayan. . . . . *R. brachyotis*.
- d*<sup>4</sup>. Molars unusually narrow; bony palate narrow; fur longer; notopatagium and tibiæ well haired. Forearm 72.5-75 mm. Celebes . . . . . *R. celebensis*.
- d*<sup>2</sup>. Wings from back of 2nd toe; fur long and dense.
- e*<sup>3</sup>. Frontal region of skull between postorbital processes concave; molars of normal breadth; lower leg short: 29-31 mm. Forearm 79-83.5. Ethiopian . . . . . *R. angolensis*.
- f*<sup>3</sup>. Frontal region of skull between postorbital processes flat; molars excessively narrow; lower leg 39-40 mm. Forearm 88.5-90. Ethiopian . . . . . *R. lanosus*.
- b*. Cranial rostrum shortened: front of orbit vertically above back of *p*<sup>4</sup>; basicranial axis nearly parallel to alveolar border. Ethiopian . . . . . *Myonycteris*.
- c*<sup>1</sup>. Small: forearm 60-67 mm. Equatorial Africa . . . . . *M. collaris*.

## I. PTEROCYON, Pet.

- |   | Type.               |
|---|---------------------|
| 1861. <i>Pterocyon</i> , Peters, MB. Akad. Berlin, p. 423 . . . . .   | <i>Pt. helvus</i> . |
| 1881. <i>Leiponyx</i> , Jentink, Notes Leyden Mus. iii. p. 60 [nec <i>Liponyx</i> , Vieillot, 1816, a genus of birds] . . . . . | <i>Pt. helvus</i> . |

Basicranial axis considerably deflected: alveolar line projected backward passing through bases of post-tympanic and paroccipital processes. Rostrum long: front of orbit vertically above posterior half or middle of *m*<sup>1</sup>. Tympanic produced externally into a short tubular bony auditory meatus (a peculiarity unique among bats). Premaxillaries separated in front. Cutting-edges of lower incisors simple (not bifid). *p*<sup>2</sup> in cross section twice the size of an upper incisor. *m*<sub>1</sub> equal in length to *m*<sub>2</sub> and *m*<sub>3</sub> combined. Palate ridges 4+3+3. Size large: forearm 114-132 mm.

*Range*.—Madagascar; African continent, from Sennaar and Senegambia in the north to Nyasaland and Namaqualand in the south; S. Arabia.

\* On *R. minor*, see p. 509.

1. *Pterocyon Dupreanus*, Schl. & Poll.

1866. *Pteropus Dupreanus*, Schlegel & Pollen, P. Z. S. p. 419 (N.W. Madagascar).

*Range*.—Madagascar.

*Cotypes* in the Leiden Museum.

2. *Pterocyon helvus*, Kerr.

1771. *Lesser Ternate Bat*, Pennant, Syn. Quadr. p. 362. no. 274 B, pl. xxxi. fig. 1.

1774. *Vespertilio Vampyrus* (nec L.), var. C, Schreber, Säugth. i. p. 154.

1777. *Pteropus Vampyrus*, var.  $\gamma$ , Erxleben, Syst. Regn. An., Mamm. p. 133.

1781. *Lesser Ternate Bat*, Pennant, Hist. Quadr. ii. p. 552, pl. lii. fig. 1.

1788. *Vespertilio Vampyrus*, var.  $\gamma$ , Gmelin, Linn. Syst. Nat. ed. 13, i. p. 45.

1792. *Pteropus Vampyrus*, var.  $\gamma$ , Donndorff, Zool. Beytr. i. p. 62.

1792. *Vespertilio Vampyrus helvus*, Kerr, Anim. Kingd. i. pt. i. pp. xvii, 91, no. 108.

1810. *Pteropus stramineus*, E. Geoffroy, Ann. Mus. d'Hist. nat. xv. p. 95 (Timor, *errore*).

1861. *Pterocyon paleaceus*, Peters, MB. Akad. Berlin, p. 423 (Africa).

1861. *Pteropus mollipilosus*, H. Allen, Proc. Ac. Nat. Sci. Philad. p. 159 (Gaboon).

1865. *Pteropus palmarum*, Heuglin, Leopoldina, Heft v. nos. 3-4, p. 34 (Middle and Upper Nile).

1866. *Xantharpyia leucomelus*, Fitzinger, SB. Akad. Wien, liv. Abth. i. H. 10, p. 544 (Sennaar).

1881. *Leiponyx Büttikoferi*, Jentink, Notes Leyden Mus. iii. p. 59 (Liberia).

*Range*.—Africa, from Somaliland, Sennaar, and Senegambia in the north, to Nyasaland, Mashonaland, and Namaqualand in the south.

*Type* not in existence.

Kerr's *Vespertilio Vampyrus helvus*.—The present species was well known to the early post-Linnean systematists, who put it down as a variety of *Vespertilio* (or *Pteropus*) *vampyrus*, L. The earliest recognizable figure and description appear to be those given by Pennant, in 1771 (*l. s. c.*), under the name "Lesser Ternate Bat," so called because Pennant considered it a lesser variety of Seba's "*Canis volans Ternatanus orientalis*." Kerr's *V. Vampyrus helvus* was based on Pennant's description and figure of this bat. The type, originally in Museum Leverianum, has probably been lost. No habitat given by Pennant nor by Kerr. Senegal may be fixed as the type locality of *Pt. helvus*.

Jentink's *Leiponyx Büttikoferi*.—Type locality: St. Paul's

River, Millsbury, Liberia; type in the Leyden Museum. Chief characters, according to Jentink: postcanine teeth  $\frac{4}{3}$ ; second digit without claw. But the rest of the description and all the measurements are sufficient evidence that *L. Büttikoferi* was based on a *Pt. helvus*. It is important to note that the skull was not extracted from the specimen (I conclude from the fact that it is not recorded in Jentink's Catalogue of osteological specimens in the Leyden Museum); the small posterior upper molar ( $m^2$ ) can therefore easily have been overlooked; in aged individuals with much worn teeth it is not rarely lost. The lack of a claw to the index-finger must be fortuitous or an individual abnormality.

### 3. *Pterocyon sabceus*, sp. n.

Differs from *Pt. helvus* in the following particulars:—Skull smaller; total length (one male ad., six females ad.) 51.5–55 mm., against 54.5–62.2 in *Pt. helvus* (nineteen males ad., twelve females ad.); maxillary tooth-row ( $c-m^2$ ) 19.2–20.8, against 21–23.5; cranial rostrum slenderer; posterior premolar and molars, above and below, markedly broader than in the larger-skulled *Pt. helvus*. The external dimensions average slightly smaller.

*Range*.—S. Arabia (Lahej, Aden).

*Type*.—♀ ad., skin and skull. Lahej, Aden; Aug. 19th, 1899. Collected by Mr. Dodson. British Museum, no. 99. 11. 6. 3.

## II. ROUSETTUS, Gray.

	Type.
1821. <i>Roussettus</i> , Gray, London Medical Repository, xv. p. 299 (Apr. 1, 1821) .....	<i>R. egyptiacus</i> .
1829. <i>Cercopteropus</i> , Burnett, Quart. Journ. Sci. Lit. Art, xxvii. p. 269 .....	<i>R. egyptiacus</i> .
1843. <i>Eleutherura</i> , Gray, List Mamm. B. M. p. xix. Nomen nudum.	
1843. <i>Xantharpyia</i> , Gray, List Mamm. B. M. pp. xix, 37 .....	<i>R. amplexicaudatus</i> .
1844. <i>Eleutherura</i> , Gray, Voyage 'Sulphur,' i. p. 29 .....	<i>R. Leachi</i> .
1852. <i>Cynonycteris</i> , Peters, Reise Mossamb., Zool. i., Säugeth. p. 25 .....	<i>R. Leachi</i> .
1870. <i>Senonycteris</i> , Gray, Cat. Monk. &c. p. 115.	<i>R. seminudus</i> .

Basicranial axis considerably deflected: alveolar line projected backward passing through upper part of occipital condyle (minimum of deflection) or through base of zygoma (maximum). Front of orbit vertically above posterior half or middle of  $m^1$ . Tympanic not produced into a bony

auditory meatus. Premaxillaries in contact or co-ossified in front. Cutting-edges of lower incisors (when unworn) bifid; the emargination of the cutting-edge continued as a shallow vertical groove for a short distance down the front face of the crown.  $p^2$  subequal in size to an upper incisor.  $m_1$  shorter than  $m_2$  and  $m_3$  combined. Palate ridges 4 (or 3) + 3 (or 4) + 1 (or 2). Size moderate: forearm 69.5–99 mm.

*Range*.—The African continent, exclusive of the Mediterranean countries W. of Egypt; S. Asia, from Palestine and Cyprus to S. China; the Indo- and Austro-Malayan Archipelago, as far east as the Solomon Islands.

### 1. *Rousettus Leachi*, A. Sm.

1823. *Pteropus collaris* (nec Ill.), Lichtenstein, Verz. Doubl. Mus. Berlin, p. 3, no. 47 (Terra Caffrorum).  
 1827. *Pteropus amplexicaudatus* (nec Geoff.), Temminck, Mon. Mamm. i. pp. 260–261 (Cape).  
 1829. *Pteropus Leachi*, A. Smith, Zool. Journ. iv. p. 433 (Cape).  
 1832. *Pteropus hottentottus*, Temminck, in Smut's Enum. Mamm. Capens. p. 3 (Cape).  
 1843. *Cynopterus brevicaudatus* (nec Is. Geoff.), Gray, List Mamm. B. M. p. 39.

Distinguished from all other species of the genus by the combination of the following characters:—Frontal region of skull between postorbital processes flattened; premaxillaries in contact, but rarely co-ossified; total length of skull 40.5–43.8 mm.; palate ridges normally 4 + 3 + 1. Wings from back of first toe, or interspace between first and second toe; pollex (with claw) 31–35.5 mm.; second phalanx of third digit 50.5–60 mm.; second phalanx of fifth digit nearly always shorter than first phalanx; ears not attenuated at tip; fur short. Forearm 89–99 mm.

*Range*.—S. Africa: Cape Colony, Natal, Lower Zambesi (Inhambane).

*Cotype* in the British Museum.

Illiger's *Pteropus collaris*.—Type locality: "die ostlichen [afrikanischen] Inseln"; no type. Illiger's *Pteropus collaris* (Abh. Akad. Berlin, 1804–11, pp. 78, 84; published 1815) is Brisson's *Pteropus collo rubro*, "Rousette à col rouge" (1762), Schreber's *Vespertilio Vampyrus*, var. B (1774), Pennant's "Rougette" (1781), Kerr's *Vespertilio Vampyrus subniger* (1792; earliest available name of the species), E. Geoffroy's *Pteropus rubricollis* (1810). In 1823 Lichtenstein (*l. s. c.*) misapplied the name *Pt. collaris* to the S. African fruit-bat here under consideration; but the error, hidden as it was in the little-known 'Verz. Doubl. Mus.

Berlin,' passed for many years unnoticed, the species being constantly referred to as *Pteropus Leachi* or *Pt. hottentottus*. In 1852 Peters ('Reise nach Mossambique') confirmed Lichtenstein's wrong identification of *Pt. collaris*, and from about that year the names *Leachi* and *hottentottus* gradually went out of fashion, being replaced by *collaris*; from about 1870 *Leachi* and *hottentottus* only appear in the lists of synonyms of *collaris*.

### 2. *Rousettus ægyptiacus*, E. Geoff.

1810. *Pteropus ægyptiacus*, E. Geoffroy, Ann. Mus. d'Hist. nat. xv. p. 96 (Lower Egypt).  
 1825. *Pteropus Geoffroyi*, Temminck, Mon. Mamm. i. p. 197, pl. xv. figs. 14, 15 (skull) (Egypt, "Senegal").  
 1870. *Eleutherura unicolor*, Gray, Cat. Monk. &c. p. 117 (Gaboon).

Similar to *R. Leachi*, but with larger skull, broader rostrum, broader frontal region, and heavier teeth; palate ridges normally 4+4+1. Forearm 88-99 mm.

*Range*.—From Loanda and Gaboon to Egypt, Erythrea, Syria, Palestine, and Cyprus.

*Cotypes* in the Paris Museum.

### 3. *Rousettus arabicus*, And. & de Wint.

1902. *Rousettus arabicus*, Anderson & de Winton, Zool. Egypt., Mamm. pp. 86, 88, 89-90 (Aden).

Similar to *R. Leachi*, but with shorter and lower rostrum, narrower ear-tips, shorter tibia and foot. Forearm 87-96 mm.

*Range*.—From Arabia (Aden, Muscat) to Sind (Karachi).  
*Type* in the British Museum.

### 4. *Rousettus Leschenaulti*, Desm.

1820. *Pteropus Leschenaulti*, Desmarest, Encycl. Méth., Mamm. i. p. 110. no. 142 (Pondichery).  
 1832. *Pteropus* sp., Hodgson, J. A. S. B. i. p. 340 (Nepal).  
 1835. *Pteropus pyrivorus*, Hodgson, J. A. S. B. iv. p. 700 (Nepal).  
 1843. *Cynopterus affinis*, Gray, List Mamm. B. M. p. 39 (Himalaya).  
 1870. *Eleutherura marginata*, Gray, Cat. Monk. &c. p. 118 ("Nepal," *i. e.* Nasirabad).  
 1870. *Eleutherura fuliginosa*, Gray, Cat. Monk. &c. p. 118 (Lao Mts., Siam).  
 1870. *Eleutherura fusca*, Gray, Cat. Monk. &c. p. 119 ("India?").  
 1873. *Cynonycteris infuscata*, Peters, MB. Akad. Berlin, p. 487 (Calcutta).

Allied to *R. arabicus*, but smaller, with the muzzle shorter and slenderer, the tip of the ears not attenuated, the pollex markedly shorter, wings shorter, especially the first and second

phalanx of the third digit, and the foot smaller. Forearm 80·5–87·5 mm.

*Range*.—Himalayas (Nepal), extending southward over the Indian Peninsula (Pondichery), eastward through Bengal, Burma, Siam (Lao Mts.) to S. China (Amoy).

*Type* in the Paris Museum.

Peters's *Cynonycteris infuscata*.—Type locality: "angeblich aus Calcutta" (a dealer's specimen); type in the Berlin Museum (no. 361). "Sehr ähnlich der *C. Leschenaultii*, in allen Verhältnissen kleiner, dunkelbraun von Farbe, mit schwarzen Krallen und dem ersten falschen Backzahn grösser"; detailed measurements given; forearm 68, third metacarpal 42, tibia 29 mm. The type, I am informed by Prof. Matschie, is a young, not full-grown individual ("die Epiphysen an den Fingergelenken sind noch nicht mit den Phalangen verwachsen," Matschie, *in litt.*); hence its small size.

##### 5. *Rousettus seminudus*, Gray.

1870. *Xantharpyia seminuda*, Gray, Cat. Monk. &c. p. 115 (Ceylon).

Similar to *R. Leschenaultii*, but  $p^2$  deciduous, nape and shoulders seminaked, general colour of fur lighter. Forearm 79–85·5 mm.

*Range*.—Ceylon.

*Type* in the British Museum.

Gray's *Xantharpyia seminuda*.—Type locality: Ceylon. "*Pteropus seminudus*, Kelaart," is a nomen nudum; in the paper usually referred to by authors, viz. Blyth's account in J. A. S. B. xxi. p. 345 (1852), on a collection of mammals sent by Kelaart to the Asiatic Society of Bengal, it appears only as a synonym, without comment, of *Ph. Leschenaultii*; the same is the case in Kelaart's 'Prodromus Faunæ Zeylanicæ' (1852). The name remained a nomen nudum, until in 1870 (*l. s. c.*) Gray published a brief diagnosis of "*Xantharpyia seminuda*"; the British Museum specimen on which Gray based this diagnosis is, therefore, the type of the species.

##### 6. *Rousettus amplexicaudatus*, E. Geoff.

1810. *Pteropus amplexicaudatus*, E. Geoffroy, Ann. Mus. d'Hist. nat. xv. p. 96, pl. iv. (whole fig.) (Timor).

1870. *Eleutherura infumata*, Gray, Cat. Monk. &c. p. 118 (Flores).

1870. *Eleutherura philippinensis*, Gray, Cat. Monk. &c. p. 119 (Manila).

1898. *Cynonycteris Bocagei*, Seabra, J. Sci. Math. Lisboa, (2) v. pp. 160–161, 169, pl. i. fig. 11 (palate ridges) (Timor).

Similar to *R. Leschenaultii*, but  $m_3$  subcircular in outline, ears narrower. Forearm 77–87·5 mm.

*Range*.—Cambodja, Philippines, Borneo, Sumatra, Engano, Flores, Savu, Alor, Timor.

*Type* in the Paris Museum.

### 7. *Rousettus minor*, Dobs.

1873. *Cynonycteris minor*, Dobson, J. A. S. B. xlii. pt. ii. p. 203, pl. xiv. fig. 9 (ear) (Java).

I have not, as yet, seen the type of *Cynonycteris minor*. In none of the characters given by Dobson is there anything to prove that *R. minor* is different from the true *R. amplexicaudatus* (Dobson, it must be remembered, lumped the continental *R. Leschenaulti* and the Indo-Malayan, insular *R. amplexicaudatus* into one species, "*Cynonycteris amplexicaudata*," and when describing *R. minor* probably compared it with *R. Leschenaulti*, not with the true *R. amplexicaudatus*),—save perhaps in one: the length of forearm is stated to be only 71 mm., whereas I have never seen a fully adult *R. amplexicaudatus* with the forearm less than 77 mm. I prefer to leave open the question as to the validity of *R. minor*, until I have had an opportunity of examining the type.

*Range*.—Java.

*Type* in the Calcutta Museum.

### 8. *Rousettus brachyotis*, Dobs.

1877. *Cynonycteris brachyotis*, Dobson, P. Z. S. p. 116 (Duke of York Isl.).

Similar to *R. amplexicaudatus*, but smaller, with shorter and narrower ears;  $p^2$  deciduous; tooth-rows shorter. Forearm 70–75 mm.

*Range*.—Amboina, New Guinea, New Ireland, Solomon Isl.

*Type* in the British Museum.

### 9. *Rousettus celebensis*, sp. n.

*Diagnosis*.—Bony palate and all molariform teeth, above and below, unusually narrow. Fur longer and richer than in any of the foregoing species; notopatagium partly (or wholly) haired; general size small. Forearm 72·5–75 mm.

*Skull*.—General size as in *R. amplexicaudatus*; rostrum very low and slender; bony palate unusually narrow; width externally across  $m^2$ – $m^2$  9·7 mm. (two adults), against 10·2–11·8 in *amplexicaudatus* (ten adults).

*Teeth*.—Upper canine and  $p^3$  (middle premolar) widely

separated;  $p^2$  in the centre of the interspace between these two teeth, not deciduous; last premolar and molars above and below very narrow:  $m_1$  at least twice as long as broad;  $m^2$  small, less than half the size of  $m^1$ ;  $p_2$  in cross section three or four times the size of a lower incisor;  $m_2$  about half the length of  $m_1$ ;  $m_3$  subcircular in outline.

*Palate ridges.*—4 + 3 + 1.

*External structure.*—Ears essentially as in *R. amplexicaudatus*: narrow, not attenuated below the tip, the tip itself broadly rounded off; antitragal lobe small, rounded. General size of the animal as in *R. brachyotis* (thus smaller than *R. amplexicaudatus*), but digits proportionally considerably longer than in any other eastern species of the genus (index of pollex 392, of third digit 1646, against 335-41 (pollex) and 1529-41 (third digit) in all other eastern species). Tail long, probably about 20 mm. (only dried skins examined).

*Fur.*—Longer, richer, and more velvet than in *R. amplexicaudatus* and allied eastern species; notopatagium clothed with dense fur; hairing on forearms, tibiæ, interfemoral, and underside of plagiopatagium longer and richer; face more densely haired.

*Colour.*—Brighter than in *R. amplexicaudatus*. Back light Prout's brown, rump more inclining to mars-brown tinged with russet; sides of back and tibiæ next to membranes almost vandyke-brown; crown and occiput dark brown, approaching bister; nape of neck broccoli-brown; a tuft of glandular mummy-brown hairs on either side of the neck in both sexes; entire underside of body dark greyish drab.—Immature individuals are similar in colour to adults, but without the mummy-brown neck-tuft.

*Range.*—Celebes.

*Type.*—♀ ad., skin and skull. Mt. Masarang, Celebes, 3500'; Oct. 1895. Collected by Dr. Chas. Hose. Brit. Mus. no. 97. 1. 2. 8. Three specimens examined.

*Remarks.*—On hasty inspection this species, owing to its small size, can easily be (and has in fact repeatedly been) confused with *R. brachyotis*. The larger skull, very narrow palate, narrow molars, not deciduous  $p^2$ , much longer pollex (28-30 mm., against 24-26 in *brachyotis*), longer wings (chiefly owing to the longer metacarpals), much longer fur, haired notopatagium, and much more densely haired tibiæ readily distinguish it from *R. brachyotis*.

#### 10. *Rousettus angolensis*, Bocage.

1898. *Cynonycteris angolensis*, Bocage, Journ. Sci. Math. Lisboa, (2) v. pp. 133, 138, fig. (palate ridges) (Pungo Andonga, Cahata, Quibula).

Frontal region of skull between postorbital processes distinctly concave; premaxillaries co-ossified in front; molars as broad as (or broader than) in *R. Leachi*;  $p_2$  in cross section only equalling or slightly exceeding a lower incisor. Wings from back of second toe; second phalanx of fifth digit nearly always longer than first phalanx; antitragal lobe well developed; lower leg very short (29–31 mm.); fur long; notopatagium haired. Size smaller than in *R. Leachi*; forearm 77–83·5 mm.

*Range*.—Angola, north-westward to Cameroon and Togo, eastward through the Congo Basin to Ruwenzori and German East Africa.

*Cotypes* in the Lisbon and British Museums.

### 11. *Roussettus lanosus*, Thos.

1906. *Roussettus lanosus*, Thomas, Ann. & Mag. N. H. (7) xviii. p. 137 (Ruwenzori East).

Molars excessively narrow;  $p_2$  in cross section twice or three times the bulk of a lower incisor. Wings from back of second toe; second phalanx of fifth digit longer than first phalanx; antitragal lobe indistinct; lower leg not shorter than usual (39–40 mm.); fur long and coarse; notopatagium haired. Larger than *R. angolensis*: forearm 88·5–90 mm.

*Range*. Shoa; Ruwenzori East, 5000–13,000'.

*Type* in the British Museum.

### III. MYONYCTERIS, Matschie.

1899. *Myonycteris*, Matschie, Megachiroptera, pp. 61, 63. *M. collaris*. Type.

Basicranial axis only slightly deflected: alveolar line projected backward passing through middle of external auditory meatus. Tympanic not produced into a bony auditory meatus. Rostrum shortened, owing to enlargement of orbital cavity: front of orbit vertically above back of  $p^4$ . Premaxillaries in contact in front. Cutting-edges of lower incisors (when unworn) bifid.  $p^2$  in cross section subequal to an upper incisor.  $m^2$  and  $m_3$  rudimentary,  $m_2$  much reduced in size (from one fourth to somewhat less than half the bulk of  $m_1$ ). Palate ridges: 4 + 3 + ?. Size small: forearm 60–67 mm.

*Range*. Ethiopian.

Matschie's *Myonycteris*.—*Myonycteris* in its original sense (a subgenus of *Xantharpyia*; Matschie, l. s. c.) included two species, *M. torquata* (i. e. *collaris*; the type) and *M. angolensis*. But *angolensis* is a true *Roussettus*, whereas *collaris*, as being in skull and teeth more closely related to *Cynopterus*

than to *Rousettus*, but clearly different from both, must be kept in a separate genus. Matschie's definition of *Myonycteris* was, however, based not on the species selected by him as type of the subgenus, viz. *collaris*, but on *angolensis*; the diagnosis of the genus as given above is therefore entirely different from that published by Matschie.

### 1. *Myonycteris collaris*, Gray.

1870. *Cynopterus collaris*, Gray, Cat. Monk. &c. p. 123 ("W. Africa").

1878. *Cynonycteris torquata*, Dobson, Cat. Chir. B. M. p. 76, pl. v. fig. 1 (Angola).

1889. *Cynonycteris brachycephala*, Bocage, Journ. Sci. Math. Lisboa, (2) i. p. 197 (San Thomé).

Forearm 60–67 mm. Wings from back of first phalanx of second toe.

*Range*.—From the Congo Basin southward to Angola, north-westward to San Thomé, Liberia, and Sierra Leone.

*Type* in the British Museum.

Gray's *Cynopterus collaris*.—Type locality: "W. Africa"; the British Museum register for 1843 proves the specimen to have been obtained "near Congo." Gray's statement (*l. s. c.*) that the specimen is "young" is incorrect; his quotation of "Gray, List Mamm. B. M. (1843)," where the specimen is stated to have been registered under the name *Xantharpyia collaris*, does not refer to the printed text of that book, but to a hand-written addition by Gray in the British Museum copy of the book. Prior to 1870 "*collaris*" had not been used as a specific name in the genus *Cynopterus*; it is therefore valid, and antedates *Cynonycteris torquata*, Dobson.

Bocage's *Cynonycteris brachycephala*.—Type locality: S. Thomé, Gulf of Guinea; type in the Lisbon Museum. From the description ("la première prémolaire et la dernière molaire extrêmement petites aux deux mâchoires"; forearm 62 mm.) and the figure of the skull and teeth in palate view clearly a *M. collaris*.

### *General Remarks.*

*The Genera*.—*Rousettus* is allied to *Pterocyon*; the two genera probably represent diverging branches from one common stem. They accord in most of their important cranial, dental, and external characters; in both the basi-cranial axis is deflected to practically the same degree. In having the premaxillaries in contact or co-ossified (not separated), the tympanic not produced into a bony auditory meatus,  $m_1$  not lengthened, and  $m^2$  less reduced in size,

*The Species and their Technical Names in this Paper, as compared with Dobson's 'Catalogue' and Matschie's 'Megachiroptera.'*

Dobson, 1878.	This paper.	Matschie, 1899.
<i>Cynonycteris Dupreana</i> .....	<i>Pterocyon Dupreanus</i> .....	( <i>Pterocyon</i> ) <i>Dupreanus</i> .
" <i>straminea</i> .....	" <i>stramineus</i> .....	" <i>stramineus</i> , pt. ( <i>Leiponyx Büttikoferi</i> .)
" <i>collaris</i> .....	" <i>sabeus</i> .....	( <i>Pterocyon</i> ) <i>stramineus</i> , pt.
" <i>egyptiaca</i> .....	<i>Rousettus Leachi</i> .....	( <i>Xantharpyia</i> ) <i>collaris</i> , pt.
" <i>amplexicaudata</i> .....	" <i>egyptiacus</i> .....	" <i>egyptiaca</i> .
" <i>minor</i> .....	" <i>arabicus</i> .....	" <i>amplexicaudata</i> .
" <i>brachyotis</i> .....	" <i>Leschenaulti</i> .....	" <i>brachyotis</i> .
" <i>amplexicaudata</i> , pt. ....	" <i>seniudus</i> .....	( <i>Myonycteris</i> ) <i>angolensis</i> .
" <i>torquata</i> .....	" <i>amplexicaudatus</i> .....	" <i>torquata</i> .
" .....	" <i>minor</i> .....	" <i>brachyotis</i> .
" .....	" <i>brachyotis</i> .....	" <i>brachyotis</i> .
" .....	" <i>celebensis</i> .....	" <i>brachyotis</i> .
" .....	" <i>angolensis</i> .....	( <i>Myonycteris</i> ) <i>angolensis</i> .
" .....	" <i>lanosus</i> .	" <i>brachyotis</i> .
" .....	<i>Myonycteris collaris</i> .....	" <i>brachyotis</i> .
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*Rousettus* is more primitive than *Pterocyon*; but it is on a higher level in the rather shorter rostrum, and the more reduced  $p^2$ . The range of the genus *Rousettus* over the whole of the Ethiopian and Oriental regions, the close affinity of *R. arabicus* to the S. African *R. Leachi*, the absence of any representative of the genus from the whole of the Mediterranean subregion except Egypt, are evidence that its origin dates back to a time when, owing to different physiographic conditions, Africa and S. Asia were much more intimately connected than now. *Pterocyon* is a more specialized Ethiopian offshoot of the common prototype.

In its essential cranial and dental characters *Myonycteris* is intermediate between *Rousettus* and *Cynopterus*, though nearer to *Cynopterus*. In *Rousettus* the basicranial axis is very distinctly deflected; in *Myonycteris*, as in *Cynopterus*, it is nearly parallel to the alveolar border. In *Rousettus* the cranial rostrum has remained comparatively long, the anterior edge of the orbital cavity being vertically above the posterior half or middle of  $m^1$ ; in *Myonycteris* the rostrum is considerably shortened, chiefly owing to the fact that the anterior edge of the orbital cavity is pressed forward to a point vertically above the back of  $p^4$ ; in *Cynopterus* the rostrum is still shorter and stouter, the anteorbital rim pressed still a little farther forward, to a point above the middle of  $p^4$ . From a glance at the dental formula it would seem that *Myonycteris* (molars  $\frac{2}{3}$ ) is closely in accordance with *Rousettus* ( $\frac{2}{3}$ ), and essentially different from *Cynopterus* ( $\frac{1}{2}$ ), but in reality *Myonycteris* is also in its teeth nearer to *Cynopterus*; in *Rousettus*  $m^2$  is reduced in size, in *Myonycteris* quite rudimentary, in *Cynopterus* lost; in *Rousettus*  $m_2$  is normal,  $m_3$  small; in *Myonycteris*  $m_2$  is much reduced in size,  $m_3$  rudimentary; in *Cynopterus*  $m_2$  much reduced in size,  $m_3$  lost. In short, the cranial and dental peculiarities (non-deflection of brain-case, shortening of rostrum, reduction of posterior molars) which distinguish *Myonycteris* from *Rousettus* have been preserved, or carried still farther, in *Cynopterus*; if the skull of *Myonycteris* were known from a fossil state only, this bat would undoubtedly have been declared a "connecting-link" between *Rousettus* and *Cynopterus*. Also externally, in the form of the tip of the muzzle (vertical furrow between nostrils deep and narrow, inner margins of nostrils abruptly projecting), *Myonycteris* closely approximates *Cynopterus*.

*The Species.*—The three species of *Pterocyon* are closely interrelated. *Pt. Dupreanus*, from Madagascar, with its relatively longer rostrum and less modified fur-structure, is

apparently the least modified species. *Pt. sabæus*, from S.W. Arabia, is a small-skulled and broad-toothed representative of the African *Pt. helvus*.

The eleven known species of *Roussettus* are referable to five types:—(1) *R. Leachi*, *ægyptiacus*, and *arabicus*: rather heavily built species, with strong rostrum and teeth, the second phalanx of third digit lengthened, the pollex comparatively long; distributed over Africa generally, Cyprus, Palestine, Syria, and Arabia, as far east as Sind (Karachi); *R. ægyptiacus* is a larger-skulled modification of the *R. Leachi* type; *R. arabicus* is more closely related to the S. African *R. Leachi* than to *R. ægyptiacus*.—(2) *R. Leschenaulti*, *seminudus*, *amplexicaudatus*, *minor*, and *brachyotis*: very closely related to the species of the former group, but rather more delicately built, with slenderer rostrum, feebler teeth, the second phalanx of the third digit not lengthened, the pollex comparatively shorter; the members of this group are, probably, on the whole slightly less specialized than those of the former; *R. Leschenaulti* (continental S. Asia) and *seminudus* (Ceylon) come near to the S. African *R. Leachi* in the width of the interspace between *c* and  $p^3$ , the size and shape of  $m_3$ , the width of the ears, and the length of the tail; in the Indo-Malayan *R. amplexicaudatus* there is a tendency to a reduction of the diastema  $c-p^3$ ,  $m_3$  is smaller and more circular in outline, the ears narrower, the tail averaging longer, the general dimensions smaller; most of these characters find a climax in the Austro-Malayan *R. brachyotis*: diastema  $c-p^3$  still more reduced,  $p^2$  deciduous, ears still smaller, size smaller.—(3) *R. celebensis*: peculiarly narrow palate, narrow molars, longer and richer fur, small size, proportionally long wings; probably a modification of the *R. amplexicaudatus-brachyotis* type.—(4) *R. angolensis* (Togo, Cameroons, and Angola, to Ruwenzori), a peculiar species: skull and teeth differing in some details, fur long and dense, coloration richer than usual.—(5) *R. lanosus* (Shoa, Ruwenzori), the most aberrant species of the genus: molars excessively narrow, fur very long and dense.

From a more general point of view the first three of these groups (the members of which are certainly more closely related to each other than to those of groups 4 and 5) may be united into one section, giving a long chain of intimately connected forms from W. Africa to the Solomon Islands; *R. angolensis* and still more *R. lanosus* are aberrant representatives of this widely distributed type of bat.

LX.—Notes on the Quagga and Burchell's Zebra in the Paris Museum. By R. I. ПОЦОК, Superintendent of the Zoological Society's Gardens, London.

IN the 'Bulletin du Museum d'Histoire naturelle,' pp. 449-452 (1906), Dr. Trouessart has given an account, illustrated by two admirable photogravures, of a quagga and a Burchell's zebra preserved in the Paris Museum. The quagga especially proves to be a specimen of considerable systematic importance; and since Dr. Trouessart omits to mention one or two points of interest connected with it, and makes some statements which are contrary to fact, no apology is needed for supplementing his communication with the following comments.

In a paper\* on the Cape Colony quaggas, with which Dr. Trouessart does not appear to be acquainted, I pointed out that the two forms named respectively by Mr. Lydekker † *E. quagga Greyi* and *E. q. Lorenzi* resemble each other and differ from *E. q. quagga* and *E. q. Danielli* in having the stripes brown and the interspaces creamy yellow; and, further, that they may be distinguished from each other by certain characters, of which the width of the stripes on the neck is one. In *Lorenzi* the neck-stripes are exceedingly wide, the interspaces forming distinct but very narrow pale lines, whereas in *Greyi* the interspaces are relatively broad and the stripes correspondingly narrow.

So far as the width of the neck-stripes is concerned the Paris specimen is more like the type of *Lorenzi* than is any other recorded specimen. But the stripes are even wider ‡ and the intervening areas narrower than in the Vienna

\* Ann. & Mag. Nat. Hist. (7) xiv. pp. 313-328 (1904).

† 'Knowledge,' xxv. p. 221 (1902). Dr. Trouessart probably had no opportunity of consulting this paper.

‡ In his description of the Paris specimen Dr. Trouessart writes:—"Les bandes foncées du cou sont doubles par le bas, mais confluentes à leur partie supérieure, de telle sorte que la bande intercalaire blanche est très étroite." The photograph does not bear out this statement, for on the left side of the body the stripes, so far as can be seen, are in two cases confluent below and divided above and in two cases divided below and confluent above, the rest being entire. Such confluence is not unusual in the quagga races of *Equus*, with which I include the Burchelline zebras. In any case, the alleged confluence does not affect the total number of neck-stripes, which is approximately the same in the Paris and Vienna specimens, as well as in the type of *Greyi* and various kinds of zebras of the *Burchelli* type. It is, moreover, the increase in the width of the stripes, not their confluence, that causes the narrowness of the intervening pale area.

example. In the latter, as in the Paris example, the pale intervening areas are distinct upon the withers; but behind the withers in the Paris example they die out, the flanks being only indistinctly striped and the hind-quarters practically unstriped. In *Lorenzi*, on the other hand, the intervening spaces persist in such a manner as to leave no doubt that both in pattern and posterior extension the stripes were, to all intents and purposes, like those of typical Burchell's zebra (*E. quagga Burchelli*), the so-called "saddle" ("selle" of Trouessart), characteristic of that animal and the more northern forms related to it, being quite evident\*. Herein lies the chief difference between the Paris and Vienna specimens. To the type of *Greyi*, on the contrary, the Paris specimen shows a close resemblance in the obliteration of the stripes on the body and hind-quarters.

Further evidence of likeness between the three specimens above discussed, and especially between the Vienna and Paris animals, is supplied by Dr. Trouessart's statement that the latter has the appearance of a chestnut horse banded with white, the stripes being brown and the intervening areas whitish. In the typical quagga and *E. q. Danielli*, on the other hand, the stripes were black and the intervening areas chestnut.

It will be evident from what has been said that the Paris specimen is to a great extent intermediate in its characters between the types of *Lorenzi* and *Greyi*. This fact may be used as an argument in favour of the view held in 1904 by Mr. Lydekker †, that all the genuine quaggas belonged to a single species very variable in the degree of development of its stripes, but not resolvable into geographical races or subspecies; and also in support of the opinion, maintained by myself, that there were several local forms of this animal, the assumption of the probable existence of intermediates justifying the view that only a subspecific value should be assigned to the differences between them. Whatever conclusion be formed with regard to this matter, the chief interest of Dr. Trouessart's paper upon the Paris specimen lies in the fact that it has proved the former existence of a quagga

\* As I have already pointed out, the pattern of the stripes on the body and hind-quarters of the type of *Lorenzi* affords convincing evidence of the nearness of the affinity between this quagga and typical *Burchelli*. Dr. Lorenz also was forcibly struck by the similarity between the two animals in this respect. The resemblance between them makes it impossible to draw up a logical definition of "quaggas" as distinct from "Burchell's zebras."

† P. Z. S. 1904, i. pp. 426-431.

intermediate in coloration between two specimens that have been made the types of distinct subspecies, namely *Greyi* and *Lorenzi*.

In his account of the Burchell's zebra in the Paris Museum, Dr. Trouessart incidentally attempts to prove that the forms named *Burchelli* and *Chapmanni* are specifically distinct from each other. Under *Chapmanni* he includes the northern form described as *Böhmi* (= *Granti*) and presumably also *Selousi*, *Wahlbergi*, and *antiquorum*. It is of no great moment whether these forms be regarded as species or subspecies; but since a practically complete gradation in the disappearance of the stripes from the fetlocks upwards to the root of the tail can be traced from *Böhmi* and *Selousi* through *Chapmanni*, *Wahlbergi*, and *antiquorum* to the various types of *Burchelli* (*sensu stricto*), it is illogical to draw a line between *Burchelli* and *Wahlbergi*, classifying the latter with *Böhmi* and *Selousi* and letting the former stand alone.

The distinctions upon which Dr. Trouessart lays stress are the alleged absence of stripes upon the legs in *Burchelli* and the presence of only narrow, faint, and incomplete stripes upon the hind-quarters, beneath the last complete stripe that runs from the root of the tail to the groin ("aîne"). Contrasted with this are the strong complete stripes on the hind-quarters in *Chapmanni* and their extension at least as far as the hocks. It is quite true that typical *Chapmanni* may be distinguished from typical *Burchelli* by these and other characters; but the variation in the development and downward extension of the stripes over the quarters in individual specimens of *Burchelli* is very great. I have before me the photograph of a specimen that formerly lived in the London Zoological Gardens. In this there are only about two very faint and narrow stripes below the one that passes to the root of the tail. The example in the Bristol Museum\* is also very imperfectly striped below that line. This is also the case in an example that was living in the Amsterdam Zoological Gardens a year or two ago. Nevertheless the statement that there are no stripes on the legs in Burchell's zebra is not true. Stripes are quite commonly retained both on the knees and hocks; and by publishing the photograph of the *Burchelli* preserved in the Paris Museum, Dr. Trouessart has supplied additional and conclusive evidence of the occasional extension of transverse stripes—narrow and more or less broken up certainly—all over the hind-quarters down to the level of the junction of the

\* For fig. and description, see Pocock, P. Z. S. 1903, ii. p. 196, and Ann. & Mag. Nat. Hist. (6) xx. p. 41 (1897).

femur and the tibia. In the striping of this region, indeed, this specimen forcibly recalls the example of *Wahlbergi* in the Tring Museum, in which the stripes on the lower portion of the quarters are broken up into an irregular reticulated pattern\*. To maintain that the Tring specimen of *Wahlbergi* and the Paris specimen of *Burchelli* represent distinct species, and to hold at the same time that the former belongs to the same species as the types of *Selousi* and *Granti*, obscures the plainest facts of affinity as testified by likeness; and the adoption of Dr. Trouessart's view regarding the zebras in question, and the nomenclature it involves, renders abortive one of the primary purposes of systematic naming—that is to say, the expression of relationships, of which, in this case at least, resemblances are the sole criteria.

Touching the affinity between so-called "zebras" and "quaggas," Dr. Trouessart remarks that Burchell's zebra approaches the quagga in pattern more than it approaches its allies, the other zebras. The truth of this statement can scarcely be admitted, for the likeness between *Burchelli* and *Wahlbergi* is, on the whole, greater than the likeness between *Burchelli* and the most "zebra"-like of all the "quaggas," namely *Lorenzi*. Nevertheless it is gratifying to welcome an adherent of the view that the differences between "Burchell's zebra" and "quaggas" are practically equivalent to the differences between Burchell's zebra and other zebras of the same type, such as Chapman's. Dr. Trouessart, however, does not admit specific identity between quaggas and Burchell's zebras, for the alleged reason that the ground-colour of the latter is white or clear grey without mixture of red or yellow. It is difficult to find justification for this argument, since Dr. Trouessart himself describes the ground-colour of the quagga in the Paris Museum as white. Moreover, the tint of the ground-colour is not a specific character in this group of Equidæ; and it is not true that it is always white in *Burchelli*, as the literature on the subject conclusively proves. For instance, although Gray described the type specimen as white between the stripes, I pointed out ten years ago that in the specimen in the Bristol Museum the ground-colour on the body and hind-quarters is "dark ruddy greyish brown"; and in a stuffed specimen in the British Museum the interspaces are heavily washed with yellowish brown †. The same variability in tint is shown in Chapman's

\* See Ann. & Mag. Nat. Hist. (6) xx. p. 45 (1897).

† In this specimen the stripes on the hind-quarters extend right down to the level of the femoro-tibial joint and are more complete and distinct than in the Paris example.

zebras. In the case of two specimens living last year in the Zoological Gardens in London, the interspaces of one were white, of the other ochre-yellow. Lastly, as has already been stated in this and other papers, the ground-colour in "quaggas" proper is either chestnut or creamy white. Hence the reasons advanced by Dr. Trouessart for separating Burchell's zebra specifically from quaggas have no foundation in fact.

LXI. — *New Mammals from Lake Chad and the Congo, mostly from the Collections made during the Alexander-Gosling Expedition.* By OLDFIELD THOMAS, F.R.S., and R. C. WROUGHTON.

THE following descriptions of two new forms of dassie were, by oversight, omitted from our paper in last month's issue of this Magazine (p. 370).

*Procavia Lopesi*, sp. n.

A large dassie of the hypsodont group with a buff dorsal spot.

Size about as in *Mackinderi*; fur short (20 mm.) and harsh as compared with that of *Mackinderi* (40 mm.) or even of *Jacksoni* (30 mm.); general colour above near "raw umber" of Ridgway, resulting from a mixture of black and buff; under surface dark buffy, the hairs greyish at base. Under-fur of back slate-grey at base, dirty white terminally; hairs of outer fur either wholly black, or black with pale buff tips.

Face grizzled black and white or buffy, the dark patch on the vertex really black, otherwise the usual colour-pattern of the genus; the dorsal spot comparatively broad, its hairs bright buff from base to tip.

Skull large as in *Mackinderi*, much larger than in *Jacksoni*, width of frontals much less than in the former, nasals narrow as in *Jacksoni*, quite different from the broad nasals of *Mackinderi*.

Dimensions of the type (those of the body taken in the flesh):—

Head and body 560 mm.; hind foot 70; ear 35.

Skull (Stage VIII.): greatest length 100; basilar length 90; greatest breadth 57; greatest breadth of frontals 39; anterior breadth of frontals 22; anterior breadth of nasals

9.5; length of nasal suture 26; length of upper molar series 43; greatest breadth of  $m^1$  8.

*Hab.* Kodja Hill, Gaima Range; River Kibali, Monbuttu.

*Type.* Adult female. Original no. 105. Collected by Mr. Boyd Alexander, 18th July, 1906. (Two specimens examined.)

The present species is easily distinguishable from either of its neighbours *Mackinderi* and *Jacksoni* by its very short fur and black vertex. In skull-characters it resembles *Jacksoni* in its long narrow nasals, but differs in its greater size and stouter teeth; from *Mackinderi*, with which it agrees closely in size, it is at once distinguishable by its shorter fur, narrow nasals, and slightly larger teeth.

We have much pleasure in dedicating this species to José Lopes, who followed Mr. Alexander so pluckily throughout his long and arduous journey.

*Procavia sharica*, sp. n.

A hypsodont dassie of medium size with a linear orange dorsal spot.

Size approximately as in the Nigerian *Goslingi*; fur short (15 mm.) and harsh as compared with that of *Goslingi*; general colour above near "hair-brown," resulting from a mixture of black and "wood-brown"; hairs of under surface buffy to their bases; under-fur of back wood-brown with dark brown bases; the hairs of outer fur black with pale buffy tips. Face grizzled black and white; crown dark (near "seal-brown"), the dark area extending on to the nape; conspicuous patches of "pinkish buff" behind the ears. Dorsal spot long (50 mm.), narrow (6-7 mm.), its hairs "ochraceous buff" from base to tip.

Skull narrower for its size than in *Goslingi*, larger in all ways than that of the Soudanese *ruficeps* at the same stage; nasals about the same length as in *Goslingi* and *ruficeps*, but narrowing sharply anteriorly, very markedly more so than in either of the other species.

Dimensions of type (those of body taken in the flesh):—

Head and body 456 mm.; hind foot 70; ear 28.

Skull (Stage VI.): greatest length 85; basilar length 73; greatest breadth 47; greatest breadth of frontals 35; anterior breadth of frontals 20; anterior breadth of nasals 8; length of nasal suture 20; length of upper molar series ( $p^1$  to  $m^2$ ) 32; greatest breadth of  $m^1$  6.5.

*Hab.* Kajibu, Shari River.

*Type.* Young male. Original no. 45. Collected by  
*Ann. & Mag. N. Hist.* Ser. 7. Vol. xix. 36

Capt. G. B. Gosling on 14th July, 1905. (Four specimens examined.)

The specimens collected by Capt. Gosling are very uniform in their characters. The two nearest neighbours of *sharica* are *Goslingi* and *ruficeps*. The duller colouring and harsh fur of *sharica* serve to distinguish it easily from *Goslingi*, while its colour separates it at once from the pale, white-bellied *ruficeps*. In skull-characters the sudden narrowing anteriorly of the nasals of *sharica* differentiates it from both of the others.

LXII.—On Two Spiders of the Genus *Selenocosmia*.  
By A. S. HIRST.

*Selenocosmia Stalkeri*, sp. n.

♀.—*Colour*. Cephalothorax and legs a light brown; sternum and lower surface of coxæ of legs, together with the dorsal surface of the patellæ of the posterior legs, darker in colour.

*Ocular tubercle* a little more than twice as long as broad; the lateral part low, the central part higher.

*Eyes*. Front row of eyes procurved; anterior median eyes a little larger than the anterior laterals and separated from them by a diameter (of a median eye), the space between the median eyes being a little more than a diameter. Posterior median eyes small and placed a little in front of the posterior laterals, from which they are separated by a short interval.

*Cephalothorax*. Length of cephalothorax much greater than the breadth and exceeding the length of the tibia and patella of the first and fourth leg. Fovea less strongly procurved than is the case in *S. Stirlingi* and of rather small extent.

*Sternum* elongate in shape; posterior sigilla situated in the anterior two thirds of it and distant a little less than a third of the width from the lateral margins.

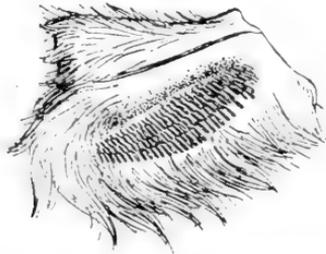
*Legs*. First pair of legs measuring a little less than three times the length of the cephalothorax. Tibia and patella of the first and fourth pairs equal in length. Tibia of fourth pair much shorter than the metatarsus.

*Stridulating-bacilla* of maxillipalp forming a narrow and elongate patch, which is convex below and runs along the

greater part of the length of the anterior surface of the coxa, the bacilla being arranged in comparatively few rows (fig. 1).

*Measurements in mm.* Length of cephalothorax 20·5, of sternum 9, of mandibles 11, of first leg 58, of second leg 51, of third leg 47·5, of fourth leg 60·5, of stridulating-area of maxilla 5·5; breadth of cephalothorax (at the middle) 16·5; breadth of cephalothorax (anterior edge) 11·75; breadth of sternum 7, of mandible 5; greatest breadth of stridulating-area 1·5.

Fig. 1.



Anterior surface of the coxa of the maxilla of *Selenocosmia Stalkeri*.

*Hab.* A single female specimen was collected by Mr. W. Stalker at Alexandria, Northern Territory of South Australia, during the month of December 1905. The specimen was presented to the British Museum by Sir William Ingram and the Hon. John Forest.

Collector's note:—"Hole driven in very hard ground; about 1 foot in depth and slightly chambered."

*Remarks.* This new form differs from *S. Stirlingi* in that the posterior sigilla are further removed from the posterior margin of the sternum and that the fovea of the cephalothorax is less strongly procurved. It also differs from that species in the shortness of the hair which clothes the legs and in the relative size and position of the eyes. The structure of the stridulating-area also affords a character of some importance. *S. Stalkeri* differs from *S. vulpina* chiefly in the characters presented by the eyes and in the bacilla of the stridulating-area being stouter, and from *S. crassipes*, *S. strenuus*, and *S. validus* apparently in the relative length of the legs.

*Selenocosmia himalayana*, Pocock.

*Colour.* Cephalothorax greyish brown; body and legs black; dorsal surface of coxæ and trochanters of the legs, together with their patellæ, white or greyish white and tinged with yellow; abdomen dorsally greyish brown or dark in colour.

♂.—*Cephalothorax* of less length than the patella and tibia of the fourth leg.

*Legs.* Patella and tibia of first leg a little longer than the corresponding segments of the fourth, the difference being due to the slightly greater length of the patella of the first leg. Metatarsus of fourth leg greatly exceeding the tibia in length.

*Palpal organ* (fig. 2) provided with an obtuse projection or lobe, which is situated on the outer side at the junction of the elongate portion of the organ with the bulb.

Fig. 2.



External view of palpal organ of *Selenocosmia himalayana*.

*Measurements in mm.* Length of carapace 20, of tibia and patella of first leg 24, of tibia and patella of fourth leg 22, of metatarsus of fourth leg 18; greatest breadth of cephalothorax 16.

♀.—*Cephalothorax* equal in length to the patella and tibia of the fourth leg.

*Legs.* Patella and tibia of the first leg a little shorter than the patella and tibia of the fourth. Metatarsus of fourth leg exceeding the tibia in length.

*Measurements in mm.* Length of cephalothorax 18, of tibia and patella of first leg 17, of tibia and patella of fourth leg 18; total length (mandibles incl.) 39; greatest breadth of cephalothorax 25.

*Hab.* A single adult male from Kasauli, Simla, 6600 feet (July 1905), and a single adult female from Dalhousie, N.W. Himalayas, 6000 feet. The specimens were collected by Col. Barrow.

*Remarks.* The acquisition of fully grown specimens of both sexes by the British Museum has enabled me to supplement the description\* of this handsome species, which was hitherto known from a single small-sized specimen.

\* Pocock, Journ. Bomb. N. H. Soc. xii. p. 746 (1899), and Faun. Brit. Ind., Arachn. p. 200 (1900).

LXIII.—*Brachiopod Nomenclature: the Genotype of Terebratula*. By S. S. BUCKMAN, F.G.S.

[Plate XII.]

To which author must the generic term *Terebratula* be ascribed, what species is the type of the genus, and to what formation does it belong? These are the questions which it is proposed to answer in the following communication. What opinions are held at present may be shown by citing a few noted authorities.

Davidson \* says "*Terebratula*, Llhwyd, 1696, type *T. vitrea* Linn. sp."; but he states further that Llhwyd's species *Terebratula minor subrubra* is *Terebratula maxillata*. In the Appendix issued in 1856, p. 16, he speaks of *Terebratula maxillata*, Sow., as being "the fossil type" of *Terebratula*.

Dall, in his Index †, writes "*Terebratula* O. F. Müller 1776 . . . . Müller cannot be said to have settled the type. *T. vitrea*, Lam., and *T. perovalis*, Sow., are generally accepted as the types of the genus."

H. Douvillé, 'Genres de Brachiopodes,' says ‡:—"TEREBRATULA, Klein, 1753. Espèce type: *Terebratula terebratula*, Linné sp. Ce genre a été fondé par Klein pour les *Concha anomia* de Fabio Colonna; Klein reproduit une des figures de cet auteur représentant une Térébratule fossile du groupe des *Biplicatae*, très-voisine de la *T. ampulla* du Pliocène d'Italie. C'est cette figure, à laquelle Linné a appliqué le nom *spécifique* de *Terebratula*, que nous prendrons pour type du genre."

He reproduces Colonna's figure and names it "*Terebratula terebratula*, Linné sp."

Hall and Clarke, in their 'Introduction to Brachiopoda,' state §:—" *Terebratula*, Klein, 1753. . . . It is inferred that the species [Linné's *Anomia terebratula*] is a fossil from the Mesozoic or Tertiary formations, though its geological horizon is not more precisely known." They reproduce Colonna-Klein's figure and give it the name "*Terebratula simplex*, Klein" ||.

Schuchert, in his 'Brachiopoda' ¶, says concisely:—

\* 'Classification of the Brachiopoda,' Monograph, vol. i. part 1, p. 62 (Pal. Soc.) (1854).

† Bull. U.S. Nat. Mus. viii. 1877, p. 70.

‡ Bull. Soc. Géol. France, (3) vii. p. 264 (1880).

§ Thirteenth Ann. Report State Geologist for 1893, vol. ii. p. 875 (1894).

|| See note below, p. 530.

¶ Text-book Pal., Zittel, transl. Eastman, vol. i. p. 329 (1900).

"*Terebratula*, Klein, 1753. Genus not well known, Mesozoic or Tertiary"; and he appends a figure labelled "*Terebratula Phillipsi*, Morris."

These extracts show current opinion; but all except Dall ascribe the name to pre-Linnean authorities, which is contrary to present custom. If a pre-Linnean authority were to be taken, it would not be Klein, but Llhwyd, who was the true originator of the term\*. However, modern nomenclature begins with Linné†, and as he did not use the term *Terebratula* in a generic sense, it is necessary to take the first post-Linnean authority. The following is the result of an investigation into the practice of early post-Linnean users of the term:—

1776. O. F. MULLER, Zool. Dan. Prod. p. 249.

This is the first post-Linnean use of the term *Terebratula* ‡. He mentions three species, the first of which is *Terebratula cranium* §, of which he says:—"Hæc Terebratula auctorum, an vero Linnæi? Valvulas enim nec bi- nec triplicatas invenio." It is evident that Muller employs *Terebratula* as an accepted term in general use, and is not defining it or giving a type, though he indicates that what Linnæus called *Anomia terebratula* is a basis of reference.

1776. JOHANN SAMUEL SCHRÖTER, Journ. des Steinreichs und d. Konch. vol. iii. pp. 372 et seqq.

He speaks of species as belonging to the *Terebratulas acunosas* (p. 374), but he does not give binomial names.

1777. JOHANN SAMUEL SCHRÖTER, Abh. über versch. Gegenstände der Naturgeschichte, 20th part, p. 358.

Separates *Terebratula* from *Anomia* and defines it "Das mag also eine Terebratul seyn eine zweischalige umgleichshalige Muschel die eine durchbohrten Schnabel hat."

1785. THUNBERG, Disputationes, vi. p. 99.

He gives a definition of *Terebratula*, and mentions *T. pectinata* first and *Terebratula terebratula* sixth. For him *Terebratula* includes all Brachiopods except *Crania*.

\* 1696. Lith. Brit. Iconogr.

† 1758. Linné, Systema Nat. ed. x.

‡ My authority for this statement is Mr. C. D. Sherborn's excellent 'Index Animalium.'

§ That he places *T. cranium* first is a mere chance, and of no value as indicating the type.

1788. A. J. RETZIUS, Diss. Nov. Test. Gen. p. 13.

Gives a definition of *Terebratula*. Places therein first *Tereb. caput-serpentis*, and fourth *Tereb. plicata*, to which he gives as a reference *Anomia terebratula*, Linné, though evidently a mistaken definition. On p. 13 he speaks of *Terebratulas Linneanas*, and how they differ from *Anomia*.

1792. BRUGUIÈRE, "Sur deux Nouv. Esp. de Térébratules fossiles," Journ. d'Histoire Nat. i. p. 419.

Bruguière describes, with figures, two species—*Terebratula cor* and *Terebr. pileus*—which now belong to the genus *Antinomia*, Catullo\*.

1793. A. MODEER, Vetens. Acad. Nya Handl. p. 180.

He defines *Terebratula*, but gives no type.

1798. CUVIER, C., Tableau Élémentaire, p. 434.

The first species which he cites under *Terebratula* is the recent species *T. vitrea*, but he gives as a synonym of this *Anomia terebratula*, Lin. He does not fix any type.

1798. J. F. BOLTEN, Mus. boltenianum, p. 192.

Catalogues certain recent Terebratuloids under the genus "*Anomia*, Die Terebratel," and removes *Anomia ephippium* into a genus *Fenestella*.

1799. LAMARCK, "Prodr. Nouv. Classif. Coq.," Mém. Soc. d'Hist. Nat. Paris, p. 89, *Terebratula*.

He gives a description and places "*Anomia terebratula*, Lin.," as type.

There is no necessity to pursue this part of the subject further. Muller, it may be said, has given us an indication that he would regard a plicate *Terebratula* like the *Anomia terebratula*, Linné, as the typical form, and he is doubtful if *T. cranium* is a (or the) *Terebratula*, because it is not plicate. Then Thunberg definitely includes *Terebratula terebratula* among his species of the genus, and, according to the accepted zoological rule, when no selection has been made a species with the trivial name the same as the generic becomes type of the genus. Fortunately the person who first made definite

\* S. Buckman, "Brachiopod Homöomorphy," Quart. Journ. Geol. Soc. lxii. p. 433 (1906).

selection—Lamarck—complied with this rule. He chose *Anomia terebratula*, Lin., to be the type; thus he may be said to have confirmed Muller and Thunberg. So we may write

Genus TEREBRATULA, Muller, 1776.

Genotype *Anomia terebratula*, Linné.

Syn. *Terebratula*, Klein, pre-Linnean.

Non *Terebratula*, Llhwyd, pre-Linnean, which = *Epithyris*, Phillips\*.

It is now necessary to identify *Terebratula terebratula* (Linné). That author describes and cites figures for his species, thus:—"A. testa obovata lævi convexa; valvula altera triplicata, altera biplicata.—Column. purp. 22 f. 1. List. angl. 240 t. 8. f. 46. Klein ostr. t. 11. f. 74."

Of these figures the first and third refer to the same shell, for Colonna used the same woodcut in various places, and Klein copied it. But Lister's figure represents a very different species: it is not plicate, and therefore it does not agree with Linné's description †. As the Colonna-Klein figure does, that must be taken as the holotype, which, in fact, has been the usual practice.

In 1819 Valenciennes ‡ gave the name *Terebratula Kleini* to a species, citing Klein's figures, and quoting as a synonym *Anomia terebratula*, Linné. In 1850 Davidson § said that the name *Tereb. Kleini* covered a well-known Bajocian fossil of Normandy (it is from the Malière), and he figured, in support of his opinion, a specimen so labelled in the Lamarck collection.

In 1856 S. Hanley identified Linné's *Anomia terebratula* as *Terebr. perovalis*, Sowerby ||.

In 1864 Deslongchamps followed Davidson's line, making *T. Kleini*, Davidson (? Lamarck), a variety of *Terebratula perovalis* ¶.

Though Lamarck may have thought that the Bajocian fossil was the same as Klein had figured, and so may have ticketed it *T. Kleini* in his collection, yet it is not the holotype of *T. Kleini*: the specimen figured by Klein

\* Ann. & Mag. Nat. Hist. ser. 7, vol. xviii. 1906, p. 322.

† Lister's smooth non-plicate Terebratulid is from near Grantham, probably therefore from Middle Lias, and it has much the aspect of one of the *T. punctata* series.

‡ In Lamarck's Anim. sans Vert. p. 252.

§ Ann. & Mag. Nat. Hist. (2) v. 1850, pl. xiii. fig. 33.

|| Ipsa Linnæi Conchylia.

¶ Pal. franç. Terr. jur. Brach. p. 197.

from Colonna must be that. And I find it impossible to think that the Bajocian fossil and Colonna's represent the same species. Both are biplicate, but there the similarity ends.

This Bajocian fossil is peculiar to Normandy; but Colonna figured an Italian shell—he tells that it was found “in Civitate Andriæ.” Now there are in the Tertiary (Pliocene) beds of Italy various species which are much more like Colonna's figure; and there is in the British Museum, Nat. Hist., no. 83458, a specimen from the Tertiary of Monte Mario, near Rome, which might almost be the original drawn by Colonna, so like is it to his figure. This specimen is represented in the delineations given in Plate XII.

Colonna's figure differs from the *Terebratula Kleini* of the Bajocian of Normandy in having the plications more nearly equal, running further up the valves, and in being much more plicate for its smaller size. In the Bajocian shell the frontal fold is much elevated, somewhat after the *T. sella* fashion, and the dorsal sulcus is inconspicuously developed.

Colonna's shell is distinguished from *Terebr. perovalis*, Sow., by having much more pronounced plications, extending much further up the valves. Again, it is distinguished from *Terebr. Phillipsi*, Morris, by lacking the very pronounced angular plications, by lacking the pronounced posterior acumination, and by having an incurved beak: in *T. Phillipsi* the beak is not incurved, it projects straight posteriorly.

There is one Mesozoic species to which Colonna's figure has rather more resemblance than to those mentioned above. This is *T. Stephani*, Dav.; but its folds are not so strong, do not extend so far back, and the shell is less elongate in shape.

The conclusion arrived at is that *Terebratula terebratula*—that is, Colonna's shell—is not a Mesozoic species; but it is a Tertiary fossil, closely allied to species which have been called *Terebr. bisinuata*, Lamarck, *T. sinuosa*, Brocchi, *T. ampulla*, Brocchi, and even to *T. grandis*, Blumenbach. These species may be said to belong to *Terebratula*, sensu stricto; but it may be doubted if any Mesozoic species would belong to the genus in this very limited sense.

The conclusions now arrived at confirm the results of H. Douvillé's investigations—that *Anomia terebratula*, Linné, is the genotype of *Terebratula*, that the species is a Pliocene shell near to *T. ampulla*; but they differ in the small detail that the name *Terebratula* must be ascribed to Muller, 1776, and not to Klein, 1753.

My application of the name differs from Douvillé's. He would keep *Terebratula* for the biplicate species (p. 265),

but I would restrict *Terebratula* to the species in actual genetic connexion with *T. terebratula* = ? *T. bisinuata*. The forerunners of such species would be non-plicate, perhaps uniplicate, before becoming biplicate. Biplicate Terebratulids are polygenetic descendants from many non-plicate forms: sometime they must be separated from *Terebratula* into their special genetic series.

For a series of Cretaceous biplicate Terebratulids, which will no doubt prove to be separable enough from the Tertiary series, the name *Musculus*, Quenstedt, seems to be available.

#### Genus MUSCULUS, Quenstedt, 1868.

Type *Terebratula acuta*, Quenstedt.

Ref. Petref. Deutschl. ii. pp. 4, 27, 384, pl. xlvi. fig. 70.

For a Jurassic biplicate series, the *T. maxillata* group, very separable from other Terebratulids, the name *Epithyris*, Phillips, is available\*.

My best thanks are due to Mr. B. B. Woodward, F.L.S., and to Mr. C. Davies Sherborn, F.G.S., for invaluable bibliographic assistance in connexion with the investigations for this communication; also to Mr. W. D. Lang, F.G.S., for kind answers to various enquiries.

Appended are a few of the synonyms by which *Terebratula terebratula* has been known; these names have been attached to the figures of Colonna or Klein, or else to the description by Linné.

#### *Terebratula terebratula* (Linné).

1616. *Concha varior anomia*, &c., Colonna.

1753. *Terebratula rugosa*, Klein †.

1758. *Anomia terebratula*, Linné.

1785. *Terebratula terebratula*; Thunberg.

1787. *Lampas terebratula*; Meuschen, Mus. Geversianum, p. 438.

1788. *Terebratula plicata*, Retzius.

\* See above, p. 528.

† Klein's statement is "*Terebratula* . . . § 427 species 1. *simplex*; & *rugosa*, Fab. Columnæ de Purp. Cap. xii. § 3, pag. 32 . . . . Icon exstat in Tab. Nostra xi. No. 74." *Terebratula rugosa* seems therefore to designate the biplicate shell figured by Colonna, § 3, p. 32, and reproduced by Klein; *Terebratula simplex* may have been intended to designate the non-plicate *Terebratula* figured by Colonna in p. 33, § 5.

1797. *Lampas columbina*, Humphreys, Mus. Caloneanum, p. 45.  
 1798. *Terebratula vitrea*; Cuvier.  
 1799. *Terebratula terebratula*; Lamarek.  
 1819. *Terebratula Kleinii*, Lamarek.  
 1856. *Terebratula perovalis*; Hanley, *vide* Dall.  
 1880. *Terebratula terebratula*; Douvillé.  
 1894. *Terebratula simplex*; Hall & Clarke.

EXPLANATION OF PLATE XII.

*Terebratula terebratula* (Linné).

*a*, drawn as seen; *b*, *c*, restored outlines.

LXIV.—*Descriptions and Records of Bees.*—XIV.

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

*Crocisa Wellmani*, sp. n.

♀.—Length 14 mm. or slightly more.

Black with bluish-white hair-markings. Anterior wings very dark fuliginous, with a pair of suffused hyaline spots just beyond the third submarginal cell. Face densely white-haired; clypeus very densely finely punctured; antennæ dark; pleura with the upper half covered with bluish-white hair, the lower half apparently nude, but with scanty black hair, and with very strong well-separated punctures; pattern of thorax above simulating a face, with a median nose-like band, a pair of spots for eyes, and a transverse mark on each side anteriorly like a moustache, all strongly defined, the appearance being further aided by a stripe on each side, curving inwards posteriorly, which outlines the head and suggests hair; margin of scutellum of the -type, with a conspicuous round spot of hair on each extreme side, but no median spot; a white fringe from underneath the middle; anterior tibiæ white-haired on outer side, middle and hind tibiæ with somewhat more than the basal half white-haired on outer side; basitarsi with a good deal of white hair; first abdominal segment with a pair of large U-like lateral marks, placed laterally and not joined basally; the broad bands on the other segments also broadly interrupted, that on the second with a pointed projection anteriorly near the side of the segment; apical plate narrow; last ventral segment produced; fifth ventral not keeled.

In Friese's table (*Verh. zool.-bot. Gesell. Wien*, 1905, p. 174) this runs to *C. arcuata*, Vachal, but that species is

somewhat larger, and has the basal band of the abdomen entire. The scutellum brownish-haired (which is not at all the case in ours), with its spots decidedly blue.

*Hab.* Portuguese West Africa. Long. E. 15° 05', lat. S. 12° 44', alt. 1360 metres above sea-level, at flowers of *Æolanthus*, Dec. 1906 (middle of rainy season); collected by Dr. F. Creighton Wellman. At the same flowers Dr. Wellman also took a small (hardly over 8 mm. long) ♀ of *C. meripes*, Vachal.

*Anthophora quadrifasciata* (Villers), ♀.

Same locality as *Crocisa Wellmani*. Dr. Wellman notes: "Stands motionless in the air like a bot-fly. Taken near a flowering *Convolvulus*, but not actually seen in the flowers. Its hum suggests a bottle fly."

*Anthophora convolvuli*, sp. n.

♀.—Length about 12 mm.

With mainly fulvous hair; superficially looking exactly like *A. vestita*, Smith, but differing as follows:—labrum yellow (as in *A. capensis*, Friese), with a dark spot at each basal corner; mandibles yellow with the apex dark; clypeus with narrow anterior margin and a narrow median band yellow; a small supraclypeal mark; hair of thorax yellower; hair on middle and hind basitarsi, except a tuft posteriorly, black. The tegulæ are clear red, and the hind margins of the fulvous-haired abdominal segments, as in *vestita*, appear pallid.

Collected by Dr. Wellman in the same locality as *Crocisa Wellmani*, in Dec. 1906, at flowers of *Convolvulus*.

*Apis nigritarum*, Lepel.

Dr. Wellman sent numerous workers from the same locality as the *Crocisa*, &c., taken at various flowers, chiefly Leguminosæ.

*Agapostemon coloradensis*, Crawford.

The male, not hitherto described, was found by Mr. S. A. Rohwer on the campus of the University of Colorado, at Boulder, Oct. 3, 1906. It has the head and mesothorax above blue, exactly as in *A. californicus*, but it is a larger insect, and the yellow band on the clypeus sends upwards a little projection in the middle. Abdomen with five yellow bands, the first with a pair of black spots in the middle;

last ventral segment not keeled; trochanters black, the hind ones with a yellow spot; hind tibiae yellow, with a small black mark in front and a larger one behind.

*Augochlora viridula*, Smith.

This insect has two forms, one golden-green, the other blue-green. Mr. N. Banks has taken females of both at Falls Church, Virginia: the golden-green at flowers of *Ceanothus* in June; the blue-green on the 2nd of August, flower not stated. Mr. C. Robertson has sent me the blue-green from Southern Illinois. *A. viridula* was founded on a male of the golden-green form; *A. lucidula*, Smith, on females of both. I have some suspicion, though I cannot produce any proof, that the two forms are distinct, but very closely allied species; if this is the case, it may be permissible to retain the name *lucidula* for the blue-green one.

*Augochlora Banksiella*, sp. n. (*pura*, subsp.?).

♀.—Length 7-7½ mm.

Brilliant green, the abdomen golden green, the head and thorax also with a golden lustre—no blue or purple; mandibles with a green basal spot; antennæ dark, flagellum obscure brown beneath; orbital margins strongly converging below; tegulae fusco-ferruginous with a green spot. Wings greyish; stigma and nervures testaceous; first r. n. joining second t.-c., second s.m. almost as broad as high, marginal cell appendiculate; area of metathorax with fine but strong striæ. Legs piceous, anterior and middle femora green on under side; hind spur simple, curved; dorsal surface of abdomen nude, not hairy, or rather with exceedingly scanty short pubescence; no vibrissæ; hind margins of segments exceedingly narrowly black.

Very closely related in all respects to *A. pura*, Say (*Robertsoni*, Ckll.), but readily distinguished by the strong golden tints and the usually larger area of metathorax. It is perhaps a subspecies of *A. pura*. The male has the tarsi ferruginous.

*Hab.* Glencarlyn, Virginia, May 4-July 20; one, June 21, from flowers of *Ceanothus*; Great Falls, Virginia, April 20; Odenton, Maryland, July 18. All collected by Mr. Nathan Banks.

The genuine *A. pura* I have from Ithaca, New York (*Banks*) and Illinois (*Robertson*). In identifying the latter I follow Robertson, but Say's original description could be applied to either form, perhaps agreeing a little better with

*Banksiella*. Apparently Say did not separate the two or three allied species of the *pura* type, and as he doubtless included the insect which Robertson calls *pura*, this application of the name may be allowed to stand.

*Augochlora azteca*, sp. n.

♀.—Belongs to group Oxystoglossi, with the hind spur not pectinate. Length about 7 mm.; anterior wing about 5.

Golden green, middle of second abdominal segment stained with coppery red; mandibles ferruginous, darker at base and apex; tubercle of labrum simple, truncate; face broad, orbits very strongly emarginate, and strongly converging below; clypeus with strong rather close punctures, and its anterior edge broadly black; flagellum dull ferruginous beneath; mesothorax and scutellum brilliantly coloured, appearing granular from extremely minute and close punctures; hind part of scutellum with some fuscous hairs; area of metathorax with fine longitudinal ridges, except the middle subapical part, which has finer transverse striæ; tegulæ ferruginous with pallid margins. Wings dusky, somewhat reddish; stigma and nervures testaceous; first r. n. meeting second t.-c. Legs black, with the knees, the tarsi, and the anterior tibiæ (except a cloud behind) ferruginous, the anterior femora green beneath. Abdomen with the hind margins of the first two segments more or less piceous, though very narrowly; no marginal vibrissæ, but the lower edge of the dark base of the second and third segments, which slides under the segment before, is very finely and regularly ciliate; venter piceous, with a subapical ferruginous stain. The ventral surface of the abdomen, as well as the hind legs, carries much pale yellow pollen.

In my table in 'Canadian Entomologist,' 1897, p. 4, this runs nearest to *A. labrosa*, Say, and *A. aurifera*, Ckll., but it is readily separable from both by the colour of the legs. In Schrottky's table of Brazilian species it runs near *A. urania*, Sm., but that is smaller, with a blue-green abdomen.

*Hab.* Tlacotalpam, Vera Cruz, Mexico, April 21 (*C. H. T. Townsend*). At the same place, on the same day, Professor Townsend took *Megachile candida*, Smith, ♀.

*Augochlora cordiæfloris*, sp. n.

♀.—Belongs to Oxystoglossi, but with stature of a *Chloralictus*; length about 6 mm.

Head and thorax brilliant green; abdomen with the first

segment brassy green, the hind margin broadly black; second and third segments similar, but not so green, and the margin redder; fourth segment hardly green at all; apex black, with short dark hairs; bases, which slide under the segments before, strongly reddish; venter rufo-piceous; mandibles ferruginous with dark tips; labrum ferruginous, with a small tubercle; clypeus strongly punctured, its anterior edge broadly dark; eyes strongly emarginate; flagellum ferruginous beneath, except at base; mesothorax and scutellum very finely and closely punctured, the colour of the scutellum especially brilliant; area of metathorax plicatulate basally; tegulae dark reddish with hyaline margins. Wings scarcely dusky; stigma and nervures testaceous; first r. n. meeting second t.-c. Legs bright ferruginous, the anterior and middle femora infuscated, the anterior ones even slightly metallic; coxae dark, the anterior ones metallic; abdomen with a fine pruinose pubescence.

Easily known by the small size, red legs, and comparatively dark abdomen.

Somewhat related, apparently, to *A. tisiphone*, Gribodo.

*Hab.* San Rafael, Vera Cruz, Mexico, on flowers of plant no. 31 (*Cordia*, probably *C. ferruginea*), middle of July (*C. H. T. Townsend*). On the same flowers, at the same time and place, Professor Townsend took *Megachile chrysophila*, Ckll., ♀.

### *Hesperapis larrea*, sp. n.

*Hesperapis larrea*, Viereck, MS., 1902 (no description).

♂.—Length about 7 mm.

Black, with rather abundant white hair; hair of face and cheeks long and dense; mandibles reddened at tips; clypeus shining and very finely punctured; vertex shining, almost entirely impunctate; antennae dark, flagellum faintly reddish, scape quite long; mesothorax shining, but very hairy; area of metathorax nude, smooth, and very shiny; tegulae testaceous. Wings milky hyaline; stigma amber-colour bordered with dark brown; nervures brownish ferruginous. Legs black, hairy. Abdomen narrow, hairy, roughened with fine punctures, the bases of the segments depressed, the apical margins faintly reddish; apex with a narrow ferruginous pygidial plate.

The general aspect is suggestive of *H. olivæ* (Ckll.), but that has the wings dusky, the abdomen more distinctly banded, and the flagellum bright ferruginous beneath. The venation also differs, the basal nervure being more strongly

bent, and more distant from the transverso-medial, in *larrea* than in *olivie*.

*Hab.* Mesilla Park, New Mexico, at flowers of *Larrea*, May 16 (*Cockerell*); also taken by Mr. Viereck at Alamo-gordo, New Mexico, at *Larrea*.

*Andrena pyrrhacita*, sp. n.

♀.—Length about  $11\frac{1}{2}$  mm.

Robust, black, with very abundant erect hair on head, thorax, and abdomen. Head broad, facial quadrangle very much broader than long; facial foveæ black, broad but short: hair of clypeus, sides of face, and vertex black; of front and between antennæ, and occiput, yellowish white or pale ochreous; of cheeks black, with more or less pale above and below: antennæ black, third joint much longer than 4+5, flagellum faintly brownish beneath; process of labrum entire; clypeus dull, with dense minute punctures and a rather faint median ridge; thorax dull and granular, with abundant, long, erect, pale ochreous hair; lowest part of pleura with black hair; area of metathorax without rugæ or raised margin. Legs black, with mainly black hair, but it is long and pale on anterior femora behind, and pale on inner side of hind tibiæ; tegulæ piceous. Wings hyaline, nearly clear, the apex a little dusky; stigma and nervures dark rufo-fuscous; second s.m. receiving first r. n. beyond the middle; abdomen with only minute feeble punctures, not banded, but covered with erect hair of a rather light ferruginous colour, whitish on first and fifth segments, black or sooty at extreme apex; second segment depressed about one third; basal part of venter with coarse black hair.

At first sight this suggests *A. Hitei*, Ckll., but it has much less brilliantly coloured hair, a broader, more oval abdomen, and the sculpture of the clypeus is entirely different. It is a very distinct and beautiful species.

*Hab.* Salina, Boulder County, Colorado, 6550 ft. alt., at flowers of *Salix*, April 14, 1907 (*W. P. and T. D. A. Cockerell*). Another specimen, with the hair of the abdomen less brightly coloured, was taken by Mr. G. Hite at Boulder, Colo., March 25, 1907.

*Andrena mimetica Falli*, subsp. n.

♀.—Differs from *A. mimetica*, Ckll. (which occurs in New Mexico), thus: smaller, length about or just over 11 mm.; third antennal joint shorter than 4+5; second and third abdominal segments with white hair at base, conspicuous when the abdomen is seen from the side.

*Hab.* Southern California, Mt. Wilson (*Davidson*). Also on Mt. Wilson, Dr. Davidson took that remarkable species *A. cleodora*, Viereck, hitherto only known from Oregon (*cf.* *Canad. Entom.* 1904, p. 161).

The new subspecies is named after Mr. H. C. Fall, the Coleopterist of Pasadena, California.

*Nomada Ednæ*, sp. n.

♂.—Length 9 mm. or a little more; anterior wing about or not quite 8 mm.

Black with lemon-yellow markings, the legs red. Head and thorax very hairy, the hair light fulvous; vertex and mesothorax dull and densely punctured; eyes in life greenish grey, delicately suffused with red, especially above; maxillary palpi long; head broad; mandibles simple; clypeus not hairy, but supraclypeal region very hairy; clypeus, broad lateral corners of face, extending narrowly up the orbital margins nearly to level of antennæ, a mark beneath eyes behind, labrum and basal two thirds of mandibles, all yellow. Antennæ stout, scape not especially swollen, mainly yellow in front; flagellum bright ferruginous, its first four joints with a large black mark above, that on first narrower than on the others; last joint normal; second antennal joint sunken into apex of scape; third joint much shorter than fourth; prothorax above, tubercles, patch on lower part of pleura, and a pair of large coalescent spots on the gibbosities of the scutellum, all yellow; minute red axillar spots; post-scutellum and metathorax all black; tegulæ red with a large yellow spot. Wings strongly dusky at apex; stigma bright amber-colour, nervures more fuscous; b. n. passing a little basad of t.-m.; second s.m. as large as third, not especially narrower above, and receiving the r. n. at its middle. Legs red, hind femora mainly black behind; anterior coxæ unarmed. Abdomen dullish, with exceedingly fine punctures; basal half of first segment black, after which comes a yellow band on a red field, interrupted in the middle; segments 2 to 6 with very broad entire yellow bands, those on 2 and 3 a little notched behind laterally; hind margins of segments broadly red, those of 1 and 2 infuscated; apical plate notched; venter red, banded with yellow.

A species of the *Xanthidium* group, which runs in my table of Rocky Mountain *Nomada* (*Bull.* 94, Colorado Exp. Station) to 47, and runs out because of the comparatively large size and notched apical plate. It has a strong superficial resemblance to *N. ornithica*, Ckll., but that is much less hairy, and differs in the colour of the legs &c. Among the

Old World species, it shows a general resemblance to *N. succincta*, Panz.

*Hab.* Boulder, Colorado, on the campus of the University of Colorado, at flowers of *Taraxacum taraxacum*, in company with *N. cuneata*, Rob., *Osmia*, &c., April 10, 1907. Collected by Miss Edna Baker.

*Osmia gaudiosa*, sp. n.

♂.—Length 6 mm. or slightly over.

Brilliant golden green, including legs; the vertex, front, and thorax above with a strong suffusion of coppery-red or almost crimson; abdomen with strong reddish-golden tints; hair of head and thorax long and white; antennæ normal, slender, not moniliform, black with a slight brown tint; tegulæ bright green, shining golden; wings clear. Abdomen strongly punctured, its hair white; first ventral segment feebly subemarginate; second ventral peacock-green; sixth dorsal with a very feeble median depression, hardly emargination; seventh segment bidentate.

*Hab.* Boulder, Colorado, on the campus of the University of Colorado, at flowers of *Taraxacum taraxacum*, April 10, 1907 (*Edna Baker*).

A most lovely little species, very distinct from all others in North America.

*Osmia universitatis*, sp. n.

♂.—Length about 9 mm.; anterior wing about 7.

Head and thorax olive-green, some brassy colour on middle of front, metathorax bluish green; abdomen dark green, approaching bluish green, the hind margins of the segments narrowly purplish black; legs black, with no metallic tints. Head and thorax very densely punctured as usual, their hair long and abundant, dullish, with a yellowish tinge, but over clypeus forming a dense shining white beard; no black or dark hairs intermixed anywhere; antennæ long and slender, black, the flagellum obscure ferruginous beneath, not moniliform; tegulæ black. Wings hyaline, very clear; b. n. falling just short of t.-m.; hair of legs mostly pale, but black or dark fuscous on basitarsi (redder within), and the hind tibiæ have long black hairs on outer side, while the hind femora show short black hair, easily overlooked because of the longer pale hair. Hair of abdomen partly black on fourth and following segments; sixth segment entire; seventh bidentate, the points quite wide apart; first ventral entire, third deeply emarginate. Eyes slate-colour. Second and third joints of middle tarsi broadened and thickened.

This is an ordinary looking species, having a general resemblance to the following :—

- (1) *O. faceta*, Cress., from which it differs by the green abdomen, without black hair on sides of second segment; segment 6 entire, &c.
- (2) *O. inurbana*, Cress., from which it differs by the clear wings, different tint of abdomen, different colour of hair of thorax above, &c.
- (3) *O. iridis*, C. & T., from which it differs by the absence of black hairs on head, the smaller, greener abdomen, &c.
- (4) *O. chlorops*, C. & T., from which it differs by the non-moniliform antennæ, &c.

Among the Old World species it resembles *O. Latreillei*, Spin.

*Hab.* Boulder, Colorado, on the campus of the University of Colorado, at flowers of *Taraxacum taraxacum*, in company with *O. gaudiosa*, April 10, 1907 (*Edna Baker*).

*Bombomelecta arizonica*, Ckll.

This species was described from a single female. Professor R. H. Forbes has found a male in a cell of *Anthophora Forbesi*, Ckll., at Tucson, Arizona, April 13, 1907.

This is the first record showing the host-relationships of *Bombomelecta*. The male *B. arizonica* is very similar to that of *B. Alfredi*, but smaller (length hardly 12 mm.), with a very distinct black band between the wings, consisting of a densely punctured area free from the white pubescence, but with a moderate amount of black hair. The middle tibiæ are densely covered with snow-white hair on the outer side; the posterior tibiæ and tarsi have much white hair on the outer side. The fourth and fifth ventral abdominal segments are covered with white hair.

*Exomalopsis solidaginis*, Ckll.

Mesilla, New Mexico, June 24, ♀ (*Cockerell*); Albuquerque, New Mexico, June 30, ♂, with only two submarginal cells, the same on both sides (*Cockerell*).

*Perdita dasytirii*, sp. n.

Exceedingly close to *P. lucie*, Ckll., but with the mesothorax, scutellums, and upper surface of metathorax entirely dark metallic green, the green being also of a bluish tint, not yellowish as in *lucie*. It is also close to *P. Martini*, Ckll., but the male has a large yellow patch on the pleura, and largely darkened nervures, and the yellow of the face does

not reach to the anterior ocellus, nor are any black dots left at the sides of the eyes.

♀.—Length about  $4\frac{1}{2}$  mm.

Bright but light yellow; mandibles tipped with rufous; head yellow except a broad area from the vertex, a little in front of anterior ocellus, to the occiput, which is dark green and granular; cheeks yellow, the dark area not extending downwards; antennæ yellow, a dark dot on second joint above; thorax dark above, but yellow at sides and beneath, except a dark mark just below wings; prothorax above with a broad yellow margin; nervures and margin of stigma fuscous, third discoidal cell absent; marginal cell broadly but obliquely truncate; legs yellow, hind tibiæ with a faint dark shade above. Abdomen yellow with apex a little reddened; first segment black with two more or less triangular yellow marks, and sides yellow; four straight black bands, not reaching lateral margins, the first three broad; venter yellow, rufescent apically.

♂.—Length  $3\frac{3}{4}$ –4 mm.

In general similar to the female, but dark colour extending a short distance down cheeks, leaving a narrow yellow line next to the eye; flagellum, except last joint, fuscous above; sides of thorax dark, but pleura with a very large yellow patch anteriorly; hind tibiæ and tarsi behind, and a spot at apex of their femora, dark brown; apical part of abdomen orange or brownish yellow, without bands; there are four well-formed bands.

*Hab.* Alamogordo, New Mexico, at flowers of *Dasylyrion Wheeleri*, Watson, June 6 to 9, very many specimens (*H. L. Viereck*).

University of Colorado,  
Boulder, Colorado, U.S.A.,  
April 20, 1907.

#### BIBLIOGRAPHICAL NOTICES.

*The Crayfishes of the State of Pennsylvania.* By Dr. A. E. ORTMANN. *Memoirs of the Carnegie Museum, Pittsburg, Pa.*, vol. ii. no. 10, pp. 343–523, 7 plates: December, 1906.

SINCE Huxley, in a well-known paper, first placed the classification of the Crayfishes on a morphological basis and showed the interest attaching to their geographical distribution, much attention has been given to this group of Crustacea. In particular, the very numerous species occurring in North America have been the subject of important memoirs by Faxon and others. Dr. A. E. Ortmann, who is well-known as an authority on the higher Crustacea, has produced, in the memoir under review, a study of the Crayfishes of

Pennsylvania which deserves attention, not only from Carcinologists but from all who are interested in the wider problems of zoology.

In the first part of the memoir the author discusses the systematic characters of the forms found within the limits of the State. Seven species and one variety are recognized, and their variations are set forth in great detail. Dr. Ortmann's conclusions as to the limits of the species are not to be lightly disputed, were it only on account of the vast amount of material—between two and three thousand specimens—at his disposal. Further, his familiarity with the living animals—most of the material was collected by himself—gives him a great advantage over the mere museum species-maker.

The next section deals at length with the oecology and distribution of the various species. Especially interesting are the details given of the habits of the "chimney-builders"—the burrowing species which are so called from the chimney-like piles of mud thrown up at the mouths of their burrows. These species are found often at considerable distances from open water, burrowing down to reach the ground-water, and their chimneys are sometimes so numerous as to "hamper farming operations by interfering with the harvesting machines, clogging and ruining them"; elsewhere they were observed "coming up even between the railroad ties of the Morgantown and Kingwood Railroad." The distribution of the species within the State is illustrated by coloured maps, and it is shown that many of the facts cannot be correlated with the existing physio-graphical conditions. An explanation is sought in past changes in the configuration of the country and especially of the river-systems. How far the author's speculations as to the pre- and post-glacial migrations of the various species are justified is a question which can only be answered by local research, but they are certainly suggestive and stimulating.

The life-histories form the subject of the following section, and remarkable differences are shown to exist between the species in this respect. Two main types of life-history are distinguished, a "warm water" type characteristic of the species found in the larger rivers, and a "cool water" type shown by the species found in mountain-streams. In the former a definite seasonal cycle is observed, mating taking place in the autumn and spawning in the spring, while the cool water species breed at all seasons of the year. Some details are also given of the remarkable alternation of breeding and non-breeding phases which, as Faxon discovered, gives rise to the so-called "dimorphism" of the males in the American Crayfishes. A similar phenomenon has recently been described by Mr. G. Smith in certain crabs and may possibly be found to occur in other Crustacea.

After a short section dealing with the economic aspects of the Crayfishes, the memoir concludes with a discussion of some current theories of evolution in the light of the facts set forth. Many of the points touched on are of a highly controversial nature, and the arguments cannot be summarized here. It may be said, however, that Dr. Ortmann sees no evidence of "mutation" in the origin of species (and here, we believe, many systematic zoologists will agree

with him), but concludes that "Isolation or Habitudinal Segregation, as the factor forming species, is clearly seen in every case discussed."

It is, perhaps, to be regretted that Dr. Ortmann has seen fit to use the term "Crawfish" as the "proper American name" of the animals he deals with. It is surely pushing the rule of priority to an absurdity to apply it in such a case. Apart from this trivial matter, however, the memoir is one upon which the author and the Museum with which he is connected are to be congratulated.

W. T. C.

*A Natural History of the British Butterflies, their World-wide Variation and Geographical Distribution. A Textbook for Students and Collectors.* By J. W. TUTT, F.E.S. Vol. I. London, 1905-1906. 8vo. Pp. iv, 479; pls. xx.

WE have here another of Mr. Tutt's enormously detailed and elaborate volumes on British Lepidoptera, which, he tells us, was issued in parts and should form vol. viii. of the whole series. The introductory chapters (Part I. Chapters i.-xiv.) are devoted to general observations on butterflies; egg-laying, eggs, and larvæ; and probably the most interesting will be found to be those on the association of Ants with Butterfly Larvæ, and on the Carnivorous Habits of Butterfly Larvæ, wherein the Author brings together a large amount of scattered information which it is most useful to have epitomized. Part II. contains a detailed account of the ten British species of Urbicolides and Ruralides (Skippers and Coppers), and the work closes with an index of eighteen closely printed pages in double columns. The twenty plates represent eggs, larval hairs, perfect insects, &c., and one plate represents an apparatus for photographing the eggs of butterflies. The chapters on Obtaining Eggs of Butterflies and on Collecting Butterfly Larvæ will be found very useful and interesting to those lepidopterists who care to undertake such work. It will probably take two hundred similar volumes to complete the history of the British Lepidoptera on the grand scale projected by Mr. Tutt, yet all praise is due to him for his undertaking the initiative in such a gigantic task, and for having made an appreciable, if comparatively small, diminution in the number of volumes required for its completion, though this would require several lifetimes, unless a numerous band of entomologists were to devote themselves to separate portions of the task simultaneously.

Of the butterflies described in the present volume, *Chrysophanus dispar* is probably the most interesting. Mr. Tutt devotes forty-eight pages to this species; but a very large volume might be written on the subject, and the notice appears to us to be somewhat less complete than that of some of the other species which he discusses.

We need hardly say that Mr. Tutt's volumes on British Lepidoptera form an indispensable mine of wealth to all future lepidopterists who attempt to take up the study of butterflies seriously.

W. F. K.

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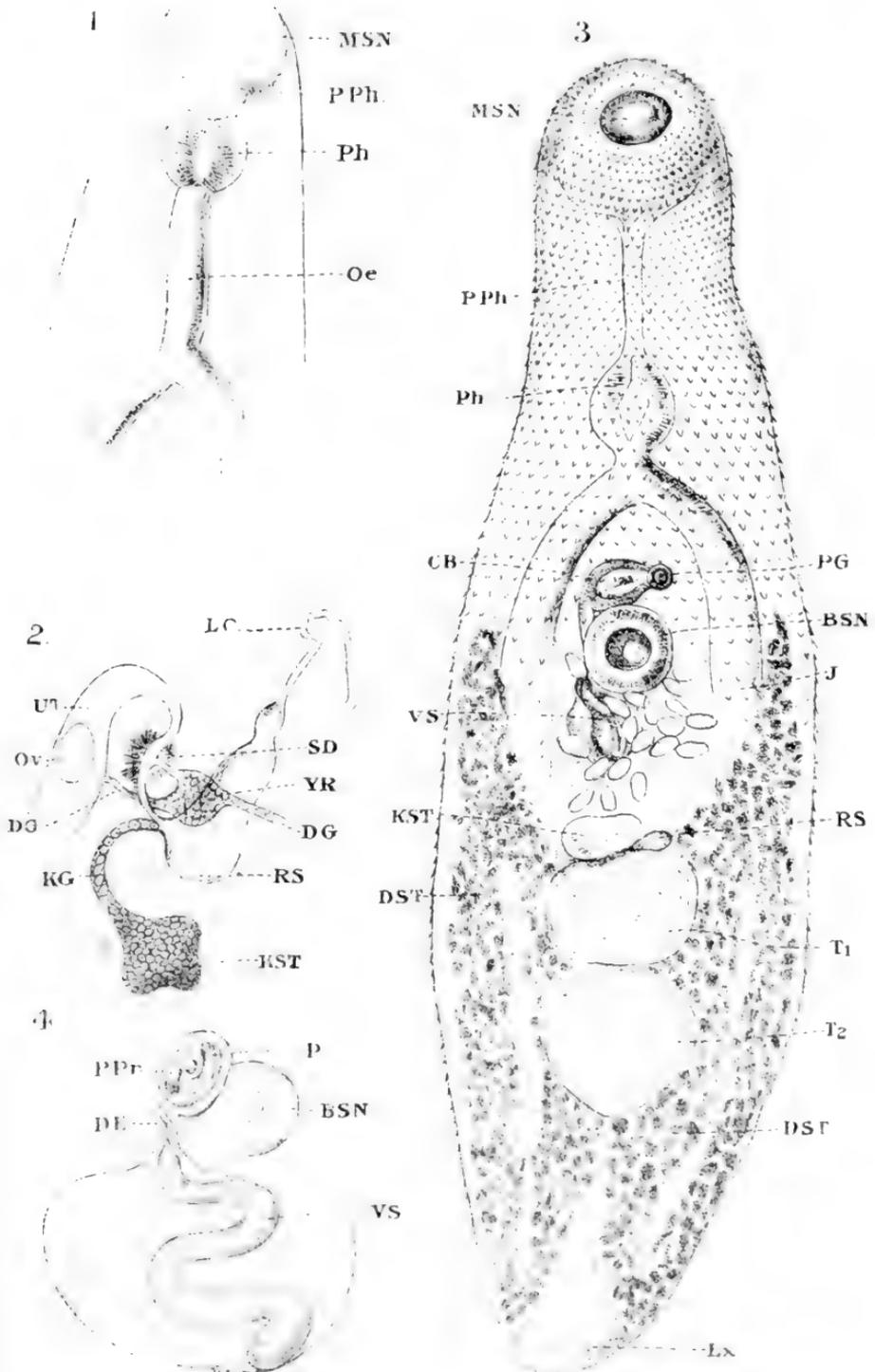
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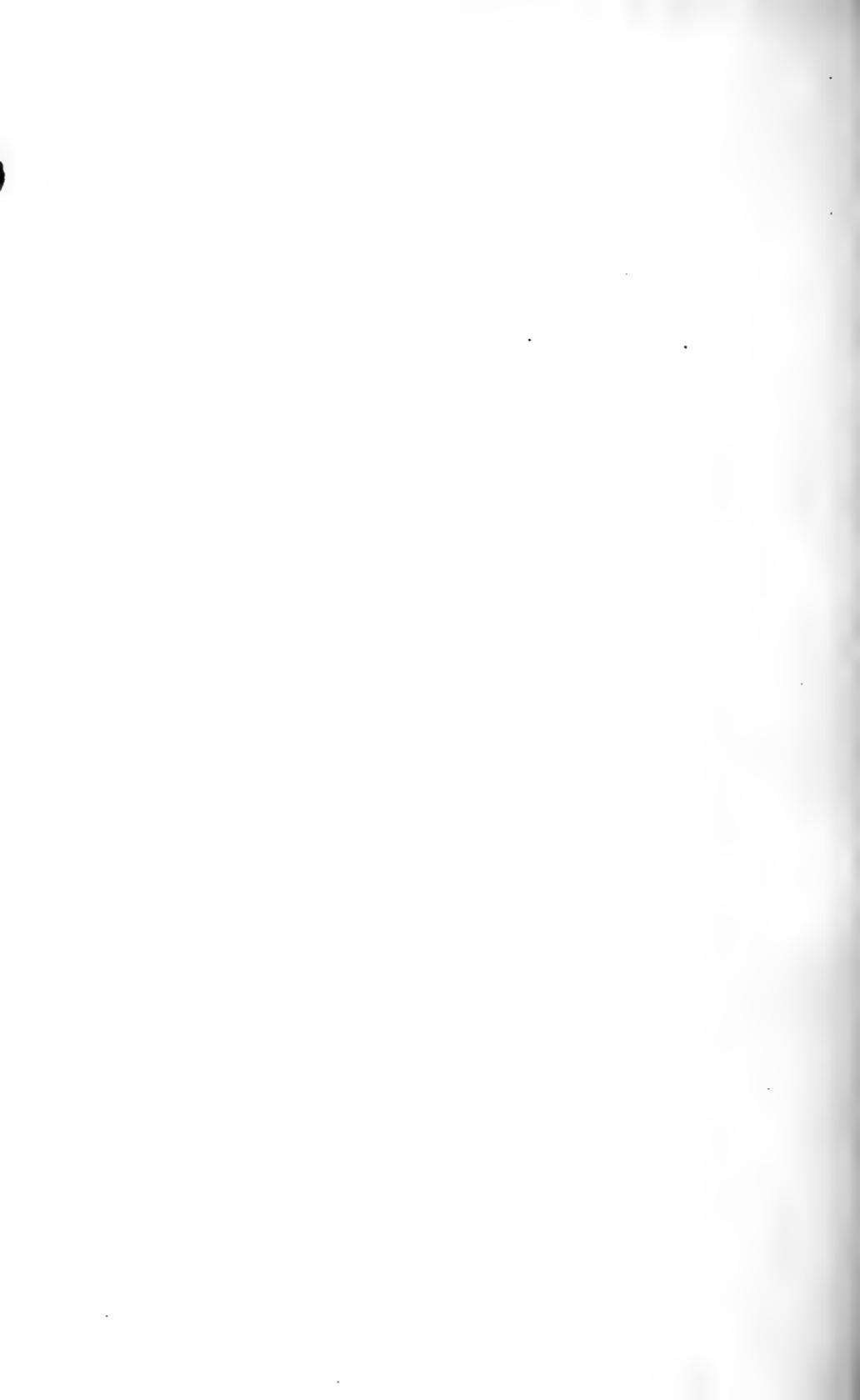
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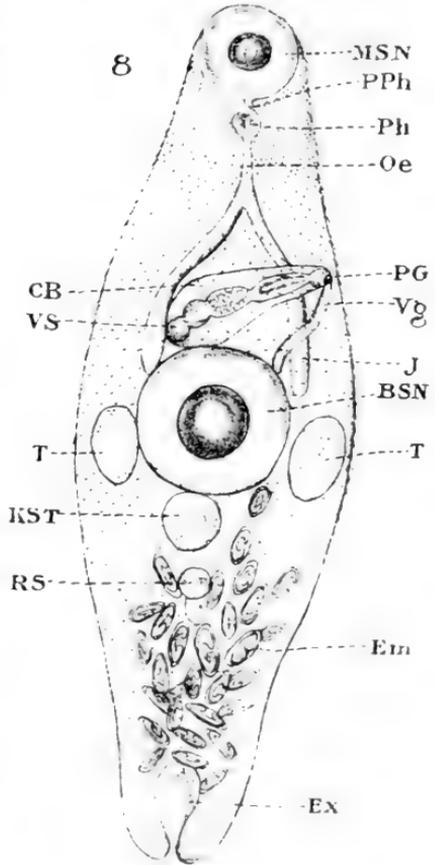
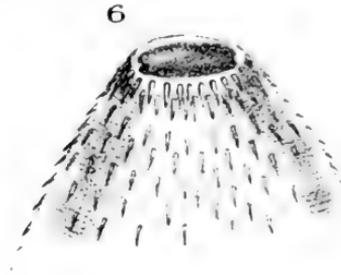
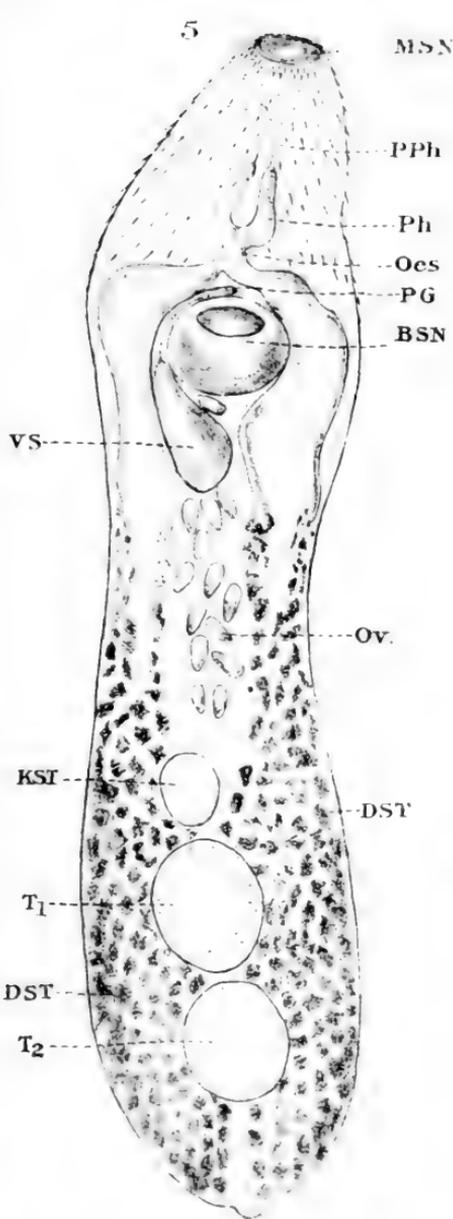
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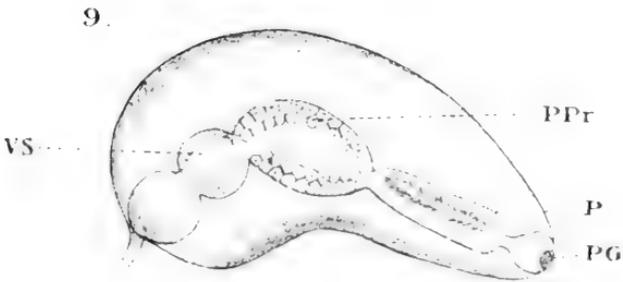
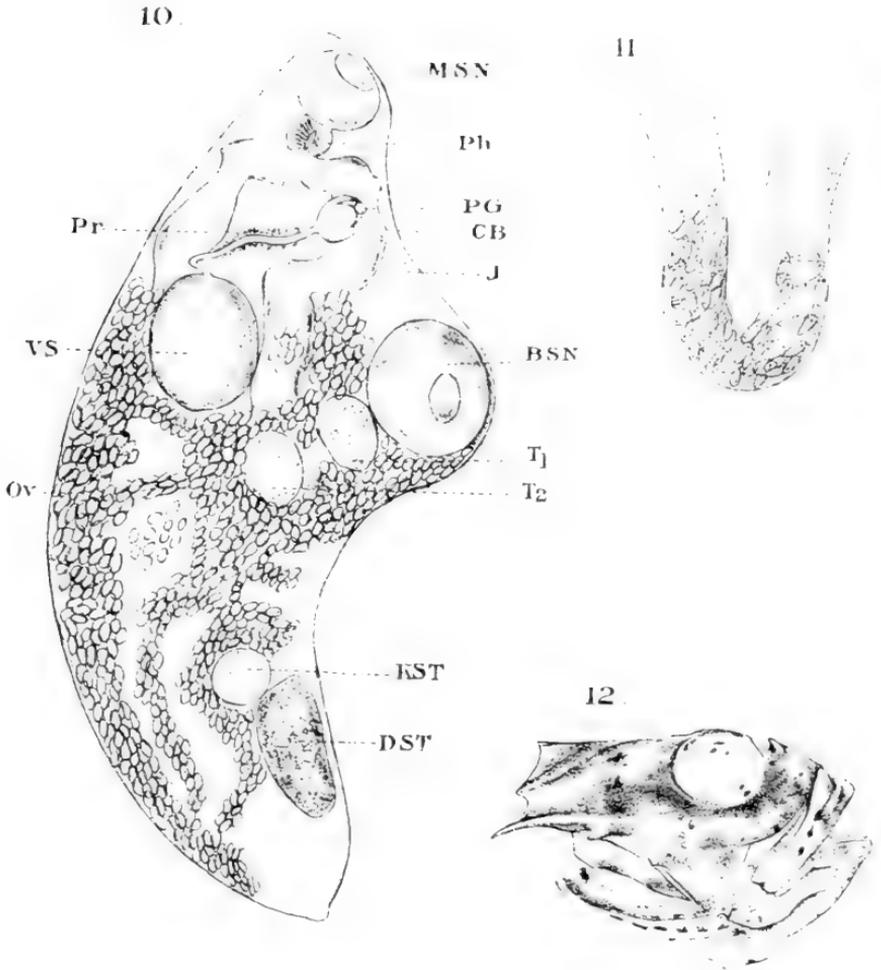
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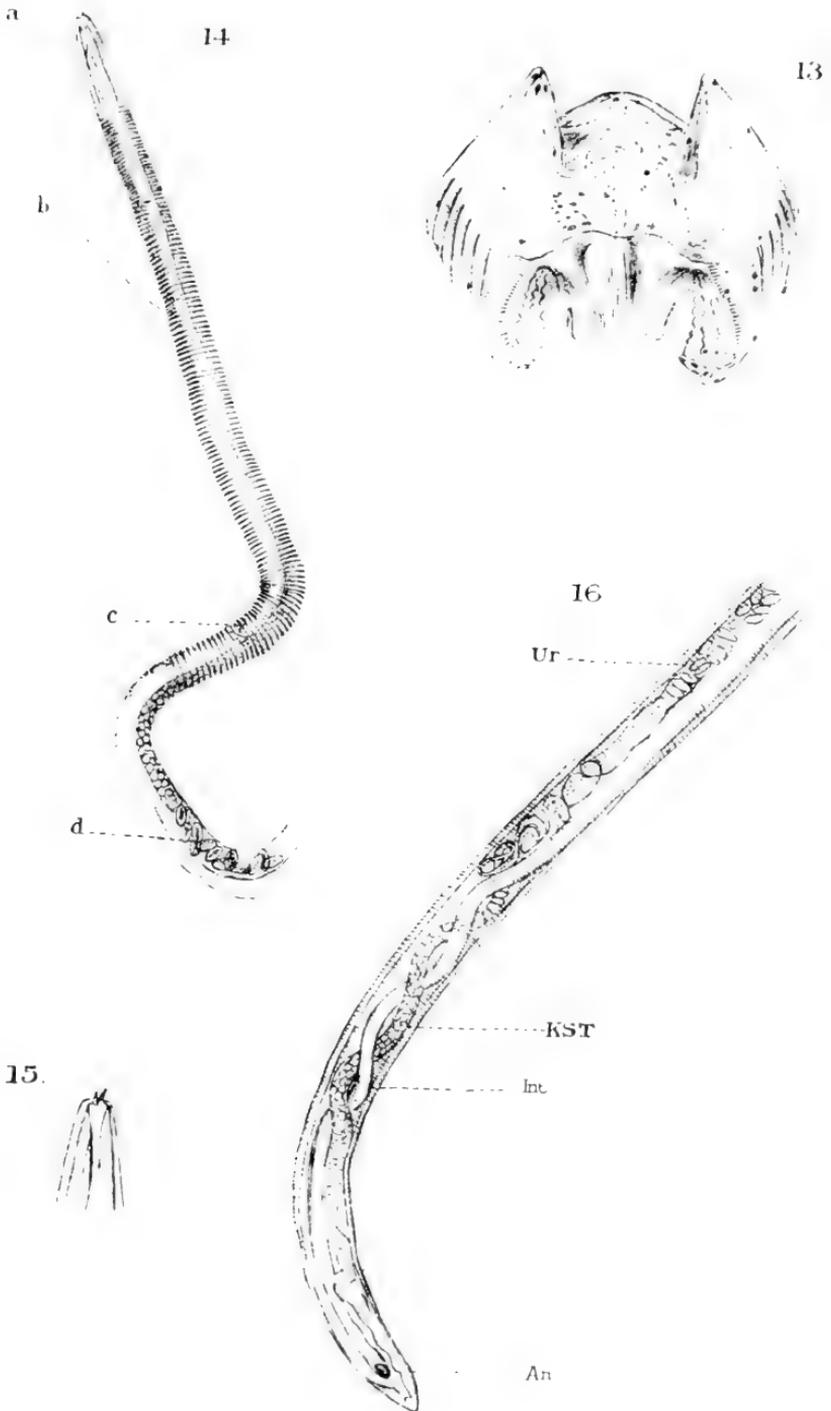




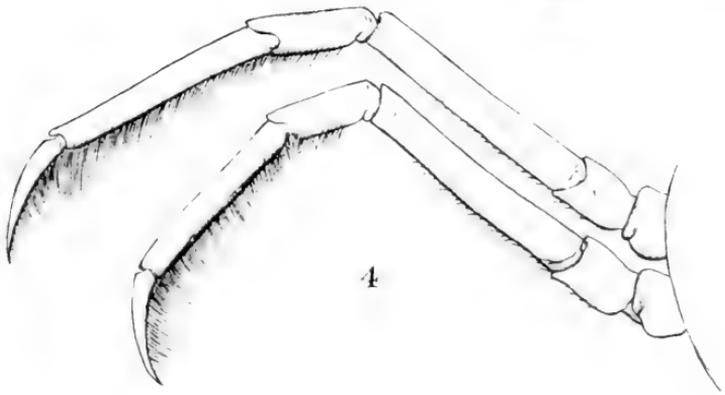
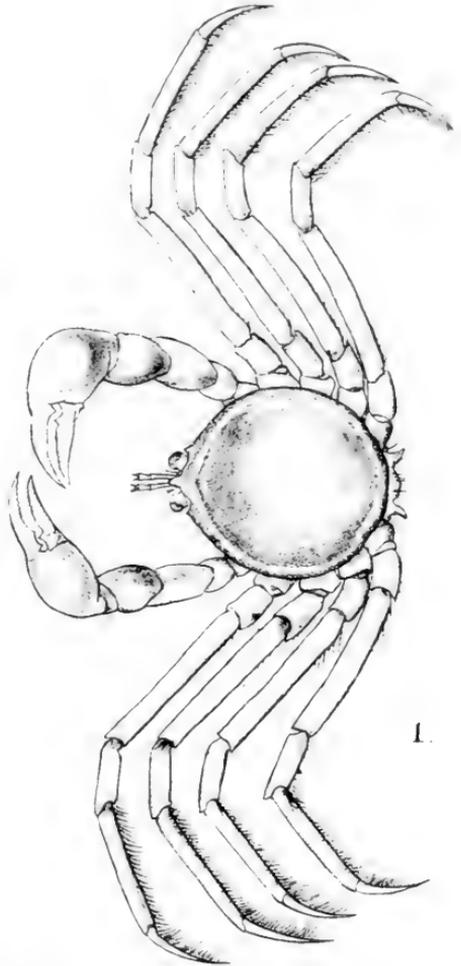
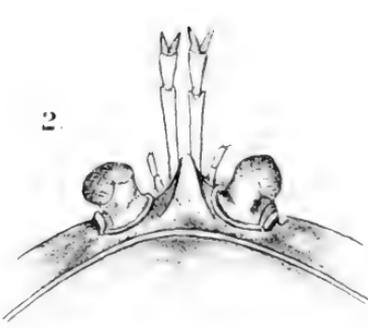








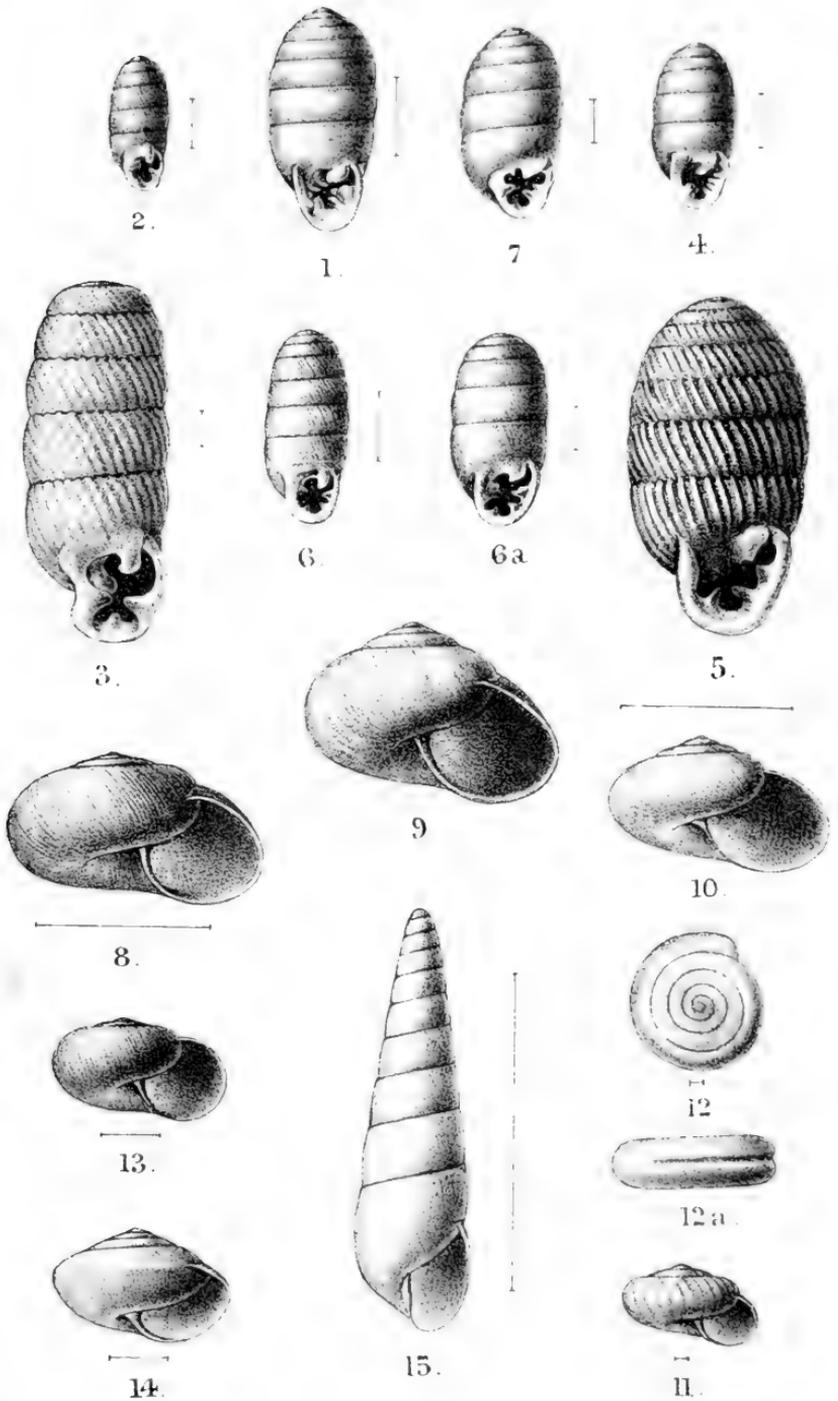




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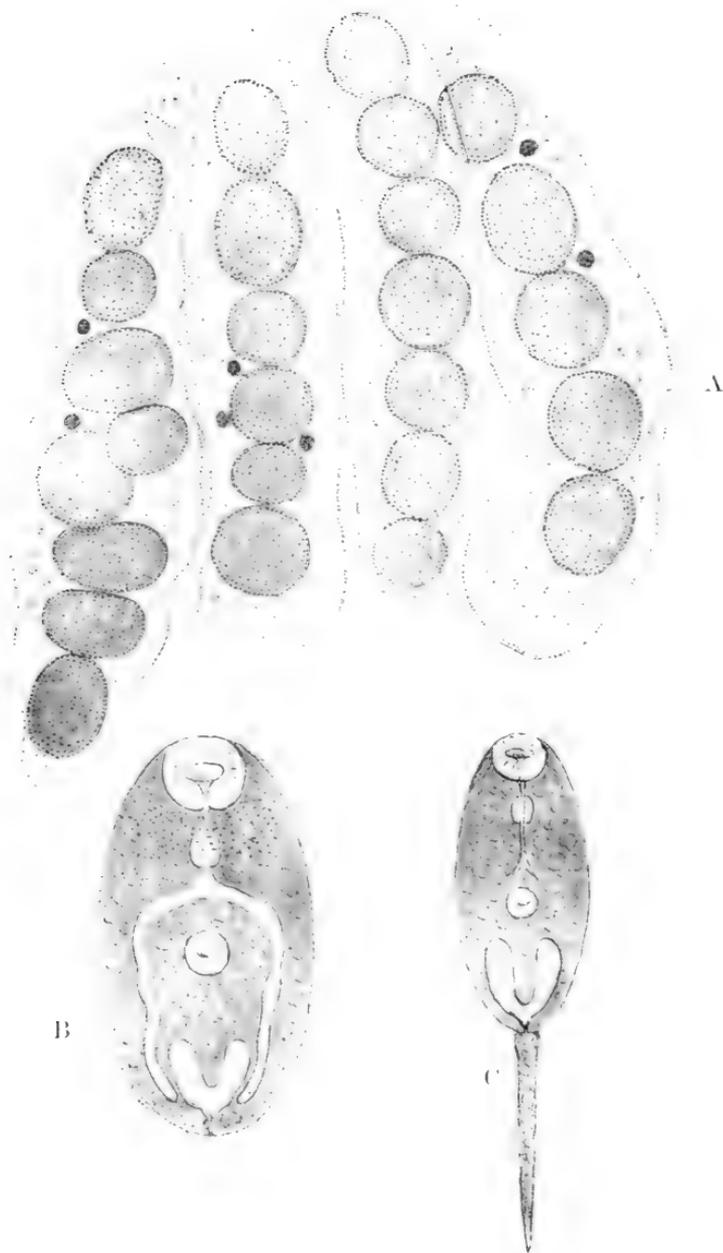
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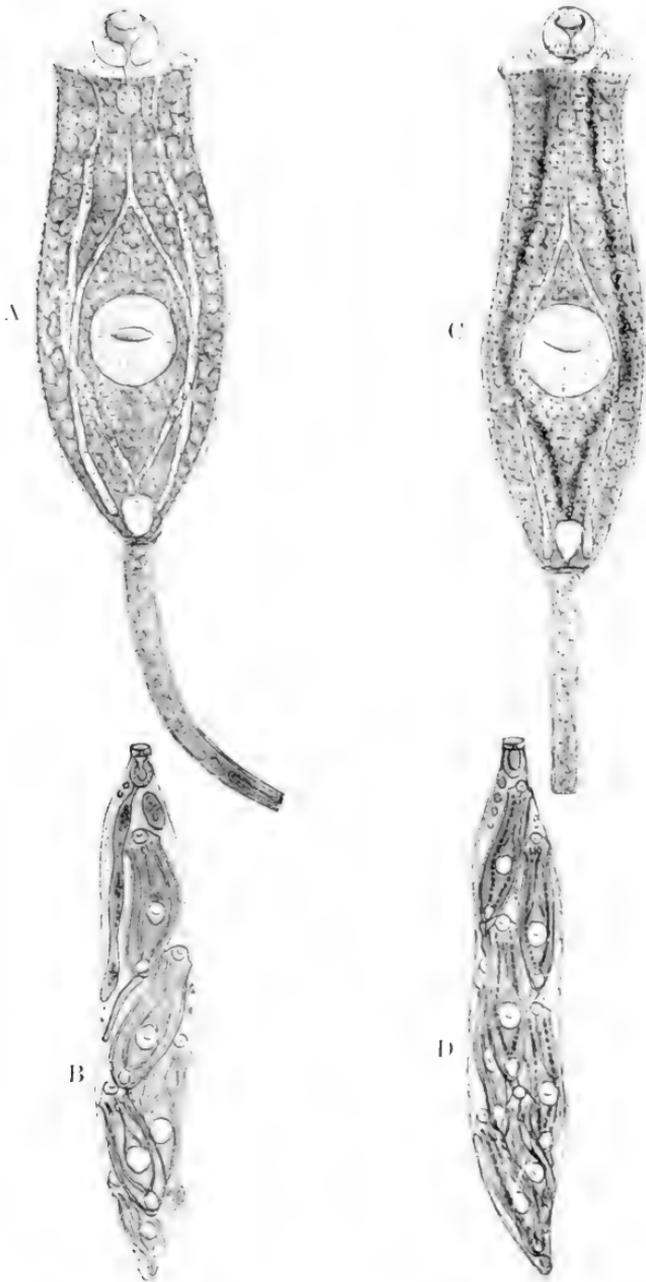




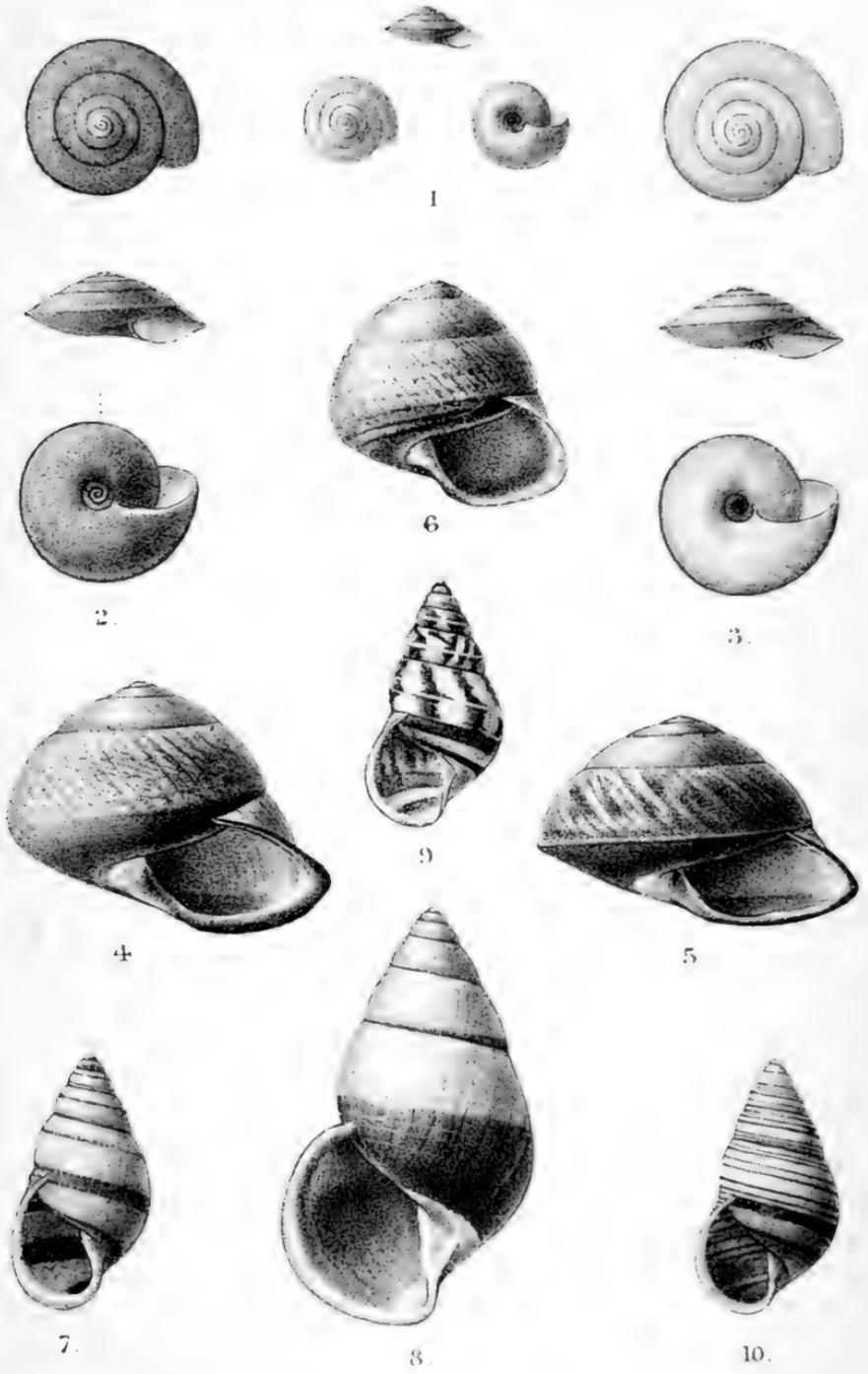
















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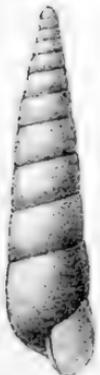
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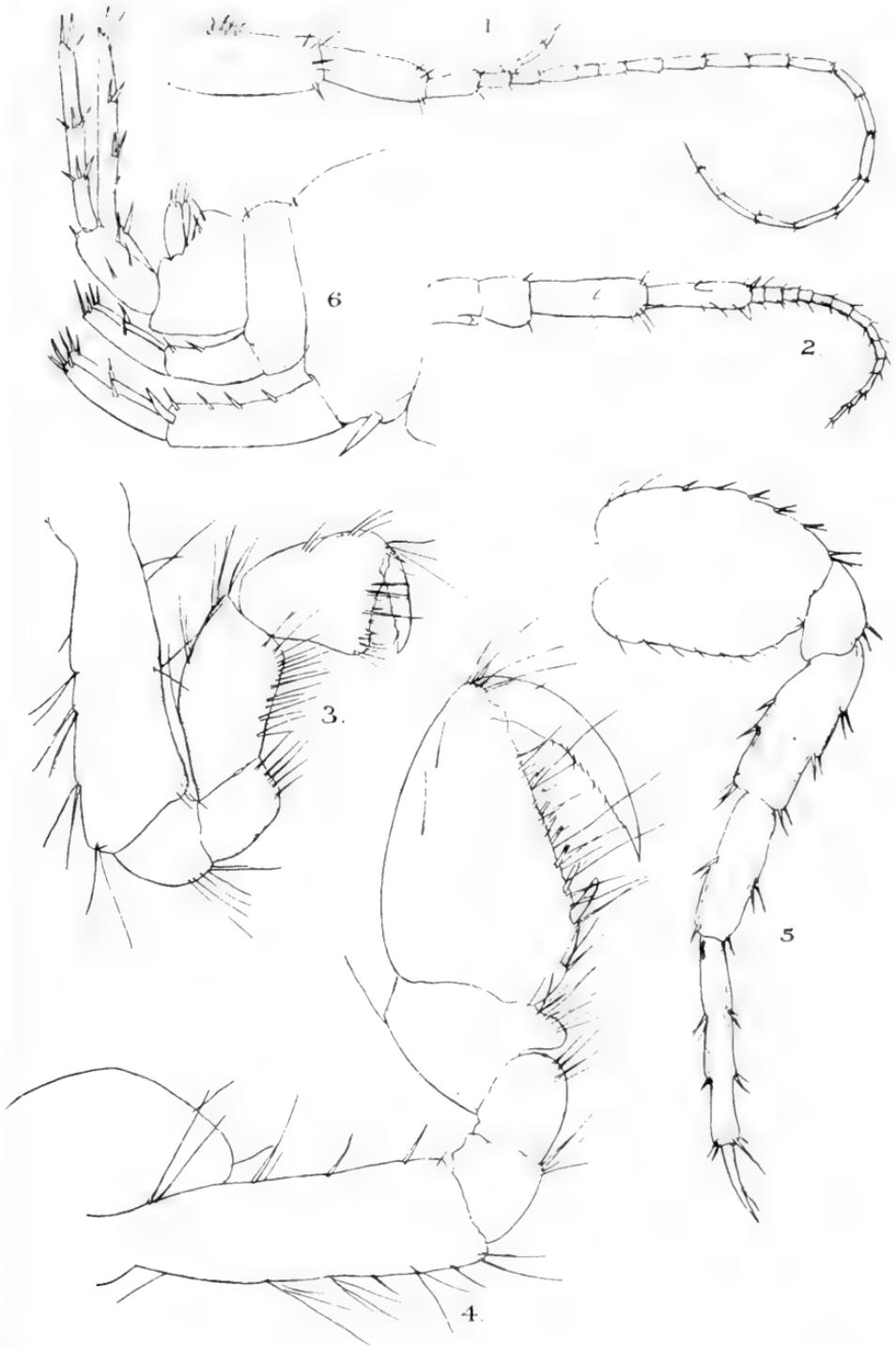
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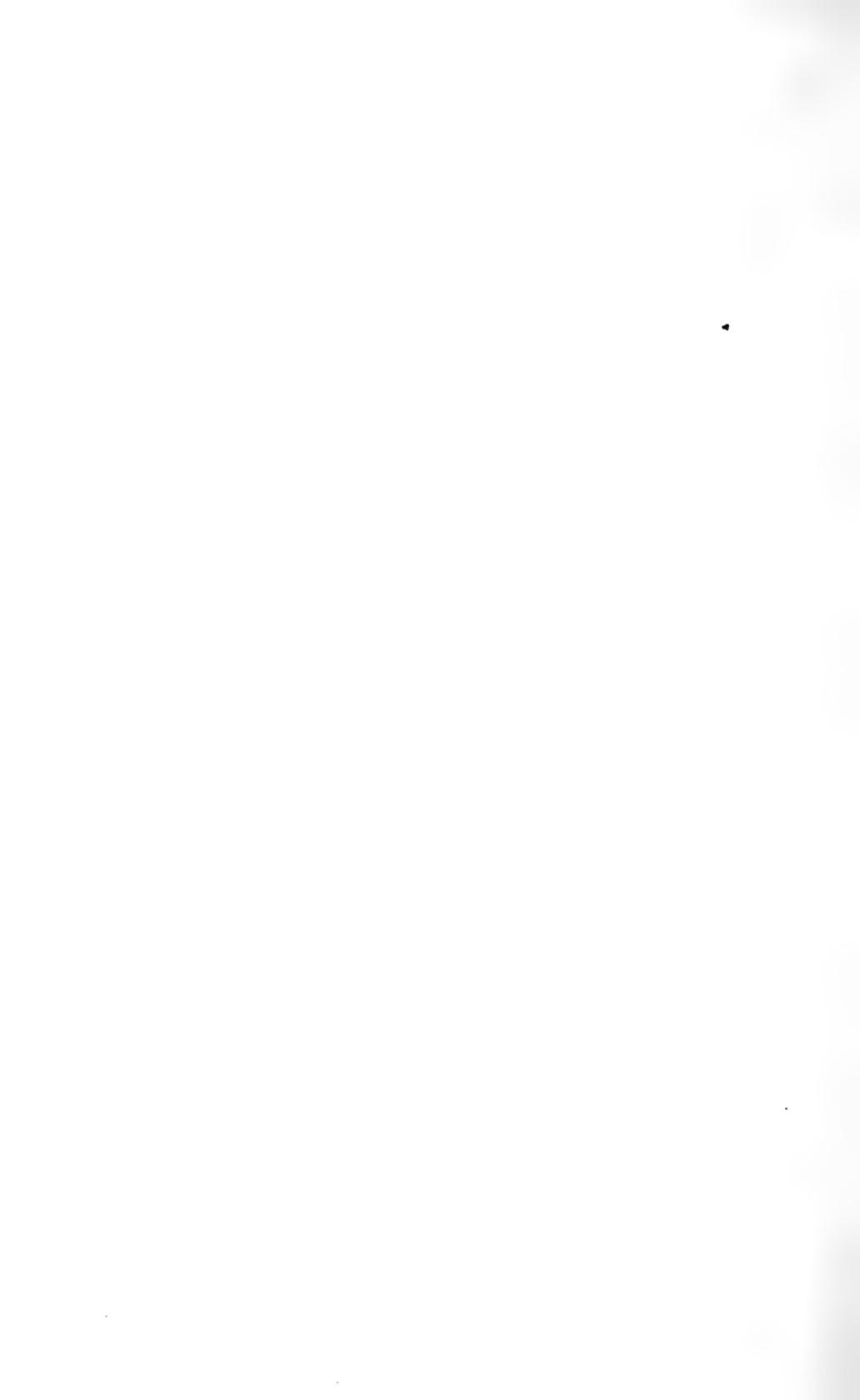


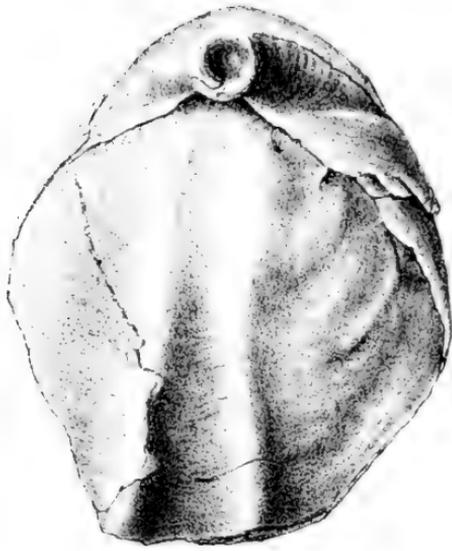
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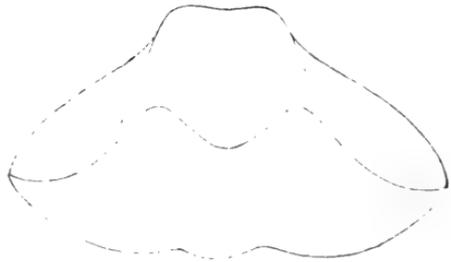




a.



b.



c.

$\times \frac{1}{3}$ .

J. Green del. et lith.

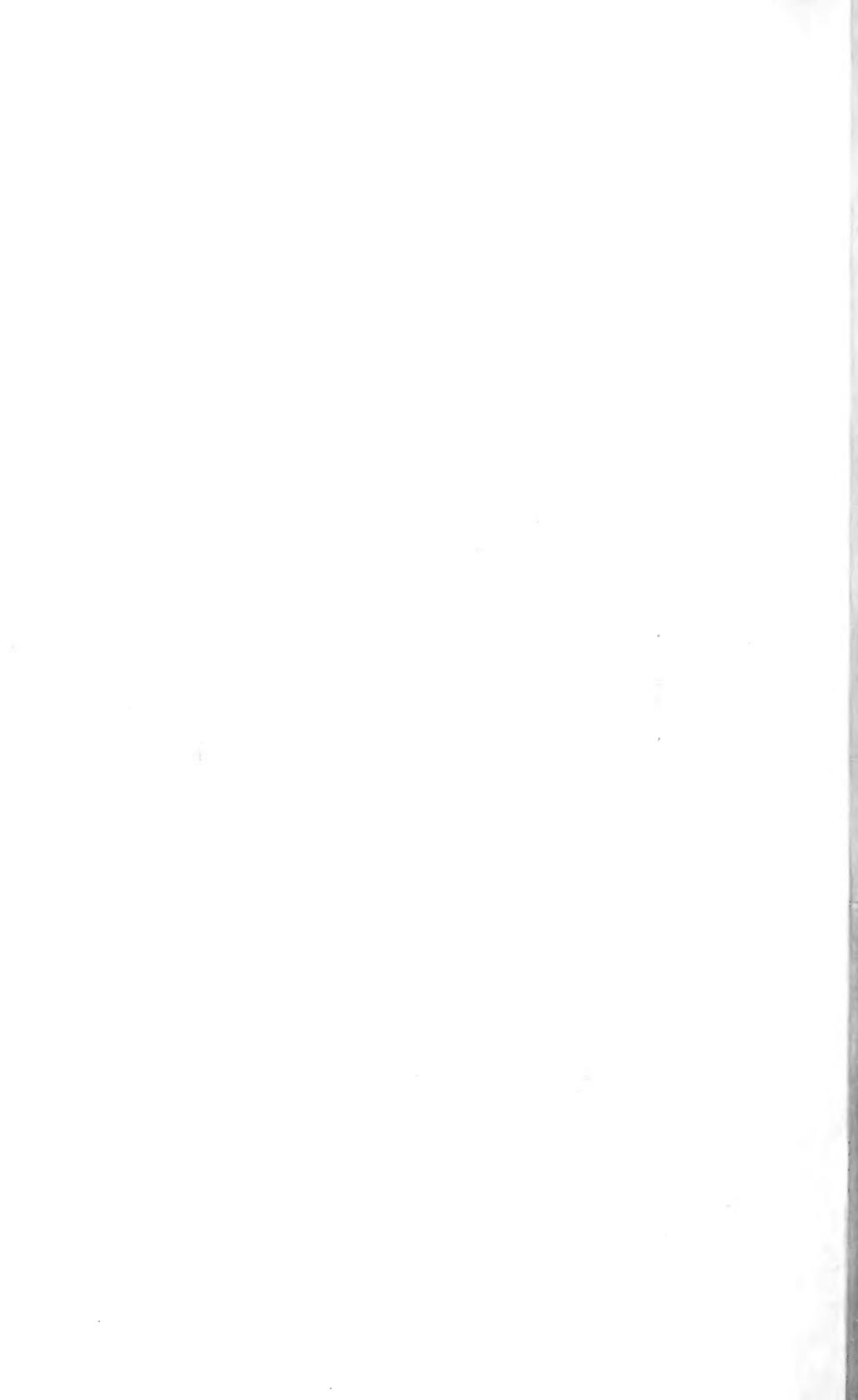
TEREBRATULA TEREBRATULA. *Linné*











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