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XXII. NOTES AND DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

By E. MEYRICK, B.A., F.R.S.

The specimens on which the following notes and descriptions are based were submitted to me by the authorities of the Indian Museum, and the types of the new species are in the collection of the Museum, but cotypes of the majority are also in my own collection.

PTEROPHORIDAE.

Oxyptilus praedator, n. sp.

♂, 12 mm. Head and thorax dark fuscous, metathorax and undersurface white. Palpi slender, curved, acute, dark fuscous mixed with whitish. Abdomen dark fuscous, white beneath, except towards apex. Forewings cleft from $\frac{2}{3}$, segments moderate, second dilated posteriorly, termen of first sinuate, of second concave; bronzy-blackish; some very undefined light suffusion towards base of first segment, and a faint whitish-fuscous subterminal line on both segments: cilia whitish, with two blackish patches on termen of each segment, dark fuscous on posterior half of both segments above and beneath, with two black scale-teeth on dorsum in middle and before cleft. Hindwings blackish, third segment very short and slender; cilia rather dark grey with rosy reflections, on dorsum of third segment with a very small black scale-tooth close before apex.

Sukna, E. Himalayas, 500 feet, in July (Annandale); one specimen. Apparently nearest to *O. vaughani* from Ceylon, but that species has a broad white band on basal portion of abdomen.

Platyptilia gonodactyla, Schiff.

Darjiling, E. Himalayas, 7,000 feet, in August (Paiva); two specimens, apparently in no respect different from European. I have it also from Rawalpindi.

PHALONIADAE.

Phalonia manniana, F.R.

Bosondhur, Khulna district, Ganges delta, at light, in August (Jenkins); I have it also commonly from Ceylon. There is some individual variability, but no constant difference from the European form; it is a very wide-ranging insect.

TORTRICIDAE.

Peronea divisana, Walk.

Phagu, Simla Hills, 9,000 feet in May (Annandale).

EUCOSMIDAE.

Eucosma balanoptycha, n. sp.

♂ ♀ 12-14 mm. Head and thorax grey or brownish, thorax more or less irrorated with dark fuscous. Palpi moderate, porrected. Abdomen dark fuscous. Forewings elongate, costa gently arched, in ♂ without fold, apex obtuse, termen abruptly sinuate-indentured beneath apex, then rounded, somewhat oblique; dark grey, sprinkled with whitish specks; costa marked with groups of very fine oblique alternate whitish and dark fuscous strigulae; a trapezoidal blotch of whitish irroration on dorsum beyond middle; a more or less marked dark stria from middle of costa to tornus, angulated in middle, where it forms a small spot; upper end of ocellus indicated by some whitish suffusion edged by an irregular black line, between which and costa is a subterminal series of short black marks; a round dark fuscous apical spot edged with whitish: cilia grey sprinkled with blackish and whitish. Hindwings with 3 and 4 stalked; dark fuscous, darker posteriorly; longitudinal hyaline patches in and beneath cell towards base; in ♂ beneath an elongate subdorsal glandular patch of dense dark fuscous scales, extending from near base to tornus, and an elongate blackish dorsal patch alongside; cilia fuscous, darker toward base, tips whitish-tinged.

Puri, Orissa coast, in October (Annandale); Konkan, Bombay (Young); Maskeliya, Ceylon, in June (Alston); three specimens.

Argyroploce illepida, Butl.

(*Teras illepida*, Butl., Trans. Ent. Soc., Lond., 1882, 42; *Arotrophora ombrodelta*, Low., Proc. Linn. Soc., N. S. Wales, 1898, 48; *Cryptophlebia carpophaga*, Wals., Ind. Mus. Not., iv, 106, pl. vii, 1; *Cryptophlebia illepida*, Wals., Faun. Haw. i, 681, pl. x, 23-25.)

Calcutta, bred from litchi fruit in June, and at light in August (Annandale). Having obtained a series of the Hawaiian form, I find it is identical with Australian, Indian, and South African examples; the larva feeds in various fruits.

Argyroploce aprobola, Meyr.

Puri, Orissa, in October; Quilon, Travancore, in November (Annandale). This widely distributed insect is doubtless attached to some garden tree or plant.

Argyroploce citharistis, Meyr.

Quilon, Travancore, in November (Annandale).

Laspeyresia jaculatrix, n. sp.

♂ ♀ 10-11 mm. Head and thorax rather dark fuscous. Palpi whitish, sprinkled with light fuscous. Abdomen dark grey, segmental margins whitish-sprinkled. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen slightly rounded, rather oblique; rather dark fuscous, tips of scales whitish; costa marked with groups of two or three very fine oblique whitish strigulae; a median dorsal patch of four slightly curved rather oblique whitish strigae, not reaching half across wing; two angulated purplish-leadene transverse striae posteriorly, of which the lower halves margin the ocellus, containing four or five short fine black dashes: cilia whitish-fuscous, with two dark fuscous shades. Hindwings dark fuscous, towards base whitish and thinly scaled; cilia whitish, with dark fuscous sub-basal line.

Calcutta (Annandale); Pusa, Bengal, bred from beneath bark of *Dalbergia sissu*, in February, May, and June (Lefroy); nine specimens.

AEGERIADAE.

Oligophlebia amalleuta, n. sp.

♂ 12 mm. Head and thorax dark shining prismatic-bronze. Palpi short, white. Antennae dark bronzy-fuscous, simple. Abdomen short, dark fuscous, segmental margins of 1, 2, and 5 partially white, apex white, beneath white. Legs dark purplish-fuscous ringed with white, middle and posterior pairs with whorls of long projecting bristles at middle and apex of tibiae, and at apex of two basal joints of tarsi. Forewings very narrow, dilated towards apex, costa sinuate, apex obtuse, termen obliquely rounded; purple-blackish; six whitish interneural streaks beyond cell, not reaching termen: cilia grey. Hindwings hyaline; veins blackish; a blackish terminal line; cilia grey.

Paresnath, W. Bengal, 4,000 feet, in April (Annandale); one specimen.

GELECHIADAE.

Epithectis oschophora, n. sp.

♂ ♀ 8-10 mm. Head and thorax fuscous, face whitish, crown sometimes suffused with whitish. Palpi whitish, second joint with several whorls of greyish scales with black bases, terminal joint with two blackish rings. Abdomen grey, apex whitish. Forewings lanceolate, acute-pointed; 9 out of 6; brownish, more or less irrorated with dark fuscous; stigmata cloudy, dark fuscous, plical obliquely before first discal: cilia greyish, with scattered black scales towards base. Hindwings grey; cilia light grey.

Calcutta and Purneah district, Bengal (Paiva); Maskeliya (Pole), Diyatalawa (Fletcher), Ceylon; from March to August, seven specimens. An inconspicuous insect.

Epithectis telifera, n. sp.

♂ 13 mm. Head, antennae, and thorax whitish. Palpi whitish, second joint externally with a dark fuscous streak. Forewings elongate, narrow, costa slightly arched, apex acute, termen slightly sinuate, very oblique; whitish, with some scattered fuscous and dark fuscous specks; a line of blackish irroration along fold from $\frac{1}{4}$ of wing to beyond middle; a similar line from middle of disc to apex: cilia whitish, at apex with a black basal mark and two dark fuscous lines, on costa with a fuscous basal line. Hindwings and cilia grey-whitish.

Darjiling, 6,000 feet, in September, at light (Brunetti); one specimen.

Anacamptis nerteria, Meyr.

Calcutta, in September, at light (Paiva).

Timyra toxastis, Meyr.

Tenmalai, W Ghats, Travancore, in November (Annandale).

Timyra dipsalea, Meyr.

Katihar, Purneah district, N. Bengal, in October (Paiva). The female (not previously described) differs from the male in having the palpi simple, and hindwings wholly fuscous.

Lecithocera itrinea, Meyr.

Tenmalai, W Ghats, Travancore, in November (Annandale).

Lecithocera triophthalma, n. sp.

♂ 11 mm. Head and thorax purplish-fuscous, sides of crown tinged with ochreous-yellowish. Palpi dark fuscous, extreme apex of second joint pale ochreous. Antennae rather dark fuscous. Abdomen grey, anal tuft pale ochreous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen nearly straight, rather strongly oblique; 2 and 3 stalked, 7 and 8 stalked; rather dark fuscous, somewhat mixed with whitish-ochreous; stigmata represented by round blackish spots edged with whitish-ochreous, plical beneath first discal; an indistinct whitish-ochreous subterminal line, indented beneath costa, forming a wedged shaped inwardly oblique mark on costa; cilia fuscous, base barred with whitish-ochreous. Hindwings pale fuscous; cilia pale fuscous tinged with yellowish.

Tenmalai, W. Ghats, Travancore, in November (Annandale); one specimen.

Heliangara macaritis, n. sp.

♂ ♀ 13-14 mm. Head and palpi bright deep orange. Antennae dark fuscous, base orange. Thorax deep shining coppery-purple. Abdomen dark grey. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen very obliquely rounded; bright deep coppery-purple: cilia concolorous. Hindwings and cilia dark fuscous.

Goalbathan, E. Bengal, in July (Hodgart); Konkan, Bombay (Young); two specimens. Nearly allied to *H. lampetis*, but distinguished by the dark antennae, and absence of yellow dorsal patch of forewings.

Onebala agnatella, Walk.

Trivandrum, Travancore, in November (Annandale).

Brachmia gradata, n. sp.

♂ ♀ 9-10 mm. Head and thorax ochreous-bronze. Palpi bronzy-whitish, terminal joint with a dark fuscous line. Abdomen light fuscous, and tuft ochreous-whitish. Forewings elongate, rather narrow, costa slightly arched, somewhat sinuate in middle, apex obtuse, termen rather strongly sinuate, oblique; 2 and 3 short-stalked, 8 and 9 out of 7; dark fuscous; a whitish streak above middle from $\frac{1}{4}$ to $\frac{3}{8}$, surmounted by an ochreous-yellowish streak extending to beyond it; three oblique white streaks from anterior half of costa, first two running into the yellowish streak, third to beyond its apex; a white oblique striga from costa close beyond this; an ochreous-yellow line from apex of discal streak very obliquely inwards to fold; an undefined irregular streak or line of pale ochreous suffusion beneath fold; an oval whitish ring beneath middle of disc, and a patch of whitish irroration beyond this; three short white strigulae from costa posteriorly; terminal area ochreous-yellowish, cut by a straight transverse leaden-metallic line rising from last costal strigula; adjoining this line is a small well-marked black spot anteriorly towards dorsum, and another in middle posteriorly reaching termen beneath apex: cilia ochreous-whitish, on costa dark fuscous, with a white basal line, and forming an apical projection, on termen bronzy-shining, with a metallic-grey basal shade, beneath apex with a dark fuscous patch beyond this. Hindwings grey; cilia ochreous-grey-whitish, with a grey subbasal shade.

Kurseong, 5,000 feet, E. Himalayas, in September (Annandale); Khasi Hills, in August and September, common; fifteen specimens. Belongs to a group of closely allied species, requiring attention to details; a characteristic point of this species is the arrangement of the two black spots adjoining the metallic sub-terminal line.

Brachmia elephantopa, n. sp.

♂ ♀ 16-21 mm. Head and thorax dark slaty-fuscos, crown sprinkled, with pale specks. Palpi whitish-ochreous, second joint externally dark fuscous, except towards apex, terminal joint somewhat longer than second, towards apex usually with a few dark fuscous scales. Antennae dark fuscous in ♂ simple. Abdomen fuscous, anal tuft in ♂ whitish-ochreous. Posterior tibiae fuscous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen obliquely rounded; 2 and 3 stalked, 7 and 8 stalked, 9 connate with 7; dark slaty-fuscous; stigmata cloudy, black, plical beneath first discal, both often more or less elongate: cilia dark fuscous, tips lighter. Hindwings and cilia fuscous.

Bhogaon, Purneah district, N. Bengal, in March (Paiva); Konkan, Bombay (Young); Coorg, 3,500 feet, in September (Newcome); Nilgiris, 3,500 feet, in March, April, and August (Andrewes); twenty specimens.

Brachmia sigillatrix, n. sp.

♂ ♀ 11-12 mm. Head, palpi, and thorax deep ochreous-yellow, partially tinged with brownish. Antennae grey, ciliations in ♂ 1. Abdomen pale whitish-ochreous. Posterior tibiae whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 9 connate with 7; deep ochreous-yellow, irregularly mixed with light brown suffusion; stigmata black edged with white, plical obliquely before first discal: cilia ochreous-yellow. Hindwings and cilia ochreous-whitish.

Ernakulam, Cochin State, Malabar coast, in November (Annan-dale); Karwar, Kanara, in August (Maxwell); three specimens.

Brachmia autonoma, Meyr.

Ernakulam, Cochin State, Malabar coast, in November (Annan-dale); Bhogaon, Purneah district, N. Bengal, in September and October (Paiva). I described this originally from the Chagos Islands, but expressed the anticipation that it would be found in India.

Trichotaphe planata, n. sp.

♀ 18 mm. Head and thorax pale greyish-ochreous tinged with flesh-colour. Palpi ochreous-whitish, second joint dark fuscous, except apex, scales roughly expanded above towards apex, terminal joint longer than second. Abdomen whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen sinuate, oblique; 9 out of 7; light greyish-ochreous tinged with flesh-colour; costal edge ochreous-whitish; stigmata dark fuscous, discal nearly approximated, plical obliquely before first discal: cilia ochreous-whitish partially suffused with

pale brownish, with traces of darker bars. Hindwings with 6 and 7 approximated towards base; grey; cilia light grey.

Dharampur, Simla Hills, 5,000 feet, in May (Annandale); one specimen.

Nothris malacodes, Meyr.

Trivandrum, Travancore, at light, in November (Annandale).

Ypsolophus ianthes, Meyr.

Quilon and Shencottah, Travancore, in November (Annandale).

Ypsolophus decusellus, Walk.

Calcutta, in September (Annandale); one example, yellower than usual.

COSMOPTERYGIDAE.

Cosmopteryx asiatica, Stt.

Museum compound, Calcutta, in July (Annandale).

Cosmopteryx basilisca, Meyr.

Sukna, E. Himalayas, 500 feet, in July (Annandale).

Cosmopteryx hamifera, Meyr.

Sukna, E. Himalayas, 500 feet, in July (Annandale).

Stathmopoda anconias, n. sp.

♂ ♀ 10-11 mm. Head and thorax dark shining bronze, face whitish-bronzy. Palpi ochreous-whitish, terminal joint more or less suffused with dark fuscous. Abdomen dark fuscous, segmental margins purple-grey edged anteriorly with coppery, on sides white. Tibiae with whorls of long bristles at origin of spurs. Forewings lanceolate, widest at $\frac{1}{3}$, thence narrowed to acute apex; dark purple-bronze, sometimes with indigo-greenish reflections; base narrowly blackish; a rather narrow orange-yellow fascia at $\frac{1}{3}$, strongly edged with black; an orange-yellow elongate longitudinal mark in disc about $\frac{2}{3}$, preceded and followed by black suffusion reaching costa, connected anteriorly with a shorter orange-yellow mark on termen; a small white costal spot or mark above posterior extremity of this, sometimes confluent with it: cilia fuscous. Hindwings dark fuscous; cilia fuscous.

Puri, Orissa, in October (Annandale); Pusa, Bengal, in December (Lefroy); Peradeniya, in February (Green); Trincomali, in June (Fletcher), Ceylon.

OECOPHORIDAE.

Scythris expolita, n. sp.

♂ ♀ 11 mm. Head, palpi, antennae and thorax dark fuscous-bronze, palpi moderately long, rising above vertex; antennal ciliations in ♂ $\frac{3}{4}$. Abdomen rather dark fuscous, beneath with last four segments and half preceding one suffused with whitish-ochreous, in ♂ somewhat less strongly. Forewings lanceolate, acute, neuration normal; shining dark bronzy-fuscous, hardly perceptibly purplish-tinged towards apex: cilia concolorous. Hindwings $\frac{1}{2}$, cilia 3; 5 absent; rather dark fuscous: cilia fuscous.

Kurseong, E. Himalayas, 5,000 feet, in July (Annandale); Ukhral, Manipur, 6,400 feet, in August (Pettigrew); two specimens.

Endrosis lactcella, Schiff.

Kurseong, E. Himalayas, 5,000 feet, in July (Annandale); Darjiling, 7,000 feet, in August (Paiva).

Borkhausenia pseudospretella, Stt.

Darjiling, 7,000 feet, in August (Paiva).

Periacma (?) *mnemonica*, n. sp.

♀ 13-14 mm. Head, palpi, and thorax dark purplish-fuscous. Abdomen rather dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen rounded, rather strongly oblique; 7 to costa; dark purplish-fuscous; a large pale whitish-ochreous oblique transverse blotch rather before middle, reaching costa but not dorsum; a small cloudy ochreous-whitish spot on costa before $\frac{3}{4}$: cilia dark purplish-fuscous. Hindwings dark bronzy-fuscous; cilia bronzy-fuscous.

Kurseong, E. Himalayas, 5,000 feet, in September (Annandale); Khasi Hills, in August; two specimens. In the absence of the ♂ the generic position is not fully assured, but is probably correct.

Cryptolechia stomota, n. sp.

♂ ♀ 11-12 mm. Head pale ochreous or whitish-ochreous, sometimes somewhat marked with fuscous suffusion. Palpi whitish-ochreous, second joint with appressed scales, sprinkled with blackish, terminal joint with blackish median band. Antennae whitish-ochreous ringed with dark fuscous. Thorax pale ochreous somewhat sprinkled with dark fuscous, shoulders dark fuscous. Abdomen greyish, anal tuft of ♂ whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 7 to costa; pale ochreous sprinkled with dark fuscous; a dark fuscous blotch on base of costa; stigmata dark fuscous, plical obliquely before first discal; a semioval

dark fuscous blotch on costa somewhat beyond middle; a triangular dark fuscous tornal spot, and a dark fuscous apical blotch, sometimes confluent on termen: cilia dark fuscous. Hindwings grey; cilia pale grey.

Kurseong, E. Himalayas, 5,000 feet, in September (Annan-dale); Khasi Hills, from August to October; Coorg, 3,500 feet, in May and September (Newcome); Nilgiris, 3,500 feet, in August (Andrewes); Matale, Ceylon, in August (Pole); eleven specimens.

ELACHISTIDAE.

Elachista ithygramma, n. sp.

♂ ♀ 7-8 mm. Head ochreous, sides broadly whitish. Palpi whitish, second joint with several whorls of pale ochreous whitish-tipped scales. Thorax ochreous, with two white stripes, lateral margin of patagia white. Abdomen grey, on sides and beneath ochreous-whitish. Forewings lanceolate, acute; ochreous, with four white longitudinal streaks, more or less sprinkled throughout with grey; first streak along costa from $\frac{1}{3}$ to apex, second from base above middle to or near termen beneath apex, third along fold throughout, fourth along dorsum and termen throughout; an indistinct small blackish dot between second and third towards termen; a few blackish scales at apex: cilia whitish-ochreous, base ochreous, round apex sprinkled with dark grey points towards base. Hindwings grey; cilia pale whitish-ochreous tinged with grey.

Quilon, Travancore coast, in November (Annandale); four specimens. Apparently allied to *E. thallophora* from New Zealand.

Elachista nearcha, n. sp.

♂ ♀ 8-9 mm. Head, palpi, and thorax white, palpi shorter and straighter than usual. Abdomen light grey, segmental margins whitish. Forewings lanceolate, acute; white; plical stigma represented by a thick elongate black mark, second discal by a short fine black dash; an oblique fascia of brownish irroration crossing wing before second discal stigma, and a less marked inwardly oblique fascia from costal extremity of this across plical stigma to dorsum; a more or less developed apical patch of brownish irroration: cilia white, round apex sprinkled with brownish towards base, and with a median line of dark fuscous points. Hindwings rather dark grey; cilia pale grey.

Puri, Orissa, in October, at light (Annandale); Calcutta, in April; two specimens.

SCHENDYLOTIS, n. g.

Head smooth; ocelli present; tongue developed. Antennae $\frac{3}{4}$, basal joint moderately elongate, without pecten. Labial palpi moderate, slender, smooth-scaled, slightly curved, porrected,

terminal joint shorter than second, acute. Maxillary palpi obsolete. Posterior tibiae smooth-scaled, with whorls of expanded bristles at origin of spurs. Forewings with 2 from towards angle, 4 absent, 7 and 8 stalked, 7 to costa, 9 and 10 from near angle, 11 absent. Hindwings $\frac{2}{3}$, lanceolate, cilia 4; transverse vein absent between 4 and 5, 5 and 6 stalked.

I denuded the undersurface of one pair of wings of the unique specimen, and satisfactorily ascertained the neurulation.

Schendylotis chrysota, n. sp.

♀ 7 mm. Head, palpi, and thorax blackish, patagia golden-metallic. Forewings lanceolate, acute; bronzy-blackish; a triangular golden-metallic spot on base of dorsum, not reaching costa; golden-metallic fasciae at $\frac{1}{3}$ and $\frac{3}{4}$, furcate on dorsum, white on costa, with violet reflections in disc; a white discal dot between these: cilia dark fuscous, with a golden-metallic basal streak on termen. Hindwings and cilia dark fuscous.

Kurseong, E. Himalayas, 5,000 feet, in September (Annandale); one specimen.

GLYPHIPTERYGIDAE.

Phycodes minor, Moore.

Rajmahal, Bengal, in July (Annandale).

Simaethis orthogona, Meyr.

Rajmahal, Bengal, in July (Annandale).

Simaethis fabriciana, L.

Simla, 7,000 feet, in May (Annandale).

Brenthia elatella, Walk.

Puri, Orissa, in October (Annandale).

GRACILARIADAE.

Lithocolletis conformis, n. sp.

♂ ♀ 6-7 mm. Head pale ochreous. Thorax bronzy-ochreous sprinkled with whitish. Abdomen dark grey. Forewings lanceolate; bronzy-orange-ochreous, sometimes tinged with fuscous; a short fine indistinct whitish median basal dash; two slightly curved narrow shining white rather inwardly oblique transverse fasciae at $\frac{1}{4}$ and $\frac{1}{2}$, anteriorly blackish-edged, slightly approximated towards costa, second sometimes slightly angulated in disc; a similar fascia at $\frac{3}{4}$, interrupted in middle; an inwardly oblique

short silvery-whitish mark from costa before apex, edged with some blackish scales: cilia greyish or greyish-ochreous, with two or three rows of blackish points. Hindwings and cilia grey.

Kasauli, Simla Hills, 6,300 feet, in May (Annandale); three specimens.

Epicephala bromias, n. sp.

♀. 7 mm. Head ochreous-whitish on crown, frontal hairs dark grey beneath, face white. Palpi white, second and terminal joints each with extreme apex and a median dot black. Antennae white ringed with dark fuscous. Abdomen dark grey. Forewings elongate, very narrow, moderately pointed; dark fuscous; a light fuscous streak along dorsum from base to tornus, upper edged suffused with white, thrice indented, and margined by a black plical streak; a whitish streak partially suffused with light fuscous extending on costa from $\frac{1}{3}$ to middle and thence running as a slender line to above tornus, edged anteriorly with blackish suffusion; an angulated white line from $\frac{3}{4}$ of costa to tornus, nearly preceded on upper half by a fuscous line edged anteriorly with blackish suffusion, its apex angulated backwards above extremity of preceding line from costa; a short black mark along termen, edged above with white, apical area above this streaked with blackish: cilia light fuscous mixed with whitish, round apex with two or three rows of black points. Hindwings dark grey; cilia grey.

Calcutta, in May (Annandale); one specimen.

Epicephala albifrons, Stt.

Calcutta and Purneah district, Bengal; W. Ghats, Travancore; in October and November (Annandale).

Acrocercops convoluta, Meyr.

Parasnath, W. Bengal, 4,300 feet, in April (Annandale); Kurseong, E. Himalayas, 5,000 feet, in September (Annandale).

Gracilaria octopunctata, Turn.

Darjiling, 7,000 feet, in August (Paiva).

Gracilaria scansoria, n. sp.

♂ 10 mm. Head and thorax lilac-ochreous sprinkled with dark fuscous. Palpi pale ochreous, suffused with blackish towards apex of second joint, and on terminal joint, except towards base. Antennae whitish ringed with dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Anterior and middle femora and tibiae blackish. tarsi white with black dots at apex of joints, posterior legs whitish. Forewings very narrowly elongate, moderately

pointed; pale brownish-ochreous irrorated with dark fuscous, slightly lilac-tinged; costa and dorsum shortly strigulated with blackish irroration; a pale brassy-yellowish spot on costa at $\frac{1}{2}$ reaching half across wing, anterior edge convex, well-defined, posterior edge suffused: cilia grey, round apex pale ochreous with several dark fuscous lines. Hindwings rather dark grey; cilia grey.

Phagu, Simla Hills, 9,000 feet, in May (Annandale); one specimen.

PLUTELLIDAE.

Epermenia chelyodes, n. sp.

♂ ♀ 8-11 mm. Head, palpi, and thorax white. Abdomen whitish. Forewings elongate-lanceolate, acute; 7 and 8 stalked; white, with scattered blackish scales; two undefined oblique patches of pale ochreous suffusion from dorsum near base and before middle, marked with black scales on dorsum; more or less irregular pale ochreous suffusion towards middle of disc, sometimes forming a defined patch beyond middle; a small blackish spot on middle of costa; apical third variably more or less suffused with blackish irroration, including a roundish pale ochreous patch anteriorly: cilia grey, on costa and at apex mixed with blackish, beneath apex and at tornus with whitish base, on dorsum whitish with three small blackish scale-teeth. Hindwings dark grey; cilia whitish, on apical half of termen grey, above apex with a dark grey patch.

Kurseong, E. Himalayas, 5,000 feet, in July (Annandale); Khasi Hills, in September and October; Palni Hills, 6,000 feet (Campbell); five specimens.

Zelleria petrias, Meyr.

Simla, 7,000 feet, in May (Annandale).

Yponomeuta temulentus, n. sp.

♂ 12 mm. Head and thorax dark grey suffused with reddish-brown. Palpi dark fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen rounded, oblique; 7 and 8 stalked; dark grey, strewn throughout with small undefined suffused black spots, veins partially suffused with red-brown; an irregular white patch in disc about $\frac{1}{4}$; an irregular white spot on costa beyond middle; some scattered white scales in disc; an irregular transverse white mark from tornus reaching half across wing; an irregular white terminal streak running round apex: cilia red-brown, base sprinkled with white. Hindwings dark fuscous; cilia reddish-fuscous.

Theog, Simla Hills, 8,000 feet, in May (Annandale); one specimen.

Arcrolepia nitrodes, n. sp.

♂ 11 mm. Head and thorax brownish mixed with black. Palpi brownish, suffusedly banded with dark fuscous irroration. Antennae fuscous ringed with black. Abdomen grey. Forewings elongate, narrow, costa anteriorly moderately, posteriorly slightly arched, apex round-pointed, termen almost straight, very oblique; light brownish, with a faint violet tinge, irregularly mixed and strigulated with black; costa marked with longer black strigulae; a dorsal patch of three white strigulae before middle; a whitish line from $\frac{2}{3}$ of costa to tornus, margined anteriorly by a blackish-fuscous patch on upper half; three white strigulae from costa between this and apex; a small blackish spot towards termen in middle: cilia whitish-grey, with two blackish-grey lines. Hindwings ovate-lanceolate, pale grey, suffused with dark grey towards termen and apex; cilia grey.

Parasnath, W. Bengal, 4,300 feet, in April (Annandale); one specimen. Allied to the European *pygmaeana*, but I have a Ceylon species still more like the European form, though certainly distinct.

Plutella maculipennis, Curt.

Purneah district and Rajmahal (Annandale), Bengal.

TINEIDAE.

Nepticula oritis, n. sp.

♂ 5 mm. Head and eyecaps pale whitish-yellow, antennae and thorax dark leaden-fuscous. Abdomen dark fuscous. Forewings lanceolate; blackish; a rather broad little oblique shining white fascia beyond middle: cilia grey. Hindwings and cilia grey.

Phagu, Simla Hills, 9,000 feet, in May (Annandale); one specimen, in fine condition.

Orostega chalcophylla, n. sp.

♂ ♀ 7-10 mm. Head and eyecaps shining whitish, sometimes ochreous-tinged, antennae ochreous-grey. Thorax shining bronze. Abdomen dark grey. Forewings rather broad-lanceolate; shining bronze, with greenish or purplish reflections, variable in depth of colouring: cilia pale bronzy-ochreous. Hindwings and cilia grey or dark grey.

Kurseong, E. Himalayas, 5,000 feet, in September (Annandale); Khasi Hills; six specimens.

CLADARODES, n. g.

Head smooth, with rough frontal tuft; ocelli present; tongue absent. Antennae $\frac{5}{6}$, in ♂ simple, basal joint dilated into a large oblong eyecap. Labial palpi moderate, filiform, drooping. Maxillary palpi rather long, several-jointed, filiform. Posterior tibiae

with series of bristles above. Forewings with 3 absent, 4 absent, 7 and 8 stalked, 7 to costa, 11 from middle. Hindwings under $\frac{1}{2}$, linear, cilia 6; 3 absent, 4 absent, 6 absent.

Differs from *Lyonetia* mainly by the well-developed maxillary palpi.

Cladarodes peloptera, n. sp.

♂ 7-8 mm. Head pale greyish-ochreous, face ochreous-whitish. Palpi and antennae whitish. Thorax greyish-ochreous. Abdomen grey-whitish. Forewings narrowly lanceolate, acute; glossy greyish-ochreous, with a purplish tinge: cilia pale greyish-ochreous. Hindwings grey; cilia whitish-grey.

Calcutta, at light, in June (Paiva); N. Coorg, 3,500 feet, in September (Newcome); three specimens.

Opogona chalinota, n. sp.

♂ ♀ 7-10 mm. Crown and thorax dark bronzy-fuscous, fillet, face, and antennae ochreous-white. Palpi ochreous-white, second joint with a dark fuscous streak externally on upper half from base to near apex. Abdomen dark fuscous. Forewings lanceolate; dark fuscous-bronze; a white line crossing wing about $\frac{2}{3}$; a whitish-ochreous apical spot: cilia fuscous, round apex whitish-ochreous. Hindwings dark grey; cilia grey.

Puri, Orissa coast, in October (Annandale); Pusa, Bengal, bred in March from larvae feeding in dry stems of *Polypodium quercifolium* (Lefroy); Colombo, Ceylon, in August (Green); five specimens.

Opogona percnodes, n. sp.

♂ ♀ 12-15 mm. Head, thorax, and abdomen dark purplish-fuscous, fillet and face shining pale whitish-ochreous. Palpi ochreous-whitish, externally dark fuscous. Antennae fuscous, beneath whitish-ochreous. Forewings lanceolate, acute; glossy dark fuscous, with purplish-bronzy reflections: cilia dark fuscous. Hindwings dark fuscous, faintly purplish-tinged; cilia dark fuscous.

Kurseong, E. Himalayas, 5,000 feet, from July to September (Paiva); Maskeliya, in May (Pole), Diyatalawa, in August (Fletcher), Ceylon; eight specimens.

Opogona flavofasciata, Stt.

Calcutta, in June and September (Paiva).

Ereunetis xenica, Meyr.

Calcutta, at light, in August (Annandale).

Monopis sertifera, n. sp.

♂ ♀ 12-13 mm. Head and thorax yellow, palpi, patagia, and abdomen dark fuscous. Forewings elongate, rather narrow,

costa moderately arched, apex obtuse, termen somewhat rounded, oblique; 9 and 10 short-stalked; dark purplish-fuscous mixed with blackish, strewn with small leaden-bluish dots; a suffused round subhyaline spot in middle of disc; an irregular bright yellow streak along dorsum from base to tornus, edge emarginate beneath discal spot; a bright yellow blotch beyond discal spot, almost reaching costa; an irregular bright yellow apical spot extending along upper half of termen, more or less produced anteriorly into irregular streaks on lower part of wing; all these yellow markings are more or less edged with ferruginous suffusion: cilia bright yellow, on costa dark fuscous, except towards apex. Hindwings bronzy-grey; cilia whitish-grey.

Kurseong, E. Himalayas, 5,000 feet, in September (Annandale); Khasi Hills; four specimens.

Monopis dicycla, Meyr.

Bred from larvae destroying woollen cloth, Calcutta, in September (Annandale).

Tinea fuscipunctella, Haw.

Kurseong, 5,000 feet, in July (Annandale); Dharampur, Simla Hills, 5,000 feet, in May (Annandale).

Tinea pachyspila, Meyr.

Trivandrum, Travancore, in November (Annandale).

Tinea nestoria, n. sp.

♂ 17-19 mm. Head and antennae yellowish-white. Palpi dark fuscous. Thorax rather dark purplish-fuscous. Abdomen pale brassy-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; pale greyish-ochreous, more or less tinged and sprinkled with fuscous; base suffused with dark fuscous, extending as a narrow streak along costa to $\frac{2}{3}$; a small undefined spot of dark fuscous suffusion on end of cell: cilia light ochreous, sometimes tinged with fuscous, more whitish towards tips. Hindwings grey, with brassy-yellowish and purplish reflections; cilia grey-whitish, sometimes infuscated towards base.

Phagu, Simla Hills, 9,000 feet, in May (Annandale); Dalhousie, Kashmir, in May; two specimens.

Pylactis mimosac, Stt.

Calcutta, at light, in July (Annandale). I have now ascertained that *seminivora*, Wals., and *ophionota*, Meyr., are both synonyms of this.

TROPHIMAEA, n. g.

Head loosely rough-haired; ocelli present; tongue absent. Antennae $\frac{1}{2}$, in ♂ moderately ciliated, basal joint clothed with long dense hairs projecting in front in a broad tuft. Labial palpi moderate, porrected, clothed with long rough projecting scales beneath, second joint with several projecting lateral bristles. Maxillary palpi obsolete. Posterior tibiae clothed with long hairs. Forewings with 1b furcate, 2 rather remote from angle, 3 and 4 connate from angle or 4 absent, 7 absent, 9 absent, 11 from or beyond middle. Hindwings $\frac{3}{4}$, ovate-lanceolate, cilia $1\frac{1}{2}$; 2-7 separate, parallel, or 4 and transverse vein between 3 and 6 sometimes absent.

Trophimaea arenatella, Walk.

Kurseong, E. Himalayas, 5,000 feet, in September (Annandale).

Sapheneutis crocotricha, n. sp.

♂ 14-17 mm. Head with tolerably appressed scales, ochreous-yellow, face sometimes mixed with fuscous. Palpi short, loosely scaled, yellowish mixed or suffused with dark fuscous. Antennal ciliations 2. Thorax and abdomen dark fuscous. Forewings elongate, moderate, costa moderately arched, apex obtuse, termen somewhat rounded, oblique; 8 and 9 stalked; purplish-fuscous, suffusedly and indistinctly strigulated with darker fuscous, veins and costa darker-suffused: cilia purplish-fuscous, sometimes with pale greyish-ochreous basal line. Hindwings rather dark fuscous, purplish-tinged; cilia light ochreous-fuscous, basal half suffused with purplish-fuscous.

Kurseong, E. Himalayas, 5,000 feet, in July (Annandale); N. Coorg, 3,500 feet, in November (Newcome); two specimens.



XXIII ON SOME AQUATIC OLIGOCHAETE
WORMS COMMENSAL IN *SPONGILLA*
CARTERI

By J. STEPHENSON, M.B., D.Sc. (Lond.).

I recently received from Dr. Annandale, of the Indian Museum, a specimen of a form of *Spongilla carteri*, Bwk., taken at Bheemanagar, Travancore, and sent by the authorities of the Trivandrum Museum to Calcutta. The specimen was stated to contain a number of aquatic Oligochaeta, and it was these which I undertook to examine.

The worms were found to be very numerous; they could be obtained in numbers by teasing any small fragment of the sponge, and could be picked out from the disintegrated portions of the sponge at the bottom of the bottle.

Thirty-eight specimens taken at random were prepared and mounted for microscopic examination; some were mounted unstained in glycerin and potash, some unstained and some stained in balsam. A first inspection showed that there was one specimen of *Pristina longiseta*, Ehrbg., and that all the rest belonged to the genus *Nais*.

As was to be expected, a certain number of the specimens were distorted in shape, and others had their dorsal setae entirely or almost entirely broken off. The rest were classified under the high power into three groups, as follows:—

- (i) Forms without eyes, with obviously forked needles in the dorsal bundles.
- (ii) Forms without eyes, with dorsal needles showing only a very fine forking, or in which forking was not evident.
- (iii) Forms with eyes.

All the individuals of groups (ii) and (iii), and a number of those of group (i) (which were the most numerous), were submitted to detailed examination with the oil immersion lens.

As is well known, the usual mode of reproduction in the Naididae is the asexual, by fission. Sexual reproduction seems, in the majority of forms, to take place only at certain seasons of the year, and is comparatively rare; consequently the sexual organs have as yet been described only in a minority of the forms included in this family. It can hardly be doubted that descriptions of these organs, if they could be obtained, would give very great help in the task of discriminating the various species.

Signs of asexual multiplication were found frequently enough in the present specimens. There were no chains of two or more still unseparated animals; but a number of the individuals examined had evidently been recently separated, as shown by the blunt or square, sometimes obviously lacerated prostomium, and the small size of the ventral setae of segments ii—v; these last, it may be said, are new productions in the zone of budding, and hence are when first developed smaller than those of the segments posterior to them.

But unfortunately none of the specimens examined in the present instance showed any sign of sexual organs; and it is necessary therefore to fall back on other structures, and specially on the characters of the setae, in order to find marks capable of being used for purposes of diagnosis. As a matter of fact the current diagnoses of the known species of this and many other genera of the family are still based very largely on the setae; and the following accounts, though necessarily incomplete, have therefore the merit of affording a possibility of comparison with previously described forms.

The association between the worms and the sponge may be called a commensalism. A similar phenomenon has been recorded by Annandale (*Journ. and Proc. As. Soc. Bengal*, N.S., Vol. II, No. 5, 1906), who found a *Chaetogaster* (*C. spongillae*) living in association with *Spongilla carteri* in Calcutta; in this case the commensal was only found in those parts of the sponge which had been killed or were dying, the healthy growing parts being quite free from them; Annandale accordingly supposes that it feeds on the organic debris left by the decay of the sponge. This supposition appears to be not improbable, since *Chaetogaster* is carnivorous,—exclusively carnivorous as far as I have observed the genus, I think; though Annandale (*Journ. and Proc. As. Soc. Bengal*, N.S., Vol. I, No. 4, 1905) speaks of having received from England a specimen in which the food probably consisted of diatoms and the like. The advantage to the *Chaetogaster* of a copious food-supply is obvious; there may also (Annandale, *l.c.*) be an advantage to the sponge in the liberation of the gemmules by the worm.

So far as I have observed, however, the other genera of the Naididae are pure vegetable feeders, and hence the advantage which the forms now under discussion receive from association with the sponge would appear to be rather that of protection; whether the advantage is altogether on their side, or whether they contribute anything in return, I am unable to say.

Of the species of *Nais* described below, one (*N. pectinata*) is undoubtedly new; but with regard to the others the question is not so simple. The form with eyes resembles very closely that described by me (*Memoirs Ind. Mus.*, Vol. I, No. 3) as *Nais variabilis*; Piguet, var. *punjabensis*. At the time when I described this form, however, I had not studied the genital apparatus, nor had Dr. Piguet published his account of the genital organs in

N. variabilis. These gaps have since been filled up (Piguet, *Rev. Suisse de Zool.*, Tome 17, Fasc. 1, 1909; Stephenson, *Rec. Ind. Mus.*, Vol. V, part 1); and Dr. Piguet, who has himself examined specimens of both forms, has (*loc. cit.*, p. 200) come to the conclusion that my worm should be called *N. communis*, Piguet, var. *punjabensis*. I accept Piguet's conclusion, and shall, therefore, refer to the form in what follows under this latter name.

The remaining specimens have no eyes, but here again there is an almost complete agreement in the characters of the setae with the last form and with the Punjab variety of *N. communis*. The question then is whether the presence or absence of eyes is of itself of specific value; and this point, as will be seen below, I have decided in the negative, giving this form varietal rank only, as var. *caeca*. I may add that *Nais bretscheri* is also described as having or as wanting eyes.

It is, however, noteworthy that specimens with well developed eyes and others in which they are completely absent should be found in such close association. It is at first sight tempting to suppose that, as in so many cases throughout the animal kingdom, so here, the exposure to light stimulates pigment formation and a life in darkness suppresses it; the eyes of the Naididae are mere pigment spots, and hence on this supposition it would be those specimens which inhabited the superficial parts of the sponge which developed eyes, and those which lived in its deeper parts which failed to do so. It seems to me rather doubtful, however, whether the conditions in an ordinary mass of *Spongilla carteri* would be so different at the surface and in the interior; and also whether the worms are so entirely sedentary as would be implied on this hypothesis.

I have added, for purposes of comparison, a description of the setae of what I regard as a typical specimen of *N. communis*, var. *punjabensis*, from Shalimar Gardens near Lahore, which I examined during the course of the present investigation in order to satisfy myself of the amount of similarity or difference between these several forms.

Pristina longiseta, Ehrbg.

One specimen only was seen. This was an extremely well marked example; the 'proboscis' measured .175 mm. in length, while one of the characteristic elongated dorsal setae of the third segment was over half a millimetre (.54 mm.) in length, and thus reached far beyond the extremity of the proboscis.

It seems doubtful whether this animal could have been living within the sponge. The enormously elongated setae just mentioned could there have had no free play; they would have much impeded the animal's movements, and would probably very soon have been broken off. The fact that only one example out of thirty-eight was of this species is also, I think, significant. This one specimen was not improbably merely crawling on the surface of the sponge at the time it was taken.

Nais pectinata, sp. nov.

The greater number of specimens belong to this species; they are those which were at first separated from the rest by the obvious forking of the dorsal needles.

On examination with the oil immersion lens, however, I was surprised to find that these setae had an entirely different form from what I had supposed. Instead of being simply forked, they were in all cases ctenate, the two prongs at the sides being the strongest, and the interval between them being filled in by a number of extremely fine points, two, three, four, or five in number. It was these intermediate points which had not been detected with the ordinary high power (Zeiss DD, oc. 6); with this degree of magnification the outermost prongs are alone visible, and hence the setae appear to be bifurcate at their extremity. It is not always possible to count accurately the intermediate prongs even with $\frac{1}{12}$ in. oil immersion and compens. oc. 6, and recourse to a 12 oc. is sometimes necessary.

Such a form of dorsal needle has not hitherto been described in the genus; so far as I know, indeed, this type of seta has not previously been met with in the family, and the nearest approach would seem to be the fan-shaped dorsal needles of *Dero tonkinensis*, Vejd. It would therefore appear to be a character of quite sufficient importance to justify the erection of a new species.

The description of the animal is as follows:—

Length of single individual (preserved specimen) about 2 mm. *Prostomium* well marked, conical with rounded tip. No eyes. *Segments* 27—31.

The *buccal cavity*, in segment ii, is narrow and tubular; the pharynx, which succeeds it, extends from segment iii to iv.

The *cerebral ganglion* appears to be deeply bifid both in front and behind; it is broader from side to side anteriorly than posteriorly.

The *ventral setae* are of the usual type, and are differentiated into two groups, those of segments ii—v, and those posterior to these.

Those of segments ii—v are regularly 3 per bundle, are about $56\ \mu$ in length, and have a markedly thinner shaft, with its proximal portion less strongly curved than those of the posterior segments. The distal prong is $1\frac{1}{4}$ times as long as the proximal, but this latter is the thicker,— $1\frac{1}{2}$ to twice as thick as the former at its base; both prongs are slightly swollen near their bases. The nodulus is proximal to the middle of the shaft, the relations of the distal and proximal portions of the shaft being 4 : 3; the swelling of the nodulus is equal on both sides of the shaft (fig. 1a).

The posterior ventral setae are sometimes 2, often 3, not unfrequently 4, and occasionally 5 per bundle. In length they are 51 — $56\ \mu$, the latter, longer measurement being that of setae towards the hinder end of the body. The shaft is thicker, and its

curve proximal to the nodulus is more marked, than in the anterior group of setae. The distal and proximal prongs of the fork are equal in length, the proximal being 2 or $2\frac{1}{2}$ times as thick at its base as the distal, and both having a slight swelling near their base. The nodulus is equal on both sides of the shaft, and is situated distal to the middle in the proportion proximal : distal :: 5 : 4. (Pl. xi, fig. 1b).

The *dorsal setae* are regularly arranged in bundles of one hair and one needle-seta. On one occasion a bundle of three was seen, composed of two needles and one hair. They begin in segment vi. The *hairs* are smooth, in length nearly or quite equal to the diameter of the body. The *needles* have a length of $56\ \mu$; the shaft is straight except in its distal third, where it is slightly sickle-shaped; the end is ctenate, the outer prongs on each side are the strongest, the intermediate prongs are fine, and 2, 3, 4 or 5 in number; some irregular forms were seen (fig. 1d.e.f.). The nodulus is rather a slight angle in the shaft than a distinct swelling; it occurs at the junction of middle and distal thirds (fig. 1c).

Nais communis, Piguët, var. *punjabensis*.

Three specimens were observed.

In *length* they were about 2 mm. *Segments* of the one perfect specimen 26. The *prostomium* appeared shorter and more rounded than in the previous species, or than in perfect specimens as met with in Lahore; but I do not lay any stress on this, since this part may have been contracted in these specimens, or, which I think more probable, the individuals had only recently been separated,—perhaps separated spontaneously at the time of killing. The facts that, while the pharynx extended to segment v, the *alimentary canal* posterior to this showed no recognizable differentiation into oesophagus, stomach, and intestine; and that in one (stained) specimen the *brain* was much shorter from front to back than from side to side, I am inclined to explain in the same way,—i.e., by supposing that the anterior part of the body had not yet completed its full differentiation. The *eyes* were laterally situated at the level of the mouth, were of moderate size, and of a deep purple colour; there were no 'Nebenaugen.

The *ventral setae* of segments ii—v were $86\ \mu$ in length, the shaft thinner than in those of posterior segments, and only slightly curved. The distal prong of the fork was $1\frac{1}{2}$ times as long as the proximal, the latter, on the contrary, being $1\frac{1}{2}$ times as thick at its base. The nodulus was slightly proximal (proximal : distal :: 8 : 9); the swelling of the nodulus was slightly more marked on that side of the shaft which corresponds to the longer prong of the fork. (Fig. 2a.)

Posterior to segment v the ventral setae were $70\text{--}75\ \mu$ in length, with shaft moderately curved, and thicker than in the case of the anterior segments. The distal prong of the fork was very slender, only a little (up to $1\frac{1}{5}$) longer than the proximal, and

slightly swollen near its base; the proximal prong was more than twice as thick as the distal. The nodule was distinctly distal to the middle (proportions varying,—proximal : distal :: 11 : 9 or 8 : 7), and was slightly more prominent on the side of the shaft corresponding to the distal prong. (Fig. 2b.)

The number of the ventral setae per bundle was either three or two throughout.

The *dorsal setae* were of two kinds, hair-setae and needles. The hair-setae were somewhat shorter than the diameter of the animal. The needles projected very little from the surface, and were in length 54—56 μ . The shaft was straight, except for a very slight curve in its distal portion; its extremity was very finely double-pointed. The nodule was rather a slight angle on one border of the shaft than a definite swelling; it was situated at the junction of the distal and middle thirds. (Fig. 2c.)

The dorsal bundles consisted always of one hair and one needle.

Nais communis, Piguet, var. *caeca*, n. var.

These forms were more numerous than those with eyes, with which, for the rest, they closely correspond.

The *length* was about the same. *Segments* 24—27. In one example the dorsal setae began on segment v, in the rest on segment vi.

The *ventral setae* were in bundles of 2 or 3 throughout. In segments ii—v they were 80, 90, or 94 μ in length, the shaft possessing a slight double curve, and a thickness estimated as about $\frac{3}{4}$ of that of the setae in the more posterior segments. The distal prong had a slight swelling near its base, and was $1\frac{1}{4}$ times as long as the proximal, which latter was $1\frac{1}{2}$ — $1\frac{2}{3}$ as thick. The nodule was more prominent on the side corresponding to the distal prong, and was situated proximally to the middle point of the shaft (proximal to distal 8 : 9 or 9 : 10). (Fig. 3a.)

In segments from vi onwards the length of the ventral setae was 71, 81 or 87 μ ; the shaft was thicker and more strongly curved than in the anterior segments; the distal prong equal to the proximal in length, or very slightly longer, but only half, or even less, as thick at its base. The nodule, more prominent on the side of the distal prong, was distal to the middle, but its exact position was somewhat variable (proximal : distal :: 8 : 6, or 19 : 14, or 10 : 9). (Fig. 3b.)

The *dorsal setae* were regularly one hair-seta and one needle per bundle. The hairs were in length equal to about $\frac{3}{4}$ the diameter of the (preserved) animal's body. The needles were in length 53—58 μ , with a shaft in which a very slight double curve might or might not be recognizable. The extremity was finely bifurcate, the prongs short, equal in length, one thicker than the other at the base. The nodule, a slight fusiform swelling, was distally situated (distal : proximal :: 4 : 13). (Fig. 3c.)

I subjoin, for purposes of comparison, a description of the

setae of a specimen of *N. communis*, var. *punjabensis*, from Shalimar, near Lahore.

Ventral setae of segments ii—v:—length $94\ \mu$, shaft not much curved, thinner than those of the more posterior segments. Distal prong half as long again as proximal, the latter being twice as thick at its base. Nodulus equal on both sides of shaft, slightly proximal (12 : 13). Four setae per bundle. (Fig. 4a.)

In segments vi and onwards:—length $84\text{--}87\ \mu$, shaft stouter and more curved than in anterior segments; distal prong $1\frac{1}{4}$ times as long as proximal, which latter is double as thick at base; nodulus equal on both sides of shaft or slightly more marked on the side of the distal prong; distal to middle (4 : 5, or, in a more posterior segment, 11 : 16). Commonly four setae per bundle, sometimes five, or three. (Fig. 4b.)

Dorsal setae in bundles of one hair- and one needle-seta; the latter $69\ \mu$ long, the shaft slightly curved beyond the nodulus in the form of a sickle, and very slightly in the reverse direction proximal to the nodulus; finely bifurcated at the extremity; nodulus distal (3 : 8). (Fig. 4c.)

I may perhaps be permitted to add a few words in regard to this form, with reference to Piguet's criticisms in his recent paper (*Rev. Suisse de Zool.*, Tome 17, Fasc. 1, 1909). An examination of the reproductive organs has, as already mentioned, resulted in approximating this form to *N. communis* rather than to *N. variabilis*, to which latter, however, the setae of the Punjab variety show the greater resemblance. A renewed examination of the 'thorn-like projections' of the dorsal setae, and the facts that such projections may be present on the ventral setae also (though rarely), and that (in a *Pristina*, for example) they may cluster round the dorsal setae in such lengths and numbers as to give the seta the appearance of a miniature ostrich feather, has convinced me that Piguet is right in supposing them to be a cryptogamic growth.

With regard to Piguet's suspicion that there may have been more than one species or variety of *Nais* among the specimens which I used for my description,—and that my account of the variations in the dorsal setae may be due to this cause, I will not at present venture an opinion, since I have not yet had time for a renewed investigation. But I do not expect to be able to record any very large number of aquatic Oligochaeta from the environs of Lahore. With the exception of artificial tanks in pleasure gardens or in connection with manufactories, and the canal, the only body of water is the river Ravi. The artificial tanks, much to the detriment of zoological studies, undergo periodical cleansing,—I think much more frequently nowadays than some years ago; and the irrigation canal runs for a few days, and is then dry for a longer or shorter period,—hence it is useless in this connection. There are no natural freshwater ponds or pools except in the rains; and the months from October to June inclusive are (with

the exception of a few showers in January) rainless. It seems unlikely, therefore, that a large variety of forms should ever be discoverable in this neighbourhood.

I am in complete agreement with Piguet when he says, "pour distinguer sûrement les *Nais* indiennes les unes des autres, et pour établir leur rapports avec les espèces déjà connues, il faudra étudier à fond leur appareil génital." But it is improbable that any more material from the same source as that described in the present paper will reach me, and the chances, in any case, would be against its including any sexual specimens; as Piguet says, "à moins d'une chance rare, ce n'est qu'en poursuivant ses recherches pendant des années, en toute saison et dans des milieux aquatiques aussi variés que possible, qu'on peut espérer se procurer un matériel de Naïdidées sexuées permettant une étude un peu approfondie." It seemed better, therefore, to give the above descriptions as they stand.

The position, briefly, is this. *Nais communis*, var. *punjabensis*, has been shown by its sexual organs to be closely related to *N. communis*; and this is expressed by making it a variety of this latter species, though its setae have, on the whole, a greater resemblance to those of *N. variabilis*. I have examined a form with eyes from Travancore, which, as far as can be ascertained, is so similar to the above mentioned variety from the Punjab that it appears mere hair-splitting to separate them. A form without eyes also occurs along with the last, identical with it, it would seem, in every other respect, so far as can be seen from an examination of the available material. If the Travancore form with eyes is a variety of *N. communis*, then so will be this latter. But these conclusions will be subject to revision in case sexual specimens become available for examination.

EXPLANATION OF PLATE XI.

- FIG. 1. *Nais pectinata*, sp. nov.
 a, Ventral seta of anterior segments (ii—v) ; *b*, ventral seta of posterior segments ; *c*, needle-seta of dorsal bundles ; *d*, *e*, *f*, irregular forms of needle-setae of dorsal bundles.
- FIG. 2. *Nais communis*, Piguet, var. *punjabensis*, from Bheemanagar, Travancore.
 a, Ventral seta of anterior segments (ii—v) ; *b*, ventral seta of posterior segments ; *c*, needle-seta of dorsal bundles.
- FIG. 3. *Nais communis*, Piguet, var. *caeca*.
 a, Ventral seta of anterior segments (ii—v) ; *b*, ventral seta of posterior segments ; *c*, needle-seta of dorsal bundles.
- FIG. 4. *Nais communis*, Piguet, var. *punjabensis*, from Lahore, for comparison with fig. 2.
 a, Ventral seta of anterior segments (ii—v) ; *b*, ventral seta of posterior segments ; *c*, needle-seta of dorsal bundles.

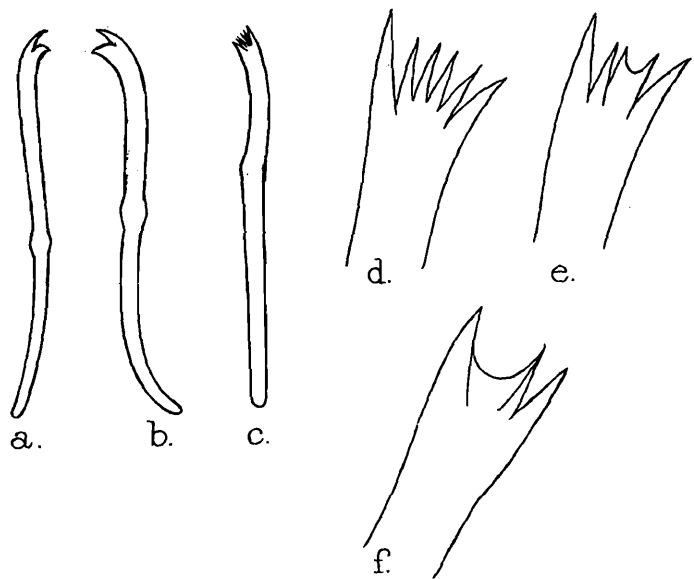


Fig. 1.

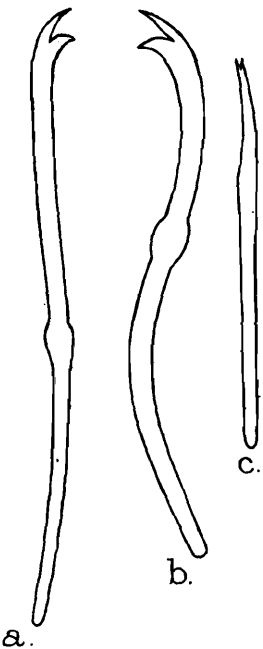


Fig. 2.

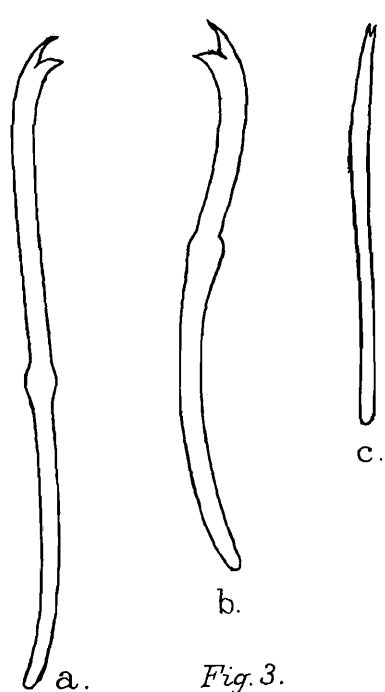


Fig. 3.

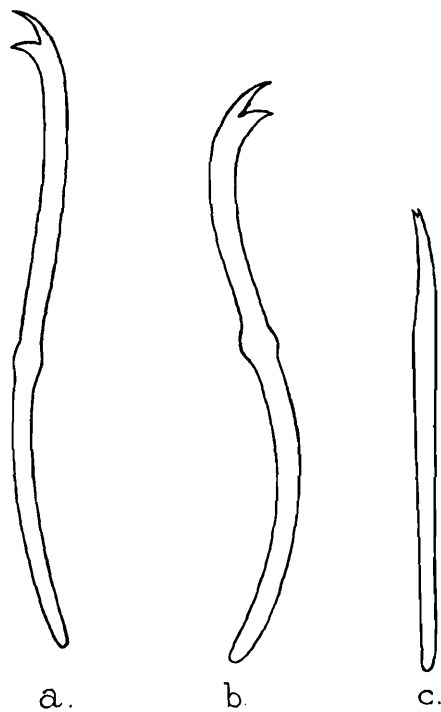


Fig. 4.

XXIV. ON *BOTHRIONEURUM IRIS*, BEDDARD.

By J. STEPHENSON, M.B., D.Sc. (Lond.).

I recently received from Dr. Annandale for examination a tube of worms which had been taken at Kurseong in the Eastern Himalayas. These I believe to be the species first described by Beddard from the Malay Peninsula, in 1901, as *Bothrioneuron iris*; Michaelsen subsequently examined some specimens of the same form from Kurseong.

These appear to be the only occasions on which this species has been met with; the material at the disposal of the investigator does not seem in either case to have been large in amount, since Beddard speaks of finding spermatophores in three out of six mature examples, and Michaelsen had one mature and a number of immature specimens at his command.

The collection sent to me from the Indian Museum comprised a considerable number of individuals, of which perhaps a third were sexual. I have been able to note a certain number of variations from the original description; and it seems worth while therefore to add the following short account to the existing literature of this form

Bothrioneurum iris, Beddard.

1901 *Bothrioneuron iris*, Beddard, *Proc. Zool. Soc. Lond.*,
1901, vol. i, p. 81.

1909 *Bothrioneurum iris*, Michaelsen, *Mem. Ind. Mus.*,
vol. i, No. 3, p. 135.

The present specimens were whitish in colour in the preserved condition; after transference to oil of cedar preparatory to examination by transparency or imbedding, the posterior half of a number of specimens was darker than the anterior, in fact was blackish.

The longest specimens measured about one inch; the worms were moderately stout. Annulation distinct. A number of epizoic Ciliata, not unlike *Spirochona* in general form, were attached to a number of individuals, perhaps to most, near their posterior end.

Segments about 64. Prostomium semicircular. The surface of all the individuals shows a number of blisters, or raised patches of epithelium, probably due to the method of fixation (Perenyi's fluid).

Setæ. Both dorsal and ventral series are of the same type, double-pronged and doubly curved in the usual $\int$ -shape: both

begin in segment ii. Their average length is about .087 mm.; the longest measured was .094 mm. The prongs of the fork are at a wide angle to each other, the distal being usually, not always, the longer, about $1\frac{1}{2}$ times as long as the proximal; the proximal however is the thicker, $1\frac{1}{2}$ times as thick as the distal prong at its base. There is a nodulus, which is situated distal to the middle of the shaft; its exact position varies only slightly, the proportions between the length of the shaft proximal and distal to the nodulus being about as 5:3. The number of setæ per bundle varies from three to six in the anterior part of the body, and in the posterior is regularly two per bundle. There are no ventral setæ on the segment which bears the male aperture (xi or xii). An examination in balsam of the specimen with five spermatophores, referred to below, seems to show that the dorsal setæ of segment xi (that of the male aperture) are small and singly pointed.

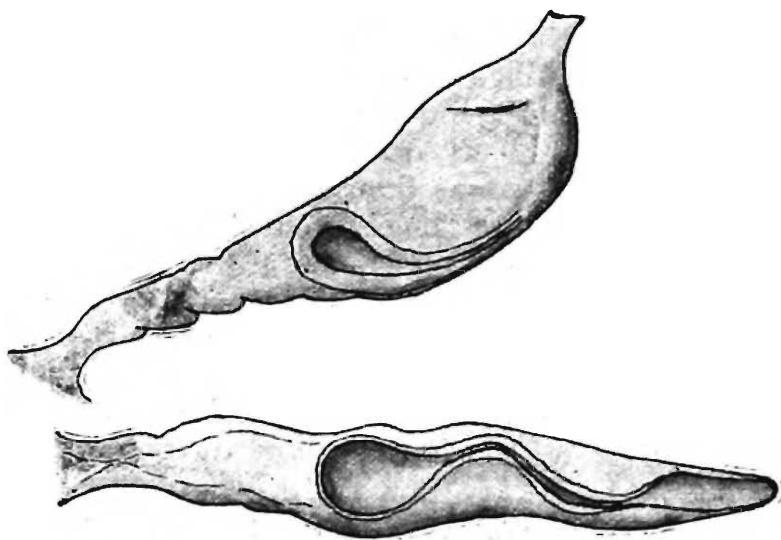


FIG. 1.—Two spermatophores from the same individual, showing their deformations when empty.

The *sensory depression* on the prostomium has the characters described by Beddard; it is variable in position, and may be nearly terminal.

The *clitellum* varies in position. It may be on segments xi and xii, or on xii and xiii.

The *male aperture*, single, median and ventral, varies in position with the clitellum; it is on xi or xii, accordingly as one or other of these is the first segment of the clitellum. In one case the clitellum extended over $\frac{1}{2}$ xi, xii, and xiii; ventral setæ were present on xi, and therefore the male pore was probably on xii, though owing to distortion at this place it could not be actually seen.

The setal distribution on these segments varies, as already said, according to the position of the male aperture, ventral setæ being always absent from the segment in which this occurs. They

appear to be sometimes absent in the following segment also ; thus in a specimen with no ventral setæ in xi, there was on one side in xii one seta only, and on the other side none ; while in another case none could be distinguished in either xi or xii.

The *spermatophores* characteristic of the genus are present on some, not all, sexual individuals. They have the general form described by Beddard ; when empty, many, indeed nearly all, exhibit a characteristic deformation (fig. 1). Such spermatophores appear at first sight to have a large pear-shaped opening on one side, the broad end of pear being towards the attached end of the spermatophore ; the margins of this apparent opening seem to be raised and rounded. The appearance is however probably due to shrinkage, since the margin of the apparent opening may not be complete at the narrow end of the pear ; moreover, one empty spermatophore had no such appearance of a lateral rent ; and in one case an open mouth was distinctly seen at the distal end of the spermatophore. The spermatozoa therefore probably escape from the free end of the spermatophore, and, as Beddard previously concluded, arguing from the solid nature of the stalk, hypodermic impregnation is improbable.

The spermatophores may occur singly, or may be present in larger numbers ; I counted as many as five in one specimen, and two on several occasions. They are found on the clitellar segments, often in or near the intersegmental groove behind the male aperture. I have never seen any on the ventral surface, *i.e.*, within the ventrolateral ridges which give this part of the body a triangular appearance in transverse section ; they are, for example, all dorsal or dorso-lateral in the specimen with five spermatophores already referred to. With one exception, all spermatophores seen were empty.

The female apertures are small openings in the intersegmental furrow behind the male aperture.

Reproductive organs. The testes spring from the junction of the septum and the ventral body-wall. The sperm funnels are small. The first part of the conducting apparatus is contained in a forward bulging of the septum on each side, so that this part of the tube is at the same actual level in the animal's body as the testis in the preceding segment, and the testis may appear wedged in between the winding vas deferens on the outer and the intestine on its inner side. The vas deferens is divisible into two regions, of which the characters and relations are as described by Beddard.

The atrium (spermiducal gland) differs a little from the previous description of *B. iris*. The typical condition, as illustrated by several series of sections, appears to be as follows :—the first part is a well defined tube, without the thick investment of peritoneal cells which clothes the vas deferens ; it is circular in transverse section and gradually widens, having on the whole a somewhat fusiform shape ; its epithelium consists of numerous layers of close-set cells, the inner ones being columnar ; the cells are very finely granular, and the cytoplasm stains equally. The next

part reaches to within a short distance of the aperture; the epithelium is columnar, the cells are in a single layer, and the lining has a ragged appearance, due to the fact that the inner portions of the cells are not in contact with each other; these cells are mucous cells, their bodies being for the most part clear

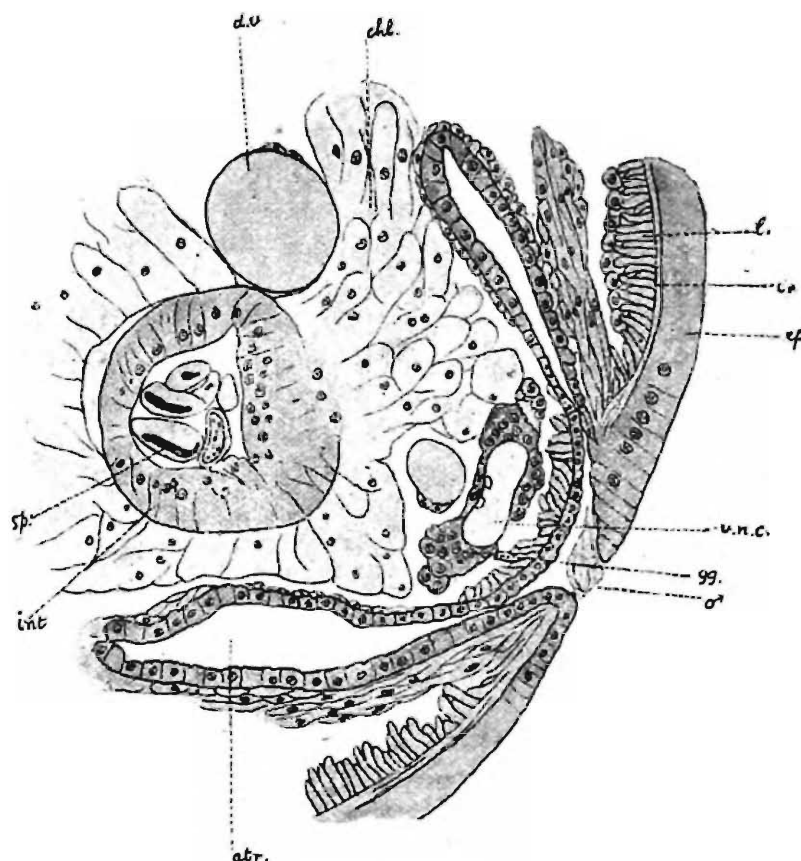


FIG. 2.—Part of a transverse section passing through the male aperture. The character of the epithelium lining the last part of the atrium, the flattening of the nerve cord in this region, its 'Neurochordröhrchen', the great bulk of the chloragogen cells, and the Sporozoa in the alimentary tract (the nucleus of one individual has broken up), are illustrated. The ventral vessel is the structure just dorsal to the nerve cord.

Zeiss's drawing apparatus, obj. DD, oc. 6.

Atr., atrium; *c.*, circular muscular layer; *chl.*, chloragogen cells; *d.v.*, dorsal vessel; *ep.*, surface epithelium; *gg.*, nerve ganglion cells; *int.*, intestine; *l.*, longitudinal muscular layer; *sp.*, sporozoa in intestine; *v.n.c.*, ventral nerve cord; ♂ male aperture.

and non-staining, and masses of a clear secretion are cast out into the lumen; the walls of the tube are thinner than those of the first part, and its outline is far less regular,—not only internally, owing to the ragged nature of the lining, but externally also, since a number of small diverticula are given off from it; these diverticula are lined by a similar epithelium to that of the tube

itself. The paratrium, which is small, egg-shaped, without a cap of peritoneal cells, and possesses a hardly distinguishable lumen, arises from this portion of the tube a little beyond the end of the first part; its mouth is invaginated into the atrium. The last part of the tube, comprising only a short extent near the male aperture, is lined by a cubical or even slightly flattened epithelium (fig. 2).

I am, however, doubtful if there is any such sharp division between the character of the cells of the first and second parts of the tube as is indicated above. In one of the series of sections, the cells of the first part of the tube, as well as the second, are mucous-looking cells, in appearance very similar to those of the clitellum in the same specimen; and the cells of the second part of the tube are close-set like those of the first part, and not ragged in appearance. The differences may, therefore, be due to differences in the functional activity of the cells.

The ovaries are in the segment succeeding the testes. The female apertures have already been mentioned. The egg funnels, in the only specimen in which they were identified, are small, and the oviducts short and narrow. There are no spermathecae.

With regard to the other systems, the following remarks may be made. The *alimentary canal* shows very little differentiation from mouth to anus; in segment i what may be called the buccal cavity is lined by a flattish epithelium; this is succeeded by columnar cells in segment ii; in segments ii and iii the cells are higher than elsewhere, and this portion may be called the pharynx; a few muscular fibres radiate backwards in these segments, attaching the pharynx to the bodywall, and reaching the parietes in segments iii and iv. Masses of gland cells are present in connection with the alimentary canal in segments iii, iv and v. Two of the most striking features in sections are the enormous parasitization of the anterior part of the alimentary canal by large sporozoa, and the great bulk of the chloragogen cells around the alimentary tube; these latter begin in segment iv (*cf.* fig. 2).

I have, in agreement with Beddard, failed to find any system of *cutaneous capillaries*. The atria unite in the middle line underneath the *nerve cord*, as described by that author; the nerve cord is here very considerably flattened in a horizontal direction; it contains, in the anterior part of the body, a tubular cavity (Neurochordröhrchen), which is double in the genital region, and may be so elsewhere (fig. 2).

The original diagnosis of *B. iris*, as given by Beddard, runs as follows:—Male pore single and median on xii. Clitellum xii, xiii. No integumental vascular system. No genital setae. Spermatophores present to the number of one.

It will be seen that the present specimens do not conform to this diagnosis, since (i) the male pore is not invariably on xii; (ii) nor is the clitellum invariably on xii—xiii; and (iii) the spermatophores may be as many as five. Further differences are found in (iv)

the number of setæ in a bundle,—not more than four in Beddard's specimens, sometimes as many as six in mine ; (v) the position of the spermatophores,—not round the male generative pore, but on the dorsal and dorsolateral surfaces of the clitellar segments ; (vi) some histological differences in the male efferent apparatus.

It may therefore seem hazardous to include these specimens in the same species with those formerly described. I do so however for the following reasons :—

(a) The species is already known to be a variable one. This is illustrated by the variations in the position of the sensory depression on the head. It is also illustrated by the fact that in the single specimen recently examined by Michaelsen, which he had no difficulty in assigning to this species, the male aperture was on the xi, and the clitellum on the xi and xii segments ; and it is interesting to note that Michaelsen's words, "I think this dislocation (*i.e.*, the dislocation backwards of male organs and clitellum in Beddard's specimens) an abnormality without systematic importance," are supported by the finding of both modes of disposition in the one batch of specimens examined by me. And further, the variable nature of this form comes out in the difference in shape of the spermatophores as found by Beddard and Michaelsen respectively.

(b) As noted above, the number of specimens at the disposal of previous investigators appears to have been small. It is therefore not impossible that the examination of a larger number of individuals would have revealed variations similar to those recorded in the present paper, which would have necessitated a widening of the specific diagnosis.

(c) I have of course also been influenced by the fact that my specimens come from Kurseong,—the identical place from which those submitted to Prof. Michaelsen were taken.

I have in conclusion to offer my thanks to Dr. Annandale for affording me the opportunity of examining this interesting form.



XXV. NOTES ON NUDIBRANCHS FROM THE INDIAN MUSEUM.

By SIR CHARLES ELIOT, K.C.M.G., F.Z.S., Vice-Chancellor
of the University of Sheffield.

The following notes deal with some nudibranchs kindly sent to me for examination by Dr. N. Annandale, Superintendent of the Indian Museum, Calcutta. Many of the specimens are of some age and so discoloured and distorted that it hardly seems profitable to describe them. They indicate, however, that the genus *Pleurophyllidia* (or *Linguella*) is abundant in Indian waters. The specimens noticed here are in good condition, and the characters of the new species appear to be certain. Both these species are connecting links which bridge over the differences dividing recognized genera, and indicate, like so many nudibranchs discovered in the last decade, that these genera have been too rigidly defined.

The collection also contains specimens which, though in a poor state of preservation, appear to belong to *Pleurobranchæa morula*, Bergh. This form also is of interest as a connecting link, for though it has most of the characters of *Pleurobranchæa*, the dorsal parts are clearly separate from the foot and overhang it, much as in *Pleurobranchus*.

The species described below are :—

1. *Linguella quadrilateralis*, Bergh.
2. *Cuthona annandalei*, sp. nov.
3. *Thordisa annulata*, sp. nov.
4. *Doris* (*Staurodoris*) *pustulata*, Abraham.
5. *Chromodoris albo-pustulata* (?), Pease.

Linguella quadrilateralis, Bergh.

See Bergh ; Anat. Unters. af *Sancara quadrilateralis*, *Naturh. Tidsskr.*, 1863, pp. 484—538, and Malac. Unter. in Sempers Reisen, Heft vi, pp. 266—268.

Two specimens from the Andamans, the largest 39 mm. long and 14 mm. broad. The shape is squarish and clear-cut. The ground colour in both is brownish green, marked in one with light longitudinal lines, and in the other with small white spots, arranged in fairly regular rows. This variation between stripes or ridges and spots or tubercles arranged in rows is found in other Phyllidiidæ. The rhinophores are whitish with green perfoliations. The lateral lamellæ are whitish and about 30 on either side: in the

branchial cleft are about 25 white lamellæ. There is no caruncle but a few projections in front of the rhinophores.

The jaws are rather long and narrow with about 8 rows of denticles, which are especially plain on the masticatory process. The formula of the radula is about $30 \times 40 + 1 + 1 + 1 + 40$. The broad and high central tooth bears about 5 ridges and denticles on either side, and six more on the median cusp. The first tooth is low, bearing about 5 denticles on both sides. The other teeth bear about 8 denticles, decreasing in number outwards until there are only one or two. The nine outermost teeth or so are smooth.

Judging by the dentition, this appears to be the *Linguella* (*Sancara*) *quadrilateralis* of Bergh. According to his descriptions the number of denticles on the laterals varies from 32 to 8, which is an unusually wide range. But perhaps the former figure is a misprint.

The colour appears to be better preserved in these specimens than in those previously described, and it seems probable that the living animal is greenish with white dots, sometimes united into longitudinal lines.

Cuthona annandalei, sp. nov. (Plate xix.)

Three specimens were found on stones at Port Canning on the Mutlah River in the Sunderbands. A coloured drawing was made of one while still alive, and all three were examined by me in the Calcutta Museum when they had not been long in spirits. They are 70—80 mm. long and 50—70 mm. broad, including the cerata, but were probably about 1.50 mm. long when living and extended. The colours, as far as preserved, agree with the drawing.

The head is expanded into a roundish disk bearing two nearly equal pairs of simple tentacles with no trace of perfoliation. The eyes are small, but distinct and black. The foot is not angulate, but, like the head, is expanded into a disk. The tail is short and rounded.

The purplish diverticula of the liver are visible through the skin. They communicate with a distinct purple hepatic tract in the body cavity posterior to the stomach. The branches of this tract are simple and clear, as in *Tergipes*. The cerata are disposed in two divisions. The first consists of four groups lying immediately behind the rhinophores¹ and supplied from the right and left diverticula of the stomach. Then comes a gap, and behind it are 6-7 rows of cerata, the rows on the right and left hand sides not being accurately opposite to one another. There are 5-6 cerata in each row, and all are supplied from the posterior diverti-

¹ It would appear from the figure that this is not the case in the living animal, but due to contraction.

culum of the stomach. The cerata are cylindrical and moderately tapering. In the preserved specimens the swelling below the tip is less marked than in the figure (fig. 2).

The jaws are yellowish and bear a single row of distinct denticles, which have blunt, but not square, tips. In the specimen dissected the radula consists of a single row of 40 teeth, white, transparent, and in some respects resembling the type found in the genus *Aeolidiella*. There is a single, low, central cusp, and on either side of it 10—15 (rarely more) long, pointed denticles. The basal part of the tooth (fig. 3) is large and squarish, not thin and crescent-shaped as in *Aeolidiella*.

The verge is conical, and appears to terminate in a small curved process which may be a chitinous tube.

The animals spawned in captivity. The egg ribbon is white, and consists of a single simple coil.

A first view of the radula of this animal suggests that it should be referred to *Aeolidiella*, but when the teeth are separated and the broad bases become visible, the resemblance to this genus is less striking. Also in *Aeolidiella* the jaws are not denticulate. It is better, on the whole, to refer the present specimens to the group of animals described under the names of *Cratena*, *Hervia*, *Amphorina*, *Cuthona*. Its dentition is not unlike that of *Cratena bylgia*, but the number of teeth and of denticles on the teeth is larger. I have discussed the nomenclature of these forms (which have been unnecessarily subdivided into many genera) in the *Journal of the Marine Biological Association*, vii, 1906, pp. 363—366, and think that the present specimens should be called *Cuthona*. It is doubtful, in my opinion, if this genus is really separable from *Amphorina*, but that genus has usually a tapering radula, a peculiarity not found in the radula here examined.

In any case this species shows how the dentition of *Aeolidiella* may have developed out of that of *Cuthona*.

[The specimens for which this species has been founded were obtained in the Matlah River, a brackish tidal creek, at a distance of about sixty miles from the open sea. This is, I believe, the nearest approach to a freshwater locality from which Nudibranchs have yet been recorded. A sample of water taken from the Matlah at Port Canning for analysis not more than a fortnight later three years ago was found to contain 25.46 parts of soluble salts per thousand (see *Rec., Ind. Mus.*, vol. i, p. 36). The molluscs were found among some stones that have been deposited a few hundred yards below the town of Port Canning in shallow water near the left bank of the river. These stones are partially uncovered at low tide. The banks of the river are entirely composed of the dense mud that forms so persistent a feature of the Gangetic delta. The food of these Nudibranchs probably consisted of a Hydroid (? *Bimeria vestita*), with which they were associated on the stones.—F. H. GRAVELY.]

Thordisa annulata, sp. nov.

One specimen from the Andamans. It is much bent, but about 25 mm. long and 14 mm. broad. The general colour of the dorsal surface is yellowish white, diversified with strongly contrasting brown rings. The general texture is soft, and the whole dorsal surface is covered with soft papillæ, about 1 mm. high in the central area and smaller near the edges. The openings for the rhinophores and branchiæ are also surrounded by small papillæ. A certain number of dorsal papillæ have their bases enclosed by perfect or imperfect brown rings. The rest are colourless. These rings are more numerous and more regular at the sides of the visceral mass, where they form two lines on either side. They are also numerous at the anterior and posterior ends of the mantle margin. But in the mid-dorsal space they are faint and imperfectly formed. On the underside of the mantle are a few scattered deep brown spots. The branchiæ are six, tripinnate and greyish. The anterior portion of the foot is contracted, but appears to be grooved and notched. The tentacles are represented by two roundish lumps.

There is no labial armature. The radula is crowded and rather confused, but the formula is about $35 \times 50.0.50$. Most of the teeth are hamate, rather tall and thin, decreasing towards the centre, the first six or so on either side of the rhachis being quite low with long bases. At the outer ends of the rows the last five teeth are small, very transparent, and difficult to see. Often they are merely jagged or serrulate, but in some rows, at any rate, the last three teeth bear a tuft of fine hairlike denticles.

The stomach is small and lies wholly outside the liver. The œsophagus and intestine are disposed so as to form an apparent circle. The liver is of a deep chocolate-brown, but its whole surface is covered by the white hermaphrodite gland, which is deeply channeled in many places and not even.

The genitalia were rather hardened, and few details could be ascertained, but it was clear that the verge is provided with a very large and striking armature, consisting of scales bearing conical spines of considerable size as in *Platydoris*. Near the tip there are two rows of these scales only. On the lower part of the verge (and perhaps in the vas deferens) there are as many as twelve rows, but the spines are not quite so large and rather elongate.

It is not easy to fix the genus of this form, for it combines (1) rings, like those found in *Diaulula sandiegensis*, (2) pectinate marginal teeth, as in *Thordisa*, (3) a genital armature, as in *Gargamella*. I call it *Thordisa*, simply because that is the oldest of the three genera (1877), and the most likely to survive as a name, if as a result of further investigation several of Bergh's genera are amalgamated.

Doris (Staurodoris) pustulata, Abraham.

See Abraham, *Proc., Zool. Soc.*, 1877, p. 205: Basedow and Hedley, *Trans., Roy. Soc., S. Australia*, xxix, 1905, p. 151.

One specimen from the Andamans. About 60 mm. long and 23 mm. broad—colour yellowish. The branchiæ are grey and darker than the rest of the body.

Over the dorsal surface are scattered large flat warts or knobs of various sizes, and the rims of the branchial and rhinophorial pockets are protected by special tubercles. The foot is grooved: the tentacles appear to be represented by a lump on either side of the head.

There is no regular labial armature, but the labial cuticle bears a granulate stripe, which, if a little more developed, would be called a ring of short rods. The formula of the radula is about $40 \times 55.0.55$, but many of the rows are incomplete. The teeth are simply hamate and erect. The innermost and outermost are smaller, but not denticulate or degraded.

No armature was found in the genitalia.

This specimen appears to be the *D. pustulosa* of Abraham, of which Basedow and Hedley have given a coloured figure. It seems referable to Bergh's genus *Staurodoris*, but, as I have pointed out elsewhere, if the type of that genus is the *D. verrucosa* of Linnæus, then the genus ought to be called *Doris*, and *Staurodoris* can be retained as at most a subgeneric designation.

Chromodoris albo-pustulosa (?), Pease.

See Pease, *Proc. Zool. Soc.*, 1860, p. 30.

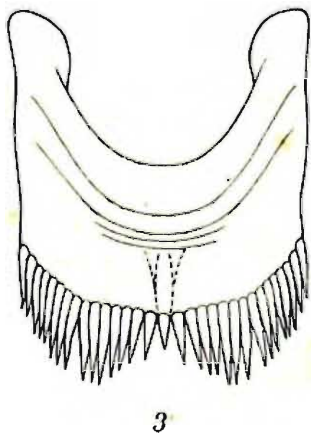
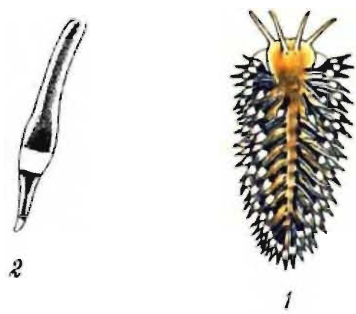
One specimen from the Andaman Islands, 15 mm. long and 5 mm. broad. It is white with traces of a darker border. The tubercles are yellowish. They are fairly numerous on the dorsal surface, especially in the middle, and there are also several in front of the rhinophores. They are flattish, about 1 mm. in breadth and .5 mm. in height. The rhinophorial and branchial pockets are not raised and are not tuberculate. The branchiæ are small and slender, 11 in number, and greyish in colour, with a white stripe on the outside of the rhachis. The tentacles are inverted. On the underside of the posterior mantle margin are eight spherical glands.

The labial armature is distinct and greyish. It consists of rods swollen at the tip and bifid. The formula of the radula is about $100 \times 40.0.40$. When looked at as a whole, it gives an impression of a great number of long denticles. The teeth are bifid with two strong prongs at the tip and 4—6 large, clear-cut denticles below

them. The three teeth nearest to the rhachis on either side are broader than the others, and the first bears at least 4 denticles on the innerside.

Several Chromodorids bearing tubercles or prominences on the back have been described, but the present specimen does not agree completely with any of them. I do not think its identification with *Chr. scabriuscula*, *verrucosa*, *nodulosa*, *pantherina*, *pustulans* or *papulosa* is justifiable, and as its appearance in life is unknown, and the other characters are not very remarkable, it seems unwise to make it the type of a new species. It is possibly the *Chr. albo-pustulosa*, which was imperfectly described by Pease, without any account of the dentition.





CUTHONA ANNANDALEI sp. nov.

XXVI. ON THE CLASSIFICATION OF THE POTAMONIDÆ (TELPHUSIDÆ).

By A. ALCOCK, C.I.E., F.R.S.

Since working at the Indian Potamonidæ, I have been able, thanks to the kindness of Dr. W. T. Calman, to look through the British Museum non-Indian Collection of these crabs, and this paper is an attempt at a synthesis of the family from data thus obtained. I say "an attempt," because a synthesis implies a complete analysis, and such an analysis in the case of the Potamonidæ involves an actual examination of every species that has been described. My justification for making the attempt is that the matter has an important bearing upon theories of geographical distribution.

Ortmann (Zool. Jahrb., Syst. x, 1897, p. 297) divides the Potamonidæ into four subfamilies, namely: (1) POTAMONINÆ, to include, *Potamon*, *Acanthotelphusa*, *Potamonautes*, *Geotelphusa*, *Paratelphusa* and *Erimetopus*; (2) DECKENIINÆ, for the unique genus *Deckenia*; (3) POTAMOCARCININÆ, to include *Potamocarcinus*, *Epilobocera*, *Hypolobocera* and *Kingsleya*; and (4) TRICHODACTYLINÆ, with *Trichodactylus* and *Orthostoma* as constituents.

Miss Rathbun (Nouvelles Archives du Mus. d'Hist. Nat., ser. 4, vi, 1904, pp. 245—247) divides the Potamonidæ into five subfamilies, namely: (1) POTAMONINÆ, embracing *Potamon*, *Potamonautes*, *Paratelphusa*, *Peritelphusa*, *Geotelphusa*, *Hydrotelphusa* *Platyotelphusa* (= *Limnotelphusa*) and *Erimetopus*; (2) PSEUDOTELPHUSINÆ, for *Pseudotelphusa*, *Potamocarcinus*, *Epilobocera* and *Rathbunia*; (3) TRICHODACTYLINÆ, for *Trichodactylus*, *Dilocarcinus* and *Valdivia*; (4) GECARCINUCINÆ, for *Gecarcinucus*; and (5) DECKENIINÆ, for *Deckenia*.

Both these systems emphasize the following points:—

(1) The isolation of the African Deckeniinæ. As I know only one of the three species (*D. imitatrix*) of the genus, I can hardly criticise this opinion further than to say that if *D. imitatrix* had come into my hands as an unknown form, I should have been inclined to regard it as a peculiarly modified *Acanthotelphusa*.

(2) The segregation of the American Trichodactylinæ. With this opinion I entirely agree. If a specimen of *Trichodactylus fluviatilis* had been brought to me as an unknown form, without any information as to its freshwater habitat, I doubt whether I should have referred it to the Potamonidæ at all.

(3) The disjunction of the American Potamocarcininæ or Pseudotelphusinæ. To this opinion I can give only a hesitating

assent. *Potamocarcinus* and its relatives seem to me to fall in with my series of *Paratelphusinae* or *Gecarcinucinae*, though they certainly have some common peculiarities of their own.

(4) The close relation of *Potamon* and *Paratelphusa*. In my memoir of the Indian Potamonidæ I have given the reasons against this association.

In Dr. Ortmann's scheme *Acanthotelphusa* is recognised as a distinct subgenus closely related to *Erimetopus*. This is, I am sure, a natural arrangement; but nothing supports Dr. Ortmann's conjecture that *Acanthotelphusa* has any specially close relation to *Potamocarcinus*.

In Miss Rathbun's scheme *Gecarcinucus* is certainly quite out of perspective. This genus, so far from being anything extraordinary, can with difficulty be dissevered from *Paratelphusa*.

For my own part I should like to eject the *Trichodactylinae* and to see *Deckenia* subordinated to the *Potamoninae*, and *Potamocarcinus* and its relatives subordinated to the *Paratelphusinae*, leaving only two subfamilies of *Potamonidæ*; but at the present moment I only propose to re-arrange Miss Rathbun's scheme slightly, and to re-characterize some of her subfamilies, as exhibited in the following synopsis and key:—

SYNOPSIS OF SUBFAMILIES OF POTAMONIDÆ.

1	{	Dactyli of crawling-legs not spinose: merus of external maxillipeds elongate, its outer border being longer than that of the ischium measured from the fork of the exopodite. Mandibular palp of three distinct joints, its terminal joint simple. Abdomen of male broadly triangular, the 6th segment when separate being several times broader than long	TRICHODACTYLINÆ.
		Dactyli of crawling-legs spinose: merus of external maxillipeds not elongate: mandibular palp of either two or three joints, its terminal joint either simple or bilobed: 6th segment of male abdomen variable, but never more than twice as broad as long	
2	{	Effluent branchial channels produced to the edge of the front, entrenching on and somewhat obscuring the epistome, cramping the antennæ, and so much contracting the antennular fossæ that the antennules fold almost longitudinally.	2

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|---|---|--|-------------------------------------|
| 2 | { | Mandibular palp of two joints, the terminal joint thickened and plumose at base, but not distinctly bilobed | DECKENIINÆ. |
| | | Efferent branchial channels not thus produced | |
| | | | 3 |
| | { | Mandibular palp of either two or three joints, the terminal joint sometimes thickened and plumose at base, but not distinctly bilobed | POTAMONINÆ. |
| 3 | | Mandibular palp of two joints, the terminal joint deeply cut into two lobes, which embrace the incisor process of the mandible | |
| | | | 4 |
| | { | Abdomen of <i>adult</i> male usually broad at base and suddenly contracted at the 5th or 6th segment: the length of the sixth segment often exceeds and seldom falls short of its distal breadth: the seventh segment is almost always either elongate-triangular or tongue-shaped | GECARCINUCINÆ (PARATELPHUSINÆ). |
| 4 | | Abdomen of adult male not abruptly contracted distally: the sixth segment is usually much broader than long, and the seventh segment is broadly triangular: male abdominal appendages heavy, with blunt, lobed ends | |
| | | | PSEUDOTELPHUSINÆ (POTAMOCARCININÆ). |

KEY TO THE SUBFAMILIES OF POTAMONIDÆ.

- | | | |
|---|--|---|
| { | Terminal joint of mandibular palp deeply cut into lobes which embrace the incisor process of the mandible between them | 1 |
| | Terminal joint of mandibular palp consisting of a single lobe (the base of which may be sometimes thickened and plumose) lying behind the incisor process of the mandible ¹ | 2 |

¹ In some of the *Potamoninæ* the thickening of the base of the terminal joint of the palp is considerable, and as the hairs that fringe the thickening hang in a tuft over the incisor process of the mandible, the whole has somewhat the appearance of an independent lobe; this condition is most manifest in *Potamonantes* and in some of the African species of *Geotelphusa*, but it is not difficult to distinguish it from the broad, heavy, overhanging lobe of, e.g., *Paratelphusa tridentata*, if the palp be removed and denuded.

- | | | |
|---|--|--|
| | { The length of the sixth abdominal segment of the adult male seldom falls short of its minimum breadth; the seventh segment is hardly ever broadly triangular | GECARCINUCINÆ (Old World; except Europe). |
| 1 | { The length of the sixth abdominal segment of the adult male is usually much less than its minimum breadth; the seventh segment is usually broadly triangular: male appendages peculiarly heavy and blunt | PSEUDOTELPHUSINÆ (New World). |
| 2 | { Merus of external maxillipeds elongate: dactyli of crawling-legs non-spinose | TRICHODACTYLINÆ (New World, chiefly S. America). |
| | { Merus of external maxillipeds not elongate: dactyli of crawling-legs strongly spinose | 3 |
| 3 | { Efferent branchial channels produced to the edge of the front | DECKENINÆ (E. Africa, Seychelles). |
| | { Efferent branchial channels not abnormally produced | POTAMONINÆ (Old World). |

Subfamily POTAMONINÆ.

In this subfamily the terminal joint of the mandibular palp is never deeply cleft into two lobes, though it may sometimes be thickened and plumose at base. The abdomen of the *adult* male is almost never abruptly contracted distally; its sixth segment is almost always much broader than long, and its seventh segment is almost always broadly triangular.

It is safe to say that the subfamily is restricted to the Old World, being represented in Europe, Africa, Asia (abundantly), the Malay Archipelago, and (doubtfully) in Australia. One species—*Potamon* (*Geotelphusa*) *chilense*, Heller—is said to have come from Chili; but both the generic determination and the locality require confirmation, for there is nothing either in the description or in the figure published that affords conclusive evidence of its position.

The diagnostic features and the broad geographical distribution of the constituent genera are shown in the following synopsis:—

SYNOPSIS OF GENERA AND SUBGENERA OF POTAMONINÆ.

1	{	Antero-lateral borders of carapace serrulate or crenulate, but not strongly laciniate or spinose, though there may be a single lateral epibranchial spine	1	
		Antero-lateral borders of carapace strongly lancinate or spinose	2	
1	{	Flagellum of exopodite of external maxillipeds strong	3	
		Flagellum of exopodite of external maxillipeds vestigial or absent		POTAMISCUS ¹ (India and China).
3	{	Post-orbital crests and lateral epibranchial spine very distinct	4	
		Post-orbital crests and lateral epibranchial spine indistinct or obsolete		GEOTELPHUSA ¹ (Asia, Malay Archipelago, Africa).
4	{	Edge of front spinulose		HYDROTELPHUSA (Madagascar).
		Edge of front entire	5	
5	{	Epigastric and post-orbital crests not continuous		POTAMON <i>subgenus</i> (Europe, Asia, Malay Archipelago, Africa).
		The epigastric and post-orbital crests of each side form an unbroken line		POTAMONAUTES ¹ (Africa).
2	{	Upper border of merus of chelipeds without a subterminal spine		PLATYTELPHUSA (L. Tanganyika).
		Upper border of merus of chelipeds with a subterminal spine or tooth	6	
6	{	Antennal flagellum and terminal joints of antennal peduncle vestigial and hidden		PARAPOTAMON (L. Yunnan Fu).
		Antennal peduncle and flagellum normal	7	
7	{	Eyes and eyestalks normal		ACANTHOTELPHUSA (Asia, Africa).
		Eyestalks somewhat tapering, eyes small	..	ERIMETOPUS (W. Africa).

¹ Subgenus of *Potamon*.

Potamon in the above synopsis refers to the subgenus only, the type of which is *P. potamios*. The species of this subgenus, as here limited, range from S. Europe, N. and E. Africa, and Madagascar, all through S. Asia, to China and the Malay Archipelago; but the subgenus is not represented in the peninsular part of India.

Potamiscus has hitherto been found only in N. E. India and Tongchuan Fu.

Geotelphusa ranges from Japan and S. Asia to N. and E. Africa. It may occur in Australia, but the only two Australian species attributed to *Geotelphusa* which I have been able to examine belong to the Gecarcinucine group *Liotelphusa*. It does not occur in the Indian peninsula, Kingsley's *Geotelphusa enodis* being, as I have lately ascertained by examination of specimens, a *Liotelphusa*.

Hydrotelphusa is peculiar to Madagascar. It is very like *Potamon*, but the thickening at the base of the terminal joint of the mandibular palp is more than ordinary prominent, and the sixth abdominal segment of the adult male is not so broad.

Potamonantes is confined to Africa; the Indian species that have been referred to *Potamonantes* belong to other groups.

Platytelphusa (= *Limnotelphusa*, Cunningham) is peculiar to Lake Tanganyika.

Acanthotelphusa is well represented both in E. Africa and S. Asia. It has not been found in the peninsular part of India.

Parapotamon seems to be restricted to L. Yunnan Fu. It includes two species—*P. endymion* and *P. spinescens*. In the former the merus of the external maxillipeds is somewhat longer and narrower than usual, and the exopodite of these appendages is non-flagellate; in the latter this is not the case. *Parapotamon* is, undoubtedly, closely related to *Acanthotelphusa*, but has the post-orbital crests almost obsolete.

Erimetopus, which is also a very near relative of *Acanthotelphusa*, is restricted to West Africa.

Subfamily DECKENIINÆ.

This subfamily comprises a single genus, *Deckenia*, with three constituent species, two of which are found in E. Africa and one in the Seychelles. The Seychelles species, judging from Miss Rathbun's figure, is a good deal unlike the other two.

No doubt the prolongation of the efferent branchial canals, which encroach on the epistome and alter the set of the antennæ and antennules, gives these crabs a peculiar appearance; but it seems to me that the ends of classification would be best served by placing *Deckenia* with the *Potamoninæ*.

Subfamily GECARCINUCINÆ.

In all the members of this large subfamily the mandibular palp is divided into two lobes, a dorsal and a ventral: the dorsal

lobe is falciform and lies behind the incisor process of the mandible; the ventral lobe, which is a broad oval plate, more or less covers the exposed surface of the incisor process. Very commonly the abdomen of the adult male is broad at base and is suddenly narrowed at the 5th or 6th segment; but, whether this is so or not, the length of the 6th segment is hardly ever less than (often exceeds) its minimum breadth, and the 7th segment is elongate-triangular or tongue-shaped—not broadly triangular.

The subfamily is restricted to the Old World, and is represented in Asia, Africa, the Malay Archipelago and Australia. All the *Potamonidæ* found in peninsular India belong to this subfamily.

It has already been mentioned that in certain *Potamoninæ* the terminal joint of the mandibular palp, when casually examined, appears to be bilobed: in any case of doubt the palp should be removed and denuded, or, better still, allowed to dry.

The following table shows the diagnostic characters of the constituent genera. The geographical distribution of the several genera cannot be stated with precision, since in the descriptions of species the points most necessary for focus are often not recorded:—

SYNOPSIS OF THE GENERA AND SUBGENERA OF
GECARCINUCINÆ.

1	{	Front in adult either not wider than or less than half again as wide as the orbit	1	
		Front in adult usually much wider than, but never less than one-and-two-thirds as wide as the orbit	2	
1	{	Lower outer corner of orbit produced into a sort of gutter		GECARCINUCUS (Peninsular India).
		Orbits normal		CYLINDROTELPHUSA (Peninsular India, New Guinea).
2	{	Upper border of merus of chelipeds with a subterminal spine ¹	3 ¹	
		Upper border of merus of chelipeds without any subterminal spine	4	
3	{	Post-orbital crests prominent		Subgenus PARATELPHUSA (Asia, Malay Archipelago, Africa).
		Post-orbital crests faint or obsolete		PERITELPHUSA (Malay Archipelago).

¹ Except in *Paratelphusa blanfordi*, a Baluchistan species with broad spooned fingers, and in a few other species which, however, can be distinguished by having the antero-lateral borders of the carapace strongly spinose.

4	{	Post-orbital crests prominent	5
		Post-orbital crests low, indistinct, or obsolete	6
5	{	Epigastric and post-orbital portions of crests either continuous or almost in line	BARYTELPHUSA ² (Asia, Malay Archipelago, Africa?).
		Epigastric portion in advance of and slightly overlapping post-orbital portion of crest	7
7	{	Exopodite of external maxillipeds strongly flagellate	OZIOTELPHUSA ² (Asia, Mauritius).
		Flagellum of exopodite of external maxillipeds vestigial or absent ¹	PHRICOTELPHUSA ² (Asia).
6	{	Exopodite of external maxillipeds flagellate	LIOTELPHUSA ² (Asia, Malay Archipelago, Australia).
		Exopodite of external maxillipeds non-flagellate	GLOBITELPHUSA ² (Asia).

Subfamily PSEUDOTELPHUSINÆ.

This subfamily is restricted to the New World.

The mandibular palp is like that of the *Gecarcinucinae*: the abdomen of the adult male is like that of the typical *Potamoninae*.

Miss Rathbun bases the subfamily on the form of the merus of the external maxillipeds, which is said to be not so broad as usual and more obliquely-cut or emarginate internal to the insertion of the flagellum, and on the reduction of the exopodite of these appendages.

As regards the form of the merus, it is very variable within the limits both of the *Potamoninae* and of the *Gecarcinucinae*.

As regards the exopodite, there are *Potamoninae* in which the flagellum is absent, and there are *Gecarcinucinae* in which not only is the flagellum absent, but also the peduncle is much reduced. More than this: in the *Gecarcinucine* subgenera *Phricotelphusa* and *Globitelphusa* there are to be found exopodites of all lengths down to less than half the length of the ischium, and in *Phricotelphusa gageii* the exopodite may be flagellate or non-flagellate on one side or on both.

If the *Pseudotelphusinae* are to be separated from the *Gecarcinucinae*, which is a questionable proceeding I think, the separation must depend on the form of the abdomen of the adult male and of its appendages.

¹ In *Phricotelphusa gageii*, a Sikkim species, a slender flagellum may be present on the exopodite of one or both sides.

² Subgenus of *Paratelphusa*.

Subfamily TRICHODACTYLINÆ.

This subfamily is South American, straggling into Central America.

To me, as to Dr. Calman, its present position in the system is not altogether satisfactory.

There is no question that the members of this subfamily are very remarkably different from all other *Potamonidæ*, in many respects: the dactyli of the crawling-legs are devoid of the characteristic spines; the merus of the external maxillipeds is quite a long joint; the postero-lateral borders of the carapace are sharply defined; and in several species the middle segments of the particularly broad male abdomen are fused. Differences so numerous, and (for Cyclometope crabs) so great, appear to me to indicate a different ancestry.



XXVII. CATALOGUE OF THE PHEASANTS, PEAFOWL, JUNGLE FOWL AND SPUR FOWL IN THE INDIAN MUSEUM

By C. W. BEEBE.

One of the most valuable helps in my work of obtaining data for a Monograph of the Pheasants has been constant study of the excellent series of skins in the Indian Museum. By the courtesy of Dr. Annandale these have been wholly at my disposal during my nine weeks of residence in India.

Finding that the collection was derived from several distinct sources, and that an inclusive catalogue was lacking, I have prepared one. This was made at the Museum during the period from March 26th to June 1st, 1910, and includes the Pheasants proper, Peafowl, Jungle Fowl and Spur Fowl. • As it may prove useful to other future students of the collection, I have submitted it for publication.

C. WILLIAM BEEBE.

INDIAN MUSEUM,

May 31st, 1910.

Galloperdix spadicea (Gmel.).

B.M.C., xxii, 261.

18129 ♂	Palni Hills, Madura Dist., Madras	W. Daly. Mus. Coll.
18458 ♂	Maddathoray, Travancore	
18125 ♂	Shevaroy Hills, Salem Dist., Madras	W. Daly. A.S.B.
1458B ♂		A.S.B.
18591 ♀	Bangalore	Mus. Coll.
18127 ♀	Palni Hills, Madura Dist., Madras	W. Daly. Mus. Coll.
18590 ♀	Bangalore	Mus. Coll.
11801 ♀	Bhoura	J Armstrong.

Galloperdix lunulata (Valenc.).

B.M.C., xxii, 263.

7083 ♂	(captive specimen)	W. Rutledge.
1457B ♂		A.S.B.
1269 ♂	Ellichpur, Berar.	W. T. Blanford.
1457D ♂		A.S.B.

18593	♂	Bangalore	Mus. Coll.
5351	♂	(captive specimen)	R. Mullick.
7269	♂	" "	W. Rutledge.
1457C	♂		A.S.B.
12058	♀	Bhutan	W Rutledge.
12059	♀	" "	" "
10859	♀	(captive specimen)	" "
4170	♀	" "	R. Mullick.
7271	♀	" "	W Rutledge.
7274	♀	" "	" "
7270	♀	" "	" "
7272	♀	" "	" "
10860	♀	" "	" "
10861	♀	" "	" "
18604	♀	Bangalore ..	.. Mus. Coll.

Galloperdix bicalcarata (Penn.)

B.M.C., xxii, 264.

25225	♂	Ratnapura, Ceylon	Purchased.
25226	♀	" "	" "

Ithagenes cruentus (Hardw.).

B.M.C., xxii, 268.

1455C	♂	" "	A.S.B.
17333	♂	(imm.) Sikkim	.. J Scully.
17934	♂	Sandakphu, Sikkim	.. W L. Sclater.
17935	♂	" "	" "
13806	♂	Sikkim	G. B. Mainwaring.
7988	♂	Darjeeling	" "
4102	♂	Yeomatong, Sikkim	W T. Blanford.
3847	♂	Katmandu, Nepal	Mus. Coll.
12056	♀	(captive specimen)	W Rutledge.
14820	♀	" "	" "
22364	♀	" "	" "
4362	♀	(no history).	" "

Tragopan satyra (Linn.).

B.M.C., xxii, 271.

17917	♂	Pindari Glacier, Kumaun	Mrs. Blissett (Oct., 1888).
7985	♂	Darjeeling	G. B. Mainwaring.
7984	♂	" "	" "
13436	♂	Kumaun Dist.	R. and A. Dept.
13437	♂	" "	" "
13590	♂	Kumaun	R. and A. Dept. (Col. Garstin).

13589	♂	Kumaun	.	R. and A. Dept. (Col. Garstin).
22146	♂	(captive specimen)		W. Rutledge.
4098	♂	Kumaun	..	Riddell Museum.
17332	♂	Nepal		J. Scully (Nov., 1877).
24980	♂	Katmandu, Nepal		J. Manners-Smith.
7260	♂	Bhutan		W. Rutledge.
1453G	♂	(imm.)		A.S.B.
24420	♂	.	.	D. Ezra.
13588	♀	Kumaun		R. and A. Dept. (Col. Garstin).
1453I	♀			A.S.B.
24983		Nepal		J. Manners-Smith.

Tragopan caboti (Gould).

B.M.C., xxii, 277.

23977	♂	(captive specimen)		W. Rutledge.
14817	♂	China		„
14818	♂	„		„
21457	♂	(captive specimen)		„
8351	♂	China		Purchased.
21347	♀	(captive specimen)	..	W. Rutledge.
14819	♀	China	.	„

Tragopan melanocephalus (Gray).

B.M.C., xxii, 273.

1452A	♂	(dismounted)		A.S.B.
4097	♀	Simla, W. Himalayas		F. Stoliczka.

Tragopan temmincki (Gray).

B.M.C., xxii, 275.

14816	♂	China		Calcutta Zool. Garden.
22908	♂	(dismounted; no history).		

Tragopan blythi (Jerd.).

B.M.C., xxii, 276.

12018	♂	Naga Hills, Assam		Calcutta Zool. Garden.
11970	♂	„ „		Capt. Williamson.
20604	♂	(imm.) Haka Hills (Chin-Lushai Hills), Northern Arakan, Burma, 7,000 ft.		O. L. Fraser.
14815	♂	Mishmi Hills, Assam		Capt. Molesworth.
1454A	♂	(mounted)		A.S.B.
10846		Mishmi Hills, Assam		C. R. Macgregor.

Lophophorus impeyanus (Lath.).

(Impeyan Moonal).

B.M.C., xxii, 278.

17330	♂	Sikkim	.	J Scully (Jany., 1876).
7987	♂	Darjeeling ..	.	G. B. Mainwaring.
24982	♂	Nepal	..	J Manners-Smith.
17329	♂	Nepal Valley .	.	J Scully (Jany., 1878).
13435	♂	Kumaun .	.	R. and A. Dept.
17919	♂	Pindari Glacier, Kumaun	.	Mrs. Blissett (Oct., 1888).
17918	♂	„ „	.	„ „
13260	♂	.	.	R. D. Oldham.
19005	♂	.	..	Purchased.
22144	♂	(captive specimen)	.	Calcutta Zool. Garden.
22145	♂	„ „	.	„ „
25065	♂	Tista Valley	.	T. Bentham.
1477E	♂	(mounted)	.	A.S.B.
14828	♂	„ Nepal .	.	Purchased.
13803	♀	Sikkim .	.	G. B. Mainwaring.
17331	♀	„ .	.	J Scully (Jany., 1876).
4132	♀	Darjeeling	.	T. R. Doucett.
24984	♀	Nepal ..	.	J Manners-Smith.
24980	♀	„	..	„
17920	♀	Pindari Glacier, Kumaun	.	Mrs. Blissett (Oct., 1888).
13587	♀	Kumaun	.	R. and A. Dept. (Col. Garstin).
4136	♀	Simla, W. Himalayas	.	F. Stoliczka.
4134	♀	Mussoorie, United Provinces	.	Miss Milman.
19006	♀	Islamabad, Kashmir	.	O. L. Fraser.
5039	♀	(no history).	.	„
638	♀	„	..	„
1477B	♀	(dismounted ; captive specimen)	.	A.S.B.

Lophophorus sclateri, Jerdon.

B.M.C., xxii, 282.

7868	♂	Sadiya, Lakhimpur Dist.,	.	W. Bryden (July, 1874).
		Assam ..	..	

Acomus erythrophthalmus (Raffl.).

B.M.C., xxii, 283.

4131	♂	Malacca	..	R. Mullick.
5038	♂	(captive specimen)	..	W. Rutledge.
814	♂	„ „	..	„
8358	♂	Penang .	..	A. Guy.

Acomus pyronotus (Gray).

B.M.C., xxii, 284.

14839	♂	(captive specimen)	W. Rutledge.
14840	♂	„ „	„

Lophura rufa (Raffl.).

B.M.C., xxii, 286.

1465D	♂	(dismounted)	A.S.B.
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Lophura ignita (Shaw).

B.M.C., xxii, 288.

12065	♂	(captive specimen)	W. Rutledge.
25203	♂	„ „	Calcutta Zool. Garden.
22081	♀	„ „	W. Rutledge.
24423	♀	„ „	Calcutta Zool. Garden.

Diardigallus diardi (Temm.).

B.M.C., xxii, 290.

1471A	♂	(Head missing)	A.S.B.
14837	♂	(captive specimen)	W. Rutledge.
14838	♀	„ „	„

Crossoptilon manchuricum, Swinh.

B.M.C., xxii, 294.

22901	♂	(no history).	
14826	♂	(captive specimen)	R. Mullick.
14827	♂	„ „	„

Gennæus albocristatus (Vig.).

B.M.C., xxii, 298.

4124	♂	Kumaun	Riddell Museum.
4123	♂	Mussoorie	Miss Milman.
4122	♂	„	„
24453	♂		Purchased.
24456	♂	.	
1470A	♂	(dismounted)	A.S.B.
4125	♀	Kumaun	Riddell Museum.
5204	♀	Simla, W. Himalayas	F. Stoliczka.
24454	♀	.	Purchased.
4121		Mussoorie	Miss Milman.
1470C	♀	(dismounted)	A.S.B.

Gennæus leucomelanus (Lath.).

B.M.C., xxii, 300.

17340 ♂	Nepal Valley	..	J Scully (Jany., 1878).
1470E ♂	(dismounted)		A.S.B.
17341 ♀	Nepal Valley		J Scully (Jany., 1878).
17342 juv.	,,		,, (Aug., 1877).

Gennæus melanonotus (Blyth).

B.M.C., xxii, 301.

13804 ♂	Sikkim	..	G. B. Mainwaring.
7178 ♂	Bhutan		W. Rutledge.
18962 Type ♂	Sikkim		A.S.B. (E. Blyth).
18286 ♂	Darjeeling		G. Masson.
8201 ♂	,, Terai		J Anderson.
13805 ♂	,,		G. B. Mainwaring (Nov., 1882).
4114 ♂	,,		H. J Elwesby.
5200 ♂	,,		J Anderson.
22159 ♂			A. R. S. Anderson.
22158 ♂			,, ,,
22160 ♂		..	,, ,,
22161 ♂			,, ,,
22155 ♂			,, ,,
22160 ♂	(mounted)		,, ,,
18287 ♀	Darjeeling		G. Masson.
4115 ♀	,,		H. J Elwesby.
22156 ♀			A. R. S. Anderson.
22157 ♀			
18963 Type ♀	Sikkim		A.S.B. (E. Blyth).
18964 ,,	juv. ,,		,, ,,

Gennæus horsfieldi (Gray).

B.M.C., xxii, 302.

19003 ♂			Purchased.
4117 ♂	Cachar, Assam		Mus. Coll.
4120 ♂	South of Irrawaddy Div., L. Burma		,,
10864 ♂	(dismounted). Naga Hills, Assam		,,
1668F ♂	(dismounted)		A.S.B.
4118 ♀	Cachar, Assam		Mus. Coll.
4119 ♀	South of Irrawaddy Div., L. Burma		
1468B ♀	Assam		A.S.B. (Major Jenkins, 1844).

Gennæus cuvieri (Temm.).

B.M.C., xxii, 203.

23681	♂	(flat skin)	..	C. T. Bingham.
23682	♀	„	„	„

Gennæus lineatus (Vig.).

B.M.C., xxii, 304.

21437	♂	juv. (captive specimen)	W. Rutledge.
1467A	♂	(dismounted)	A.S.B.
1467C	♂	„	„
4128	(?)	albino, 20 miles from Rangoon	Hon'ble A. Eden.
1467D	♀	Arakan, Lower Burma	A.S.B. (Capt. Phayre).

Gennæus oatesi (Hume nec. Temm.).

1467F	♂	(captive specimen). Barrack- pore Menagerie	A.S.B.
1467G	♀	Arakan, Lower Burma	„ (Capt. Phayre).

Gennæus andersoni (Elliot).

B.M.C., xxii, 306

2568	♂	(rectrices only)	J. Anderson (Yunnan Expedition).
18965	Type	♂ Kakhyen Hills to the East of Bhamô	„ „
25204	♂	„ „	„ „

Gennæus nycthemerus (Linn.).

B.M.C., xxii, 307.

18697	♂		Purchased.
22293	♂	(captive specimen)	W. Rutledge.
1466D	♂	(dismounted)	A.S.B.

Gennæus swinhoii (Gould).

B.M.C., xxii, 309.

18560	♂		Purchased.
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Pucrasia macrolopha (Less.).

B.M.C., xxii, 311.

1472A	♂	(mounted)	A.S.B.
19049	♂	Sayree, Pethoragurh, Kumaun, U.P.	Lucknow Museum (Mus. Coll., May, 1886).

19051 ♂	Kumaun, U.P.	Lucknow Museum.
19048 ♂	Moor Nowlee, Bhim Tal, Kumaun, U.P.	Lucknow Museum (G. Reid, June, 1886).
5205 ♂	Simla, W Himalayas	F. Stoliczka.
1477D ♂		A.S.B.
19007 ♀	Islamabad, Kashmir	O. L. Fraser.
4103 ♀	Mussoorie, U.P.	Miss Milman.
1472B ♀	(captive specimen). Barrack-pore Menagerie	A.S.B.

Phasianus shawi, Elliot.

B.M.C., xxii, 326.

17335 ♂	Yarkand	J Scully (Feb., 1875).
17337 ♂	"	" (May, 1875).
17334 ♂	Kashgar	" (Nov., 1874).
17336 ♂	Yarkand	" (Mar., 1875).
20278 ♂	near Yarkand	Yarkand Expedition, 1873-74. F. Stoliczka
20280 ♂	Yarkand	" "
20279 ♀	near Yarkand	" "
17338 ♀	Yarkand	J Scully (Mar., 1875).

Phasianus sp. (*colchicus*?)

7465 ♂	albino (captive specimen)	W Rutledge.
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Phasianus principalis principalis, Scl.

B.M.C., xxii, 325.

14307 ♂	Maruchak, Murghab, Herat	Afghan-Baluch. Commission (Capt. Yate).
14306 ♂	"	" "
14305 ♂	Chahar Shamba, Maimanah	" "
14517 ♂	Bala-morghab, Badghis	Afghan Delim. Commission.
14516 ♂	"	" "
14480 ♂	Gooldan	Purchased.
14481 ♀	"	" "
14308 ♀	Maruchak, Murghab, Herat	Afghan-Baluch. Commission (Capt. Yate).
14309 ♀	"	" "

Phasianus principalis komarowi, Bogd.

20393 ♂	Taraja-jacy	D. G. Radde (Nov., 1886).
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Phasianus elegans, Elliot.

B.M.C., xxii, 329.

9057	♂	Momien (= Tengyueh), Yunnan	J. Anderson (Yunnan Expedition).
9055	♂	„ „ „	„ „
2570	♀		
9052	♀	Momien (= Tengyueh), Yunnan	J. Anderson (Yunnan Expedition).
9053	juv.	„ „ „	„ „
9054	juv.	„ „ „	„ „

Phasianus torquatus, Gmel.

B.M.C., xxii, 331.

7573	♂	(captive specimen)	R. Mullick.
7265	♂	„ „	W. Rutledge.
7507	♂	„ „	R. Mullick.
23978	♂	„ „	O. Thomas.
14831	♂	semi-albino (captive specimen)	R. Mullick.

Phasianus soemmerringi scintillans, Gould.

B.M.C., xxii, 337.

14832	♀	(captive specimen)	Calcutta Zool. Garden.
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Calophasis humiae, Hume.

B.M.C., xxii, 335.

17914	♂	Ruby Mines, U. Burma	Capt. Daly.
25205	♂	Kanpilet	
25206	♂	(no history).	
25207	♀	„ „	

Calophasis ellioti (Swinh.).

B.M.C., xxii, 335.

14833	♂	(captive specimen)	W. Rutledge.
23694	♀	„ „	Calcutta Zool. Garden.

Syrnaticus reevesi (Gray).

B.M.C., xxii, 337.

22295	♂	China	W. Rutledge.
14830	♂	(captive specimen)	R. Mullick.
19002	♂		Purchased.
7266	♂	China	W. Rutledge.

Chrysolophus pictus (Linn.).

B.M.C., xxii, 339.

18559	♂		Purchased.
23808	♂	(captive specimen)	Calcutta Zool. Garden.
17921	♂		
18641	♂		Purchased.
22352	♂	(captive specimen)	W Rutledge.
22083	♂	(no history).	
22294	♂	China	W Rutledge.
12066	♂		
20601	♂	mounted	
23910	♀	,, (captive specimen)	Calcutta Zool. Garden.

Chrysolophus amherstiae (Leadb.).

B.M.C., xxii, 342.

11006	♂	(captive specimen)	W Rutledge.
14836	♂	,, ,,	R. Mullick.
1476A	♂	(imperfect skin)	A.S.B. (B. H. Hodgson, 1843).
12068	♀	(captive specimen)	W Rutledge.
12067	♀	,, ,,	,,
9059	♀	Momien (= Tengyueh), Yunnan, 6,000 ft.	J Anderson.

Catreus wallichii (Hardw.).

B.M.C., xxii, 317.

1473C	♂	mounted	A.S.B. (1847).
4129	♂	Kumaun, U.P.	Riddell Museum.
19052	♀	Pethoragurh, Kumaun, U.P.	Lucknow Museum (Nov., 1885).
19053	♀	Garhwal, ,,	Lucknow Museum (J S. Campbell, March, 1888).
1473B	♀	.	A.S.B. (Capt. Thomas, 1845).
4130	♀	Darjeeling (probably incorrect locality)	T. R. Doucett.

Gallus gallus (Linn.).

B.M.C., xxii, 344.

5209	♂	Darjeeling	J Anderson.
4108	♂	,,	.
18921	♂	Gaya District, Bengal	Mus. Coll.
18922	♂	,, ,,	,,
18923	♂	,, ,,	,,
18920	♂	,, ,,	,,

9047	♂	Ponsee, Kakhyen Hills, 3,300 ft.	J. Anderson.
1462	♂	dismounted	A.S.B.
21675	♂	.	A. R. S. Anderson.
21629	♂	.	G. King.
4105	♂	S. of Irrawaddy, L. Burma	Mus. Coll.
4106	♂	Sibsagar, Assam	S. E. Peal.
21676	♂	.	A. R. S. Anderson.
21673	♂	mounted	"
25159	♂	,, Parasnath Hill, Bengal	N. Annandale.
1462A	♂	mounted. Hazaribagh, Bengal	A.S.B.
18925	♀	Gaya District, Bengal	Mus. Coll.
18924	♀	,,	"
4109	♀	Cachar, Assam	"
9051	♀	Upper Burma, 600 ft.	J. Anderson.
24996	♀	Nepal	Mus. Coll. (R. Hodgart).
1462B	♀	Midnapur Dist.	A.S.B.
21674	♀	.	A. R. S. Anderson.

Gallus gallus, domestic varieties.

22174	mounted.	Japanese Bantam cock	Purchased.
22177	,,	Malay cock	"
22027	,,	White-crested Polish hen	W. Rutledge.
25209	,,	Chittagong cock	A. C. Chowdhary.
25210	,,	,,	"
1462P	,,	Partially hen-feathered cock. ¹	A.S.B.

Gallus varius (Shaw and Nodd.).

B.M.C., xxii, 352.

25211	♂	mounted (captive specimen)	Calcutta Zool. Garden.
22877	♂	(captive specimen)	,,

Gallus lafayettii, Less.

B.M.C., xxii, 348.

25224	♂	Anuradhapura, N.C.P., Ceylon	Purchased.
25223	♀	,,	"

Gallus sonnerati, Temm.

B.M.C., xxii, 350.

18122	♂	Shevaroy Hills, Salem Dist., Madras	.. W. Daly.
18588	♂	Bangalore, Mysore	Mus. Coll.
18587	♂	,,	"
18586	♂	,,	"
18612	♂	South Arcot, Madras	."

¹ Type of *G. "pseudhermaphroditus,"* Blyth (Journ. As. Soc. Bengal, x (2), p. 925, 1841).

25208	♂	(captive specimen)	Calcutta Zool. Garden.
1464A	♂	mounted	A.S.B.
1464N	♂	dismounted	
4112	♂	East of Baroda, C. India	W T. Blanford.
22703	♂	(captive specimen)	W Rutledge.
18124	♀	Shevaroy Hills, Salem Dist., Madras	W Daly.
18123	♀	„	
11807	♀	Bhoura, 2,500 ft.	J Armstrong.
4111	♀	East of Baroda, C. India	W T. Blanford.
11839	♀	Bhoura, 2,500 ft.	J Armstrong.
1464B	♀		A.S.B.
18614	♀	South Arcot, Madras	Mus. Coll.

Polyplectrum chinquis (Müll.).

B.M.C., xxii, 354.

4141	♂	Cachar, Assam	Mus. Coll.
5717	♂		..
7340	♂	Naga Hills, Assam	W Rutledge.
22162	♂	mounted	A. R. S. Anderson.
22524	♂	(captive specimen)	Calcutta Zool. Garden.
14821	♀	„ „	W Rutledge.

Polyplectrum bicalcaratum (Linn.).

B.M.C., xxii, 357.

1460B	♂	Malacca	A.S.B.
4142	♂	„	A. B. Spray.
21350	♂	(captive specimen)	W Rutledge.
12060	♂	„ „	„
12061	♂	„ „	„
14822	♂	Bhutan	..
6311	♂	(dismounted ; captive specimen)	„
5970	♂	no history.	
6601	♀	(dismounted ; captive specimen)	W Rutledge.
6603	♀	„ „	„
14823	♀	(captive specimen)	..
12062	♀	„ „	..

Argusianus argus (Linn.).

B.M.C., xxii, 363.

25213	♂	(captive specimen)	Calcutta Zool. Garden.
1461G	♂	dismounted	A.S.B.
1461B	♂	„ Malacca	„
3894	♂		..
18063	♂	Perak	Mus. Coll.
18069	♂	Tenasserim	Malet.

18065	♂	Perak	..	Mus. Coll.
22166	♂	(captive specimen)		W. Rutledge.
21346	♂	„ „	..	„
22141	♂	„ „		„
25214	♂	mounted		
21428	♀	(captive specimen)		W. Rutledge.
18066	♀	Perak		Mus. Coll.
13447	♀	Malacca	..	Bengal Economic Museum.
14825	♀	Singapore		A.S.B.
5926	♀	no history.		
6326	♀	(dismounted ; captive specimen)		W. Rutledge.
25215	♀	mounted		

Pavo cristatus, Linn.

B.M.C., xxii, 368.

1449B	♂	(specimen in bad condition)		A.S.B.
23685	♂	(captive specimen)		Calcutta Zool. Garden.
23825	♂	„ „		„
25092	♂	Shakwani, Nepal		J. Manners-Smith.
24433	♀	no history.		

White var.

21343	♂	(captive specimen)		W. Rutledge.
25215	♂	no history.		
25218	juv.	„		

Black-winged var. (*P. "nigripennis."*)

25216	♂	..	..	Purchased.
1449	♂	dismounted	..	A.S.B.

Pavo muticus, Linn.

B.M.C., xxii, 371.

21438	♂	(captive specimen)		Calcutta Zool. Garden.
23077	♂	„ „		W. Rutledge.
22701	♂	„ „	.	„
19269	♂	mounted	..	.
21217	♂	no history.		
22140	♀	(captive specimen)	..	W. Rutledge.



XXVIII ON CERTAIN SPECIES OF *PALAEMON* FROM SOUTH INDIA

By J. R. HENDERSON, M.B., F.L.S., and GEORGE
MATTHAI, M.A.

The collection of freshwater prawns on which the following observations are based is one formed during a number of years, and comprising specimens collected at various localities in the Madras Presidency, from Ganjam to Tranquebar on the east coast, and from Mangalore to Travancore on the west coast. In most of the species reported on, a large series of individuals has been obtained at all stages of growth. Altogether nine species are described, and of these two are regarded as new to science, while in the present state of our knowledge of the genus, and as a matter of convenience, we have considered it advisable to assign a name to a third form which may prove to be only a variety of a previously known species.

Species of *Palaemon* are found abundantly throughout Southern India, wherever there are more or less permanent tanks (ponds and lakes) or rivers. We have obtained *P. carcinus* from the back-water at Cochin, but with this exception have not met with any of the other species in salt water. Freshwater prawns form an article of food among the poorer classes, but in this respect are inferior to marine prawns (*Penaeus*).

Comparatively little attention has been paid to the Indian species of *Palaemon*. Forms from Central and Northern India have been described by Milne-Edwards, Henderson, and de Man, while for Southern India there is the original description of the genus by Fabricius (Supplem. Ent. Syst.) and a recent paper by the late Dr. Giuseppe Nobili (Boll. Mus. Zool. Torino). Fabricius in 1798 described three species from South India, *P. tranquebaricus*, *P. brevimanus*, and *P. coromandelianus*, but the diagnoses are so brief that the forms are unrecognisable; all three probably occur among the species which we are about to describe. Nobili records seven species from Pondicherry, but this number can be reduced to five, all of which are present in our collection. The only one to which he assigns a new name, *P. alcocki*, is, we are convinced, a young example of probably *P. rudis*, Heller. He also briefly describes a single small specimen which he refers to *P. multidentis*, Coutière, from Madagascar. It is impossible to identify this last from Nobili's description, but in any case a reference to Coutière's paper shows that his species was undoubtedly based on immature specimens, and in our opinion the name should be suppressed.

Owing to the great differences which exist between young and old individuals, and between the two sexes, considerable difficulty is often experienced in determining the species of *Palaemon*. As a rule, new species should not be described in the absence of a series of individuals of both sexes at different periods of growth, and certainly never from individuals which do not appear to be adult. In some cases where adult males show clearly marked differences, e.g., *P. rudis* and *P. idae*, very young individuals of the same species are almost indistinguishable, and the adult females can only be separated with considerable difficulty. Descriptions of new species which have not been largely based on an examination of adult males are therefore likely to be misleading, and lack of attention to this general principle has largely contributed to the numerous synonyms with which the genus *Palaemon* is overburdened.

The most reliable specific characters are those derived from the form and relative length of the joints in the larger chelipedes of adult males, and the general form and tothing of the rostrum in both sexes. In opposition to Ortmann we do not attach much importance to the shape of the telson-tip, which sometimes varies greatly in members of the same species; but we find that useful characters can frequently be obtained from the relative lengths of the two sub-terminal spinules when compared with the telson-tip. The division of the genus into four groups, *Eupalaemon*, *Brachycarpus*, *Parapalaemon* and *Macrobrachium*, which has been proposed by Ortmann, is of doubtful utility, for the characters on which they are founded depend to some extent on the age of the individual. Thus *P. scabriculus*, when young is a *Eupalaemon*, when older a *Parapalaemon*, and very old males might be placed in the group *Macrobrachium*.

In the case of our species the examination of a large number of individuals of different sizes seems to establish the following facts in regard to the modifications of structure which accompany growth :—

1. The rostrum in the young is relatively longer than in the adult.
2. The larger chelipedes, always shorter than the body in the young, are usually much longer than the body in the adult. In species with the chelipedes of the second pair very unequal, the latter part of this statement only applies to the larger chelipede.
3. The merus and carpus of the larger chelipedes as a rule remain of the same relative length.
4. The ischium grows much more slowly than the merus and carpus, with the result that while in the young it is either equal to or longer than the merus, in the adult it is always shorter than the merus.
5. The palm grows much faster than the merus, carpus and fingers, so that while usually shorter than the carpus

in the young, it equals or sometimes even exceeds the latter joint in the adult.

6. The fingers (except in the case of *P. idae*) grow a little more quickly than the carpus and merus, but less rapidly than the palm.

The following sexual characters, though common to other *Macrura*, are of some practical importance; the thoracic legs of the female are not so approximate at their bases as in the male, and this is particularly the case with regard to the last pair of legs; the ventral surface of the abdomen is also wider in the female, and the abdominal epimera which form a lateral protection for the eggs attached to the abdominal appendages, are of greater depth, especially those of the first three segments. Of much greater importance, however, are the special sexual characters of the genus. The female is smaller than the male. The rostrum in the female is usually comparatively longer than in the male, and in species in which it is upturned distally that of the female is more distinctly curved. The chelipedes in the female are always much thinner and shorter than those of the male. The spinosity and pubescence of the chelipedes, carapace and legs, which frequently characterise males, are much less strongly developed and in some cases even totally absent from females. The fingers of the female are of equal length, and the teeth or tubercles on their ridges weak or absent, while their tips are less curved than those of the male. Coutière has drawn attention to an apparent preponderance of males in the genus *Palaemon*, but we imagine that this is partly due to a process of selection by collectors, for in most of our species females were met with in as great numbers as males.

The subject of dimorphism in the males of *Palaemon* is one of considerable interest. While the young individuals of any species are all very much alike, it is not till a later stage, when the maximum size of the individual is practically attained, that the male characters definitely assert themselves. In many if not in all species, two forms of male are to be met with, *viz.*, normal males usually of considerable size, with the larger chelipedes specially developed, and males of the second type ("mâles féminisés" of Coutière) generally smaller but sometimes attaining the same size as normal males, in which the chelipedes resemble those of females.

Dimorphism of the males has been recorded in several species of Decapod Crustacea, and it has been shown, notably by Faxon in crayfishes of the genus *Cambarus*, that the two forms represent breeding and non-breeding stages, which alternate in the life history of each individual. In order to ascertain if any similar alternation exists in *Palaemon*, we have recently (September and October) examined the reproductive organs of a large number of males of *P. malcolmsonii*, *P. dubius*, and *P. scabriculus*, but with negative results. We find that in these three species many males of the second type, with the larger chelipedes undeveloped, appear to be sexually mature; their testes are well-developed, and in all

those examined free spermatozoa were found in the vasa deferentia. In normal males similar conditions were met with, but the testes were proportionately larger, and the vasa deferentia more coiled. We met with free spermatozoa in a male of *P. dubius*, which measured only 37 mm. in total length, with the chelipedes subequal and only about half the length of the body, yet the general appearance of this specimen, and more particularly of its chelipedes, would have led to the assumption that it was a young individual. A specimen of *P. malcolmsonii*, measuring only 93 mm. in total length, with chelipedes considerably shorter than the body, contained free spermatozoa in abundance in the vasa deferentia. The spermatozoa of *Palaemon* have a single process springing from a head, the free surface of which is convex, so that the whole structure bears some resemblance to an umbrella.

With regard to the last three forms on our list, *P. scabriculus*, *P. dolichodactylus*, and *P. dubius*, we have encountered problems of considerable perplexity, and are strongly disposed to think that they may all belong to one and the same species. Specimens of all three forms of adult male were taken together in the same tanks, along with adult females which appeared to be all of one type, and a careful examination failed to reveal any differences among them such as one would have expected had there been three species. Very young males collected under the same conditions were also alike, and finally there appeared to be connecting links between the three forms of adult male. If our view, which amounts almost to a conviction, can be established, we have here to deal with a species in which the males exhibit polymorphism, and we would hazard the opinion that a number of the so-called species of *Macrobrachium* are based upon similar varieties of male.

In some of the species there appears to be considerable variation in the size of adult individuals. In *P. malcolmsonii*, we have females with eggs ranging in total length from 90 mm. to 118 mm., and our largest female (one without eggs) measures 133 mm. In this species we also find males with all the special characters developed, from 191 mm. to 230 mm. in length.

Parasites and commensals are occasionally met with on some of the species. A *Probopyrus* is met with, sometimes abundantly, on *P. malcolmsonii*, inhabiting the branchial chamber of either side, and we have found a similar parasite in single specimens of *P. rudis* (right side) and *P. scabriculus* (left side). In all cases the infected host suffers an arrest in growth, and the male chelipedes resemble those of females, an observation which has frequently been made with regard to other instances of parasitism in Decapod Crustacea. Specimens of *P. malcolmsonii*, from the neighbourhood of Madras, are occasionally found with the chelipedes, carapace, and abdominal terga, covered by algae, and the polyzoon *Victorella bengalensis*, Annandale.

In the descriptions which follow the total length of the prawn is taken from the tip of the rostrum to the apex of the telson. In the measurements of the chelipedes the coxa and basis are not

included. All measurements are in millimetres, and are taken in the case of joints from the dorsal side. The *ischium*, *merus*, *carpus*, *palm*, and *fingers* of the large chelipedes, are indicated respectively by their initial letters i., m., c., p., f.; the abbreviations im. f., and m. f., stand for the *immobile* and *mobile* fingers respectively.

The term *young* as applied by us includes specimens with the chelipedes shorter than the body; it does not necessarily imply that the individuals are sexually immature.

PALAEON CARCINUS, Fabricius.

(Pl. xv, figs. 1a—g.)

P. carcinus, Fabricius, Suppl. Ent. Syst., p. 402 (1798); Milne-Edwards, Hist. Nat. des Crust., t. ii, p. 395 (1837); Ortmann, Zool. Jahrb. Syst., Bd. v, p. 700 (1891); de Man, in Max Weber's Zool. Ergebn., p. 421 (1892).

Characters of adult males.—The rostrum is long, and exceeds the antennal squame by nearly one-fifth of its length; it is bent near the middle and upturned distally. The tooth formula is $\frac{12 \text{ to } 15}{10 \text{ to } 14}$ (most commonly $\frac{12 \text{ to } 13}{11 \text{ to } 13}$); the seventh to the eleventh teeth are usually separated by wider intervals than the others. The first three upper teeth, or rarely the first two, are on the carapace.

The large chelipedes are sub-cylindrical and either equal or sub-equal; they are nearly half as long again as the body; a longitudinal pale line traverses the upper and lower surfaces of the palm, carpus, and sometimes the merus. The joints are beset with broad-based spines, which are less strongly developed on the ischium and the immobile finger, and absent from the mobile finger. The distal end of the carpus is about the same width as the palm, while the latter is of uniform width. The finger-tips are strongly incurved, more especially that of the mobile finger. The mobile finger is stouter than the immobile finger, and is densely pubescent, a fact which causes it to look stouter than it really is. The tooth on the immobile finger is conical, while the crenation of the ridge situated proximally to this tooth is well pronounced; the proximal tooth of the mobile finger may, in some cases, be followed by a small tubercle. When the fingers are closed, the tooth on the immobile one lies nearer the proximal than the distal tooth of the mobile finger. The following measurements are taken from the chelipede of an adult specimen (dried) measuring 295 mm. in total length:—

i. 38 m. 85 c. 110 p. 112 f. 89.

The telson-tip is acutely pointed; the inner sub-terminal spinule on each side projects backwards beyond the outer one, but does not nearly reach the tip of the telson itself.

The whole surface of the body is conspicuously punctate, but this characteristic is less marked on the carapace.

The colours of fresh specimens are as follows :—Deep peacock blue on the large chelipedes, passing into green on the palm and fingers; this coloration is absent from the coxal and basal joints, and is deeper on the upper than on the under surface. The ambulatory legs are pale blue; the spines on the legs are deep blue at the base, and orange towards the apex. The body is flesh-coloured; the abdominal segments have deep blue transverse bands, which are broadest on the fourth, fifth and sixth segments.

Characters of females.—The rostrum is more strongly upturned distally, and is somewhat less deep than in adult males.

The large chelipedes are more than half the length of the body; they are beset with feebly developed spines, those on the ischium and fingers being the weakest, while there are none on the mobile finger. The palm is slightly compressed dorso-ventrally, and is about the width of the distal end of the carpus. The mobile finger is stouter than the immobile, but not to the same extent as in males, nor is it so densely pubescent. When the fingers are closed, the distal tooth of the immobile finger lies midway between the two teeth on the mobile finger.

The following measurements show the length of the joints of the large chelipedes in an adult female (dried) measuring 232 mm. in total length :—

i. 35 m. 32 c. 43 p. 35 f. 27.

Characters of young individuals.—In specimens under 200 mm. in total length the rostrum closely resembles that of the adult female.

In an individual measuring 139 mm. in total length, the joint measurements are as follows :—

i. 17.5 m. 16 c. 20 p. 17 f. 14.5.

With advancing age the coloration of the body deepens, the mobile finger becomes much stouter than the immobile, the pubescence appears on the former, and the punctation on the body becomes more pronounced.

This species is the largest, and one of the best known members of the genus. It has been recorded from many localities in the Indo-Malayan region, from India to New Guinea, and has been so often and so fully described that a fuller description than that given above is unnecessary.

Localities.—From many localities in the Malabar District, Cochin State, Travancore State; Godaveri District (Rajahmundry and Cocanada); Chingleput District (Red Hills and other localities near Madras). We have obtained adult males and females from the back-waters of the Cochin State near Ernakulam, a fact which is of some importance since the genus *Palaemon* is chiefly met with in fresh water.

P. MALCOLMSONII, H. Milne-Edwards.

(Pl. xv, figs. 2a—f.)

P. malcolmsonii, H. Milne-Edwards in Jacquemont's "Voyage dans l'Inde," Crustacés, p. 8, pl. iii (1844).

P. danae, Nobili, Boll. Mus. Zool. di Torino, vol. xviii, n. 452, p. 7 (1903).

Characters of adult males.—The rostrum projects beyond the antennular stalk for about one-fifth of its length. Its upper margin consists of a toothed highly convex proximal part, and a much shorter more or less straight distal part, which carries only one or two teeth near the apex. The proximal portion is relatively deep, while the terminal portion is much narrower. The tooth formula is $\frac{9 \text{ to } 11 + 1 \text{ or } 2}{5 \text{ to } 7}$ (most commonly $\frac{10 \text{ to } 11 + 1}{6}$).

As in *P. carcinus* the first three upper teeth or rarely the first two are on the carapace.

The large chelipedes, which are sub-equal in length, resemble those of *P. carcinus*, but the spinules are not so strongly developed, and are more closely set; the movable finger is somewhat less pubescent; the chelipedes are less than double the body-length. A groove traverses both the upper and lower surfaces of the palm and carpus, recalling the longitudinal lines visible in *P. carcinus*. The following measurements are taken from the chelipede of an adult specimen (dried) measuring 191 mm. in total length:—

i. 44 m. 71 c. 95 p. 86 f. 46.5.

From the above measurements, it will be seen that the ischium and fingers are both relatively shorter than in adult males of *P. carcinus*.

The telson-tip, as in *P. carcinus*, is acutely pointed. The inner sub-terminal spinule on each side projects backwards beyond the outer one, but does not nearly reach the telson-tip.

The anterior surface of the carapace, the postero-ventral regions of the first five abdominal epimera, the anterior region of the second abdominal epimeron and sometimes of the first, fifth and sixth abdominal terga, and the upper surface of the telson are scabrous. The thoracic legs, with the exception of their dactyli, are provided with very numerous closely set spinules.

Characters of females.—The rostrum may be slightly upturned distally, and extends as far as, or a little beyond, the distal margin of the antennal squame; sometimes the upper penultimate tooth is midway between the ultimate and antepenultimate teeth.

The large chelipedes are scabrous, and are about two-thirds the length of the body. The palm is slightly compressed dorso-ventrally, and is of uniform width; it is as wide as, or slightly wider than, the distal end of the carpus. The mobile finger is not pubescent. The grooves on the carpus and palm which are charac-

teristic of males are absent in the female. In a specimen measuring 118 mm. in total length, the joint-measurements are as follows:—

i. 16 m. 15 c. 19 p. 16 f. 11.

The body is smooth and exhibits none of the roughness characteristic of males.

Females with eggs vary from 90 to 118 mm. in total length; the largest specimen from Tanjore is without eggs, and measures 133 mm. in length.

Characters of young individuals.—In individuals under 110 mm. in total length the rostrum may be slightly upturned distally, and may extend a little beyond the distal margin of the antennal squame.

A table of measurement taken from male individuals is given, to show the changes which accompany growth in regard to the relative lengths of the joints of the large chelipedes.

No.	Locality.		Total length of body.	Total length of chelipede.	LARGE CHELPEDE.				
					Ischium.	Merus.	Carpus.	Palm.	Finger.
I	Bezawada	..	68	34.75	8	7	8.75	6	5
II	Chingelput	..	73	46.5	9.5	9	12	9	7
III	Surada reservoir		87	62	12.5	12.5	16	12	9
IV	"	..	98	89.75	15.5	18	23.75	18.5	14
V	"		118	127.25	20	24.75	32	28	22.5
VI	Godavery River	..	131	142.5	22.5	25.75	33	33	28.25
VII	Karoor	..	155	171.5	28	33	41	40	29.5
VIII	Tanjore		191	342.5	44	71	95	86	46.5
IX	Renigunta	..	230	442	51	92	115	115	69

No. VIII in the above table, though much smaller than No. IX, presents adult characters, and hence it appears that there is considerable variation in size in adult males also.

General remarks.—*P. danæ*, Heller, judging from the original figure, is perhaps based on young specimens of *P. malcolmsonii*. Nobili has referred to *P. danæ* certain specimens from Pondicherry, the largest of which measured 65 mm. in total length; these we have little doubt in regarding as young individuals of *P. malcolmsonii*. *P. weberi*, de Man, which is undoubtedly a distinct species, agrees closely with *P. malcolmsonii* in the shape and toothing of the rostrum. It is extremely probable that the common South Indian species described above, was one of those originally diagnosed by Fabricius, and we possess a well-developed male specimen from Tranquebar, the locality which furnished the Danish naturalist with his type specimens. It is impossible, however, to determine from his brief descriptions to which of the species it belongs.

Localities.—This species, originally described by Milne-Edwards from Nagpore, is the commonest freshwater prawn in Southern India. It has not so far been recorded from any locality

outside India. We have a large number of specimens from the following localities:—

Ganjam District (Surada Reservoir and Berhampore), Kistna District (Bezawada Anicut), Godaveri District (Rajahmundry), Madras District, Chingleput District (Chingleput, Pallavaram, Red Hills and Walajabad), North Arcot District (Renigunta), Trichinopoly District (Trichinopoly), Tanjore District (Tanjore and Tranquebar), Coimbatore District (Karoor).

We have not so far obtained any specimens from the Western side of India.

P. IDÆ, Heller.

(Pls. xv, figs. 3a—c, and xvi, figs. 3a—l.)

P. idæ, Heller, Sitz.-Ber. Akad. Wiss. Wien, Bd. xlv, p. 416, tab. ii, figs. 40, 41 (1862); Ortmann, l.c., p. 717 (1891).

P. sundanicus, Heller, l.c., p. 415, tab. ii, figs. 38, 39 (1862); Ortmann, l.c., p. 719 (1891); de Man, in Max Weber's Zool. Ergebn., p. 437, tab. xxvi, fig. 35, p. 437 (1892); Nobili, l.c., p. 8 (1903).

Characters of adult males.—The rostrum extends as far as, or a little behind, the distal margin of the antennal squame; its proximal portion is deep, and shows slight convexity above, while the narrow terminal part is straight or slightly upturned. The tooth formula is $\frac{12-15}{4-6}$ (most commonly $\frac{13}{4}$); the first and second upper teeth are separated by a wider interval than any of the others, and these, with in rare instances a third tooth, are on the carapace. The two distal teeth are separated by a narrower interval than the other teeth, while a somewhat wide gap separates the first of these from the proximal series; in some cases there are three teeth in the distal series, and very exceptionally four teeth.

The large chelipedes are slender, sub-cylindrical, and sub-equal; their length is more than one and a half times the length of the body. The joints are beset with short blunt almost tubercular spines, which, however, are feebly developed on the ischium and fingers. These tubercles are arranged in approximately longitudinal rows. The proximal portion of the carpus is of the same width as the palm, while its distal portion is wider than the latter. The palm is very slightly compressed laterally at its distal end. The fingers are usually of equal thickness, and the finger-tips are incurved; the inner margin of the immobile finger, and the whole surface of the mobile finger are pubescent; the ridges on the opposed edges of the fingers are less strongly developed than in *P. carcinus* and *P. malcolmsonii*. The tooth on the immobile finger is acute, and in some male specimens from Mangalore, the front margin of the teeth on the fingers is somewhat convex; the teeth on the mobile finger are not so wide apart as in *P. carcinus* and *P. malcolmsonii*; and the proximal tooth is less prominent than

the distal one. When the fingers are closed, the tooth on the immobile finger lies nearer the distal than the proximal tooth of the mobile finger. In a specimen measuring 111 mm. in total length, the following are the measurements of its large chelipedes :—

	i.	m.	c.	p.	f.
R. chelipede	25	33	67	40	23
L. chelipede	25	33	66	39	22.5

It is to be noted from the above measurements, that the carpus is longer than the propodus, and that the fingers are a little more than half the length of the palm.

The Mangalore specimens in our collection have comparatively longer and more slender chelipedes than those from Malabar.

The telson is broad towards the apex with a short median point. The inner sub-terminal spinule on each side projects beyond the tip of the telson by about half its length ; the much shorter outer lateral spinule does not reach the tip.

Minute tubercles are present on the anterior surface of the carapace, the exposed dorsal surface of the last pair of abdominal appendages, the ventral surface of the exopodites of the same pair of legs, the telson and the sixth abdominal segment, and the ventral and posterior margins of the abdominal epimera, especially of the second, third and fourth segments. The presence and distribution of these tubercles are of specific value.

Characters of females.—The number of teeth on the almost straight upper margin of the rostrum varies within greater limits (11 to 15). The large chelipedes are slightly scabrous and are about two-thirds the body-length. A few setæ are irregularly distributed on the fingers which are otherwise naked. The palm is as wide as, or slightly wider than the distal end of the carpus. The following measurements are taken from the large chelipedes of an adult female measuring 89 mm. in total length :—

i. 12.5 m. 11 c. 20 p. 13 f. 11.

From the above measurements it will be seen that the carpus is slightly shorter than the propodus,¹ and the fingers longer than in the male. Adult females vary from 70 to 90 mm. in total length. The single female specimen (with eggs) from Mangalore measures 78 mm. and the joint-measurements of its right chelipede are as follows :—i. 12 m. 12 c. 21 p. 13 f. 8 mm. As in the case of the male specimens from the same locality, the chelipede of the female is relatively longer than that of female specimens from Malabar. The Mangalore examples might almost be regarded as constituting a distinct variety of *P. idæ*, but the differences are not sufficiently great in our opinion to entitle them to specific rank.

Characters of young individuals.—The proximal portion of the carpus is narrower than the palm, while its distal portion is as wide

¹ The reader is reminded that our initial letter p. stands for palm. The length of the propodus is obtained by adding the measurements recorded for p. and f.

as the latter. The following are the measurements of a young specimen measuring 72 mm.:—

	i.	m.	c.	p.	f.
R. chelipede	13.5	14.5	26	15	11
L. chelipede	13.5	14	24	14.5	10.5

General remarks.—On comparing this species with Heller's description and figures, we find that it agrees in a great many respects with *P. idæ*. The large chelipedes have the same general build, and the joints show almost the same relative lengths. The following differences, however, appear to exist:—Heller states that the inner margins of the fingers are toothless, and that the tooth-formula is $\frac{10 \text{ to } 11}{4 \text{ to } 5}$, while his figure shows the large chelipede to be stouter. Hilgendorf's figures based on specimens from Zanzibar which he refers to *P. idæ*, seem to agree with those of Heller except that the tooth-formula is $\frac{9}{3}$, and the chelipedes are even stouter than in Heller's figure.

Von Martens thinks it probable that *P. sundaicus*, Heller, from Java, in which the carpus is shorter than the propodus, is the young of *P. idæ*. Ortmann rejects von Martens' view on the assumption that the carpus, which, in the young, is already shorter than the propodus, can never, as a result of growth, exceed it in length; while this observation is true of most species of *Palaemon*, we have reason to believe that it does not apply to the present one. From observations carried out on a large number of specimens, we are able to state that the fingers in the present species elongate less rapidly with advancing age than do the merus and carpus, and the palm does not grow so quickly as it does in *P. carcinus* and *P. malcolmsonii*, with the result that in adult males the carpus is longer than the propodus. Our observations, therefore, seem to corroborate von Martens' supposition. Moreover young male individuals and females of the Indian species which we refer to *P. idæ*, agree closely with Heller's description and figures; his specimen, which was probably a female, measured 3 inches in length.

While Heller's account of *P. sundaicus* appears in his paper before that of *P. idæ*, the latter name is preferable, because the description is based on the characters of an adult male, while some uncertainty must attend the identification of the former based as the species is on a female specimen.

Nobili has referred to *P. sundaicus* a single specimen from Pondicherry, which measured 55 mm. in total length, with the rostral formula $\frac{11}{5}$.

P. lanceifrons, Dana, originally recorded from Manila, in which the carpus nearly equals the palm in length, is perhaps also the young of *P. idæ*, but in a slightly more advanced stage than

P. sundaicus. Ortmann, however, refers to *P. lanceifrons*, a specimen from Ceylon measuring 85 mm. in total length (Dana's original specimen measured only 55 mm.), in which the carpus and palm are sub-equal, and he argues as in the case of *P. sundaicus*, that the differences between the two examples in the relative lengths of the carpus, palm, and fingers, are accountable by the greater growth of the Ceylon specimen.

The following measurements taken from the large chelipedes of male individuals show the changes which accompany growth in regard to their relative lengths:—

No.	Locality.	Total length of body.	LARGE CHELIPEDS.						
			Right or left.	Total length of chelipede.	Ischium.	Merus.	Carpus.	Palm.	Finger.
I	Mangalore ..	67	R			Missing.			
			L	108·5	14·5	19	37	24	14
II	Kottayam ..	72	R	80	13·5	14·5	26	15	11
			L	76·5	13·5	14	24	14·5	10·5
III	Mangalore ..	73	R		17·5	25·5	47		
			L	136·5	17·5	25·5	46·5	31	16
IV	Cochin ..	77	R	91·5	13·5	17	29	20	12
			L	71·5	12	14	21·5	15	9
V	,, ..	79	R	89	13·5	16	28	20	11·5
			L	84·75	13	15·25	27	18·5	11·5
VI	,, ..	88	R	134·5	18·5	24	47	28	17
			L	132·5	18·5	24	45	28	17
VII	,, ..	89	R	142	18·5	25	48	32·5	18
			L	145·5	18·5	26	49·5	33	18·5
VIII	Calicut ..	91	R	145	19	25	51·5	31	18·5
			L	139·5	19	24	48·5	30	18
IX	Trichur ..	103	R	196·5	25	34	71	44	22·5
			L	188·5	24·5	35	67	41	21
X	Palghat .	104	R	184	23·5	33	61·5	46·5	19·5
			L	192·5	24	34·5	65	49	20
XI	Calicut ..	111	R	188	25	33	67	40	23
			L	185·5	25	33	66	39	22·5

It is to be noted from the above table that the two Mangalore specimens, though only 67 and 73 mm. in total length, yet possess adult characters and their chelipedes are relatively longer than those of the Malabar specimens. They may, therefore, be regarded as a smaller variety of *P. idæ*. Numbers IX and X, though with shorter body-length than No. XI, have longer chelipedes and in No. X, the propodus is slightly longer than the carpus. The latter was the only example out of a large number examined, of about the same size, which exhibited this peculiarity.

Localities.—Western India. Several specimens of both sexes from South Canara District (Mangalore), Malabar District (Calicut, Palghat), Cochin State (Koll Lands, Cochin), Travancore (Kottayam).

General Distribution.—*P. idæ* has been recorded from Madagascar (Coutière), Zanzibar (Hilgendorf), Dar-es-Salaam (Ortmann), Seychelles and Mauritius (Richters), Ceylon (Heller), Singapore (von Martens), Sumatra (Nobili), Java (von Martens, de Man, Thallwitz), New Guinea (Nobili), Borneo (Heller), and the Philippines (von Martens, Thallwitz). It is recorded from the sea at Java by de Man.

P. sundaicus has been met with in the following localities:—Madagascar (Coutière), Natal, in the sea (Max Weber), Mozambique (Hilgendorf), Zanzibar (Grandidier), Java (Heller, de Man), Flores and Celebes (de Man).

PALAEEMON SULCATUS, n. sp.

(Pl. xvi, figs. 4a—g.)

We refer six specimens from Cochin to this new species, of which one is a female and the rest males. Though possessing some points in common with *P. idæ*, they can yet be distinguished from the latter by certain well-marked differences.

Characters of adult males.—In the largest specimen measuring 93 mm. and in another measuring 84 mm. in total length, the rostrum shows some resemblance to that of *P. idæ*, but the proximal portion of the upper margin is only very slightly convex, and the rostrum extends nearly as far as the distal margin of the antennal squame, with the tooth-formula $\frac{12}{6}$ and $\frac{12}{4}$ respectively. In a third specimen measuring 79 mm. the upper margin is almost straight with the tooth-formula $\frac{11}{4}$; in the fourth specimen measuring 82 mm. the proximal portion is straight, but the distal portion is turned up, with the formula $\frac{11}{4}$; in the fifth specimen, the rostrum extends beyond the distal margin of the squame, and is considerably upturned distally, the three distal teeth are very close to each other, the fourth and fifth teeth are separated by a much wider

gap than the others, and the dental formula is $\frac{12}{5}$. In all these specimens the first and second upper teeth, as in *P. idæ*, are separated by a wider interval than the others, and the two distal teeth are usually situated close to each other; the teeth are stronger and are placed further apart than in *P. idæ*; the first three upper teeth are on the carapace.

The large chelipedes are sub-cylindrical and sub-equal, but in the largest specimen they are unequal, the right one being longer than the left. The palm is as wide as, or slightly narrower than, the distal end of the carpus. The fingers are of equal thickness and their tips are incurved, while the tooth on the immobile finger is acute; in these respects they resemble *P. idæ*. The upper surface of the chelipedes, with the exception of the fingers, is beset with very short and slender forwardly directed spinules, while the rest of the surface is provided with fewer but stronger spinules slightly directed forwards, which are best developed on the lower surface; the longitudinal arrangement of the spinules is specially marked in the present species. A lateral groove free of spinules runs along the outer side of the merus, carpus and palm, being most distinct on the carpus. The characteristic linear arrangement of these spinules and the presence of a lateral groove on the chelipedes are very characteristic of the present species; the specific name is taken from the last mentioned peculiarity. It may be noted that a similar groove is present in *P. lar*, Fabr. A dark brown mottling occurs on the chelipedes more particularly on the fingers. From the largest specimen measuring 93 mm. in total length, the following measurements were obtained:—

Long chelipede (right).

i. 18 m. 25 c. 48 p. 44 f. 22.

Short chelipede.

i. 14 m. 20 c. 29 p. 22 f. 12.

It should be noticed from the above that the longer chelipede is more than one and a half times the length of the body, while the shorter one nearly equals it, and that the carpus is shorter than the propodus, but longer than the palm, while in *P. idæ* the carpus is longer than the propodus.

As in *P. idæ* the inner sub-terminal spinules on the telson project beyond the tip of the latter by about half their length; the much shorter outer lateral spinule does not reach the tip.

The anterior surface of the carapace, the exposed upper surface of the last pair of abdominal appendages, and the lower margins of the abdominal epimera are scabrous. The upper surface of the telson is provided with close-set spinules, similar to those on the large chelipedes.

Characters of the female.—It measures 71 mm. in total length. The rostrum has an almost straight upper margin, and extends a

little beyond the antennal squame; the tooth-formula is $\frac{11}{4}$. The large chelipedes are practically equal, and much shorter than the body; the spinules are weaker than in males, but retain the same characteristic arrangement. The lateral groove is well seen on the carpus, but it tends to assume a more dorsal position; whether this is characteristic of all females cannot be determined as there is only a single specimen in the collection. The pubescence on the fingers is similar to that in males but feebler. The joint-measurements of the chelipedes are as follows:—

i. 8 m. 9 c. 12 p. 10 f. 6.5.

The entire surface excepting the chelipedes is smooth, but the telson is slightly rough. The following are detailed measurements of all six specimens:—

Length of—	♂		♂		♂		♂		♂		♀	
body	79		82		82		84		93		71	
	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.
chelipedes	83	86.5	94.5	94	96.5	96	107.5	97	157	97	46.5	45.5
ischium	12	12	14	13	14	15	14	13.5	18	14	8	8
merus	14.5	14.5	16.5	16.5	18	17	18	17.5	25	20	9	9
carpus	23.5	24.5	26	26	29.5	28	29.5	28	48	29	12.5	12
palm	21	22.5	24	24.5	21	20.5	29	24	44	22	10.5	10
fingers	12	13	14	14	14	15.5	17	14	22	12	6.5	6.5

Locality.—We have obtained this species only from Cochin.

PALAEMON RUDIS, Heller.

(Pl. xvii, figs. 5a—h.)

P. rudis, Heller, Verh. Z. B. Gesellsch. Wien, p. 527 (1862); Ortmann, l.c., p. 741 (1891); Coutière, Ann. des Sci. Nat. Sér. 8, t. xii, p. 288 (1901).

P. mossambicus, Hilgendorf, Monatsb. Akad. Wiss. Berlin, p. 839, tab. iv, fig. 17 (1878).

P. alcocki, Nobili, l.c., p. 9, fig. 5 (1903).

Characters of adult males.—The rostrum which shows a moderate proximal convexity extends as far as the distal margin of the antennal squame, or a little behind it; the distal portion slopes slightly downwards; the tooth-formula is $\frac{10-12}{4}$. The first two teeth, as in *P. idæ*, are on the carapace, and are separated by a wider interval than any of the others; as a rule the two distal teeth are closer together than any of the others.

The large chelipedes are always unequal; the longer chelipede is a little less than one-and-a-half times the length of the body; the shorter chelipede is about five-sixths the length of the longer one. The chelipedes are everywhere pubescent, but this characteristic is less marked on the ischium, and most pronounced on the opposed margins of the fingers. The palm is practically cylindrical, and is the same width as the distal end of the carpus, or sometimes slightly narrower. The fingers are of equal thick-

ness; as in *P. idæ* and *P. sulcatus*, the tooth on the immobile finger is acute and the proximal tooth on the mobile finger is smaller than the distal one; when the fingers are closed the first of these teeth fits between the other two; the crenation of the ridge of the immobile finger, proximal to its basal tooth, is more prominent than in *P. idæ* and *P. sulcatus*. A row of from 15 to 20 tubercles exists on each side of the median ridge of both fingers, and is exposed on removal of the pubescence; sometimes it is found only on one side of the ridge; this character and the pubescence on the chelipedes are distinctive of the present species. The following measurements are taken from the large chelipedes of a specimen measuring 117 mm. in total length:—

Total length	i.	m.	c.	p.	f.
185	20	35	55	40	35
169	18	32	50	40	29

From the above measurements it will be seen that the joints of both chelipedes have about the same relative lengths, but unlike *P. idæ* the carpus is shorter than the propodus and the fingers are relatively longer.

The telson is similar to that of *P. idæ*, the inner sub-terminal spinule on each side projecting beyond the tip of the telson by about half its length; the much shorter outer lateral spinule does not reach the tip.

The carapace is slightly scabrous anteriorly; the rest of the body is merely punctate.

Characters of females.—The rostrum is slightly longer than that of the male; it may extend as far as, or slightly beyond, the distal margin of the antennal squame.

The large chelipedes are punctate, sub-equal, and about two-thirds the length of the body. The tubercles on each side of the finger-ridges are poorly developed or even absent. The middle of the palm is sometimes wider than the extremities, in which case it is wider than the distal portion of the carpus. In a specimen measuring 86 mm. in total length, the joint-measurements are as follows:—

i. 9 m. 10.5 c. 16 p. 10 f. 9.

The females of the present species may easily be mistaken for those of *P. idæ*, but the rostrum differs from that of the latter species in possessing a moderate proximal convexity. In *P. idæ* the proximal portion is very slightly convex or even almost straight. The upper rostral teeth are also larger and placed further apart than in *P. idæ*.

Characters of the young.—The rostrum is sometimes upturned distally as in *P. idæ*; it may extend a little beyond the distal margin of the antennal squame as in females. The proximal portion of the carpus is extremely slender. The proximal portion of the palm is as wide as the distal portion of the carpus. The palm widens towards its middle, so that its inner surface

appears almost convex. This characteristic persists even in certain large males; it is specially marked in young individuals from Cocanada. The tubercles on each side of the finger ridges, so characteristic of adults, are absent in the young. In a specimen measuring 82 mm. the chelipedes are practically equal, and their joint-measurements are as follows:—

i. 9 m. 10 c. 16 p. 10 f. 9.

With advancing age, the chelipedes become unequal in length, the tubercles on the fingers make their appearance, and the pubescence appears more fully developed.

General remarks.—Nobili has described under the name of *P. alcocki* a freshwater prawn from Pondicherry, of which he was able to examine only a single specimen measuring 57 mm. in total length and obviously immature. In it the tooth-formula is $\frac{9}{4}$; the two upper distal teeth are placed near the tip and two teeth are situated on the carapace. The nature and arrangement of the teeth are the same as in the species just described, but we have not yet met with a specimen showing only 9 upper rostral teeth, although we have examined a considerable number. Nobili's figure of the rostrum shows the upper margin to be straight, while in the present species the proximal portion is generally slightly convex. The large chelipede, a figure of which is also given by Nobili, greatly resembles that of young individuals of our species both in shape and in the relative lengths of the joints. Nobili lays stress on the dilatation of the palm in *P. alcocki*, and certain young individuals from Cocanada which we refer to *P. rudis* agree in this respect.

The following is a comparison of the joint-measurements in one of our young specimens measuring 58 mm., and those recorded by Nobili in his single specimen which measured 57 mm. in total length:—

	i.	m.	c.	p.	f.
Our specimen	6	7	10.5	6	5.5
Nobili's specimen		7	12	6.5	7.5

While, therefore, it is not unlikely that Nobili's species was based on a young specimen of the one which we have just described from examples at different stages of growth, it is impossible to decide the matter definitely, because young individuals of many species of *Palaemon* closely resemble one another.

The joint-measurements of the large chelipedes of specimens at various stages of growth are given on page 294.

No.	Locality.				LONG CHELPEDE.						SHORT CHELPEDE.					Total length of body.	Total length of long che-lipede.	Total length of short che-lipede.
					Right or left.	Ischium.	Merus.	Carpus.	Palm.	Finger.	Ischium.	Merus.	Carpus.	Palm.	Finger.			
I	Cocanada	..	..	R	10	11	17	13·5	13		9	10·5	15	12	11·5	74	64·5	58
II	„	..	..	L	10·5	14·5	21·5	18	14·5		10	13·5	20	16	14	79	79	73·5
III	„	..	..	L	10·5	13	20·5	15·5	13		10·5	12·5	19·5	14·5	12·5	83	72·5	69·5
IV	„	..	..	L	16	28	44	32·5	25·5		13	17	30	20	14·5	92	146	94·5
V	Madras (Otary)			R	11	13	21	14	13		11	12	19	12·5	11·5	94	72	66
VI	„	„	..	R	13	20	31·5	21·5	18·5		12·5	18·5	28	18	16	98	104·5	93
VII	„	„	..	L	12	16	26·5	18·5	16		11·5	15·5	24·5	17	15·5	99	89	84
VIII	„	„	..	L	12·5	16	24·5	17	14·5		12	14·5	22	14	12·5	101	84·5	75
IX	Madras (Vyasarpadi)		..	L	14	18·5	29	21·5	17		13	16·5	26	17·5	14	102	100	87
X	„	„	..	R	19	32	52·5	40	31·5		17·5	30	48	35	27	111	175	157·5
XI	„	„	..	R	20	35	55	40	35		18	32	50	40	29	117	185	169

Localities.—A large number of males and females from Madras; several males from Cocanada.

General distribution.—*P. rudis* has been recorded from Madagascar (Coutière), Mozambique (Hilgendorf), East Africa (Pfeffer), and Ceylon (Heller).

PALAEEMON NOBILII, n. sp.

(Pl. xvii, figs. 6a—e.)

We include in this species two specimens from Walajabad, Chingleput District, a male and a female, the latter bearing eggs, which differ greatly from all the other Indian species which we have examined.

Characters of the male.—The single specimen measuring 64 mm. in total length is well developed and apparently possesses adult characters. The rostrum tapers somewhat abruptly towards the acute tip, and extends slightly in front of the antennular stalk; the dental formula is $\frac{12}{2}$. The part of the upper rostral margin on which the fourth to the tenth teeth are situated is convex, and the apex forms an acute slightly upturned tooth. The first five upper teeth are on the carapace, and of these the first four are separated by wider intervals than the others; the last tooth is placed a little distance from the apex.

The large chelipedes are sub-cylindrical, and unequal, the left one longer than the right. In the former, the palm is slightly compressed dorso-ventrally, and is as wide as the distal end of the carpus; the finger-tips are abruptly incurved. The distal tooth on the mobile finger is a little behind the middle of the joint, and is smaller than the proximal tooth; the tooth on the immobile finger is about the same size as the distal tooth on the mobile finger. The chelipedes are provided with numerous forwardly directed spinules; those on the under surface being fewer but more strongly developed than those on the upper surface. The teeth on the median ridges of the fingers of the short chelipede are weaker, and the opposed margins are provided with more numerous setæ; in other respects the short chelipede is similar to the longer one. The joint-measurements are as follows:—

	Total length	i.	m.	c.	p.	f.
R. chelipede	56	8.5	11	14.5	15	7.
L. chelipede	70.75	10.75	13.75	19.5	18.75	8.

It should be noticed from the above measurements, that the fingers are shorter than half the length of the palm, and that in the longer chelipede, the carpus is much longer than the merus.

The telson-tip is not so acute as in *P. carcinus* and *P. malcolmsonii*; the inner lateral spinules extend beyond the tip by a little less than half their length; the outer spinules are very short;

the setæ at the tip of the telson exceed the lateral spinules in total length. The body is smooth.

Characters of the female.—It measures 54.5 mm. in total length. The distal portion of the upper margin of the rostrum is almost straight, and extends only as far as the tip of the antennular stalk. The tooth-formula is $\frac{10}{2}$; the first four upper teeth are on the carapace, while the first three are separated by wider intervals than the others. The large chelipedes are sub-equal, and are very slightly scabrous; the teeth on the immobile finger are absent, while the one on the mobile finger is poorly developed. The joint measurements are as follows:—

	Total length	i.	m.	c.	p.	f.
R. chelipede	38.5	7	7.5	10	8	6
L. chelipede	41.5	7	8	11	9.5	6

In some respects, this species resembles *P. altifrons*, Henderson, recorded from Delhi, the River Jumna and Lahore, but in the latter the carpus is a little shorter than the merus, and the fingers are more than half the length of the palm and are smooth above and below.

We have associated this species with the name of the Italian naturalist Nobili, by whose untimely death science has been deprived of an indefatigable worker, more particularly in the field of carcinology. While the genus *Palaemon* was established by Fabricius more than a century ago, from South Indian specimens, Nobili was the first to describe any of these in detail.

P. SCABRICULUS, Heller.

(Pls. xvii, figs. 7a—c, and xviii, figs. 7a—p.)

P. scabriculus, Heller, Verh. Zool.-Botan. Ges. Wien, p. 527 (1862); *Id.*, "Novara" Crust., p. 117, taf. x, fig. 9 (1865); Ortmann, Zool. Jahrb. Syst., Bd. v, p. 710 (1891); de Man, in Max Weber's Zool. Ergebn., p. 462, taf. xxvii, fig. 41 (1892); Henderson, Trans. Linn. Soc. Zool. ser. 2, vol. v, p. 442 (1892); Nobili, Boll. Mus. Zool. di Torino, vol. xviii, n. 452, p. 12 (1903).

Characters of adult males.—The rostrum admits of great variation in length and shape; it generally extends as far as the tip of the antennular stalk, but in some cases may fall short of this, while in others it extends slightly beyond; its depth in relation to its length is not very definite. The upper margin of the rostrum also varies considerably in the amount of its convexity; in some examples this margin is practically straight. The tooth-formula is $\frac{12 \text{ to } 15}{2 \text{ to } 3}$, the upper teeth being placed very near each other; the first three or four are wider apart than the others, and the first four or five are on the carapace; thickly-set setæ are present between the teeth.

The large chelipedes are stout and always unequal in length; the longer chelipede which may be either the right or the left is much stouter than the shorter one; they are well provided with long setose hairs. The upper surface of all the joints is roughened by minute close-set spinules, which are best developed on the carpus, while those on the under surface are fewer, but somewhat better developed and more erect; only a few spinules occur on the basis while in the longer chelipede those on the palm are confined to its proximal upper surface. Traversing the dorsal surface of the carpus is a longitudinal groove proceeding from the upper protuberance or knob on the inner side of its distal end; this groove is, however, very faint in some specimens and in a few it is absent. The following are the chief characters of the longer and larger chelipede. The setose hairs on the palm and basal regions of the fingers are matted together to form a velvety covering. The lateral groove on the outer surface of the ischium which is generally present in other freshwater prawns is very faint or even absent here, while that on the inner surface is specially deep. The two inner knobs generally present on the distal end of the carpus are specially prominent in this species, and the groove between them is very deep. The palm is compressed dorso-ventrally; its length in relation to its width varies from about two to one to about three to one; it is wider than the distal end of the carpus. The fingers are of nearly equal thickness; the immobile finger is slightly concave internally and the mobile one has almost the same curve; the tip of the mobile finger is more strongly incurved than that of the immobile one, so that when the fingers are closed it crosses the immobile finger at a short distance from the tip. There is a row of from 17 to 26 tubercles on the median ridge of the mobile finger, and from 12 to 20 on the immobile finger; these tubercles gradually decrease in size towards the distal end; the third or fourth tubercle of the mobile finger is the largest and the basal tooth of the immobile finger fits in behind it. When the fingers are closed their opposed margins do not meet. There is great variation in the relative lengths of the joints; the carpus is generally shorter than the merus, but in some cases it is equal to or even slightly longer than the latter the palm is longer than the carpus; the fingers are usually much shorter than the palm, but in some cases, they are either equal to it or even slightly longer. The larger chelipede is longer than the body. The smaller chelipede differs from the larger one in the following respects:—The palm is as wide as the distal end of the carpus, and the setose hairs with which it is provided are not matted together. The fingers are equal, and their tips are very slightly incurved; the tubercles on their ridges are poorly developed towards the distal end, and in some cases are totally absent; when closed their margins meet. The palm is generally sub-equal to the carpus, sometimes even shorter; the fingers are always longer than the palm. The shorter chelipedes is shorter than the body.

A table of measurements of the chelipedes in a number of specimens which present adult characters is given on page 299 to show the variation in the relative lengths of the joints.

The tip of the telson is variable; it may be either broadly pointed or rounded. The terminal median spine is short and blunt, and the inner lateral spinules project beyond it by about half or two-thirds of their length; long setæ are present at the tip, and extend much beyond the inner lateral spinules.

The antero-lateral regions of the carapace are scabrous; the walking legs are also scabrous and setose; the setæ present on the free margins of the abdominal epimera and caudal fin are longer than in any of the preceding species.

Characters of females.—The rostrum is usually deeper than in males, and extends beyond the antennular stalk, but not so far as the distal margin of the antennal squame. The large chelipedes are equal or sub-equal, and their length is about half that of the body; they are sparingly setose. The palm is only slightly compressed; the fingers are equal, their median ridges are feebly indented and definite tubercles can scarcely be said to exist. The body is practically smooth. Females with eggs (which are very small in this species) vary from 53 mm. to 40 mm. in total length. In one of them measuring 49 mm. the joint-measurements are as follows:—

i. 5 m. 6 c. 6 p. 5 f. 5.

Characters of the young.—The chelipedes are of equal length in very young males, which shows that with growth one of the chelipedes increases more quickly in length, and assumes the characteristics of the larger chelipede of the adult, while the other grows more slowly. In a specimen measuring 42 mm. in total length, the joint-measurements are as follows:—

i. 4 m. 5 c. 5 p. 5 f. 4.5.

Colours when fresh.—In large males a median pale band runs along the dorsal surface from the tip of the telson to the rostrum; this is continued along the upper half of the rostrum to its tip. On the abdomen this band is incompletely divided by a median discontinuous greyish streak. The fingers of the shorter chelipede, with the exception of the extreme tips, are dark-blue.

The fingers in the female are encircled by two blue bands; the extreme tips are white. The last pair of abdominal appendages are violet above and below, but their outer borders are white.

Localities.—A large series from Madras, Red Hills, and Wala-jabad; Trichinopoly; Palghat; Calicut; and Tanjore District.

General distribution.—*P. scabriculus* is recorded from Ceylon (Heller), Saleyer and Celebes (de Man). It has been previously met with in the following Indian localities:—Kotri on the River Indus (Henderson), and Pondicherry (Nobili).

No.	Locality.	LONG CHELIPED.								SHORT CHELIPED.					Total length of body.	Total length of long che- lipede.	Total length of short chelipede.
		Right or left.	Ischium.	Merus.	Carpus.	Palm.	Mobile finger.	Immobile finger.		Ischium.	Merus.	Carpus.	Palm.	Finger.			
I	Trichinopoly	L	8	13	13	17	18	19		8	10.5	10.5	10	12	61	70	51
II	Madras	L	7.5	14	13.5	20	20	20.75		7	10	9	7.5	10.5	62	75.75	44
III	Walajabad	R	8	6.25	15	26	20.5	20.75		7.5	12	11	10	11.5	66	86	52
IV	Saidapet	R	8	16	14.5	25	20	20.75		7.25	11.5	10	10	11.25	68	84.25	50
V	Trichinopoly	R	8	17	15	25	22.5	24		8	12	11	10	12	71	89	53
VI	Oothucadu (Tanjore Dt.)	L	9.5	19	16	24.5	23.5	24.5		8	13	11.5	11.5	12.5	75	93.5	56.5
VII	Trichinopoly	L	9.5	17	18	26.5	27	28.5		8	12	14	11	16	76	99.5	61
VIII	„	L	10	20	18	30	24	25		9	14.5	13	14.5	15	85	103	66
IX	„	R	11	22.5	19	38	28	30		10	16	14	15	17	88	123	72

P. DOLICHODACTYLUS, Hilgendorf.

(Pl. xviii, figs. 8a—b.)

P. dolichodactylus, Hilgendorf, Monatsb. Akad. Wiss. Berlin, p. 840, taf. iv, fig. 18 (1878); Ortman, l.c., p. 731 (1891); Coutière, Ann. Sci. Nat. Zool. t. xii, p. 283 (1901); Nobili, l.c., p. 13 (1903).

Characters of adult males.—The only points of difference that we have been able to discover between this so-called species and the last are as follows:—The carpus of the longer chelipede is usually longer than the merus; the palm is never wider than the distal end of the carpus, and in most cases is of the same width. The fingers are thinner than those of *P. scabriculus* and *are much longer than the palm*; the velvety covering on the latter joint is continued to the proximal halves of the fingers. The median ridges bear more tubercles than in *P. scabriculus*, 25 to 32 on the mobile finger and 23 to 25 on the immobile; when closed the opposed margins of the fingers meet.

A table of measurements of the large chelipedes in some specimens which appear to be adult is given on page 303.

We have a male prawn from the Nilambur forest, measuring 64 mm. in total length, which seems to connect *P. scabriculus* and *P. dolichodactylus*. The carpus and merus are of equal length, and the palm is a little longer than the fingers. The fingers are subequal and the velvety covering on the palm is continued on them for only one-third of their length; their opposed margins meet when closed. The mobile finger bears 22 tubercles, and the immobile one 17 in addition to the basal tooth. The joint measurements are as follows:—

	i.	m.	c.	p.	m.f.	im.f.
Long chelipede	8	15	15	26·5	24·5	25
Short ,,	7	10·5	10·5	8	12·5	12·5

This specimen bears considerable resemblance to *P. petersii*, Hilgendorf, from East Africa (Monatsb. Akad. Wiss. Berlin, p. 841, taf. iv, fig. 19, 1878), and we are led to think that *P. petersii* is perhaps only a connecting link between *P. scabriculus* and *P. dolichodactylus*.

Localities.—Many specimens from a river in the Nilambur forest in the Malabar district; an adult male from Palghat; Madras; Walajabad.

General distribution.—*P. dolichodactylus* has been recorded from the East coast of Africa, from Natal to Mozambique (Hilgendorf), Madagascar (Coutière). Nobili records it from Pondicherry.

P. DUBIUS, n. sp.

(Pl. xviii, figs. 9a—d.)

Characters of adult males.—Again in this form we shall content ourselves by merely indicating the points of difference between it

and the two preceding. The chelipedes are much weaker than in *P. scabriculus* and *P. dolichodactylus*, while the longer chelipede is a little shorter than the body. The setose hairs on the chelipedes are short and few; those on the palm and bases of the fingers are comparatively sparse, so that the joints appear almost naked. The spinules on the chelipedes are feebly developed. The carpus is always shorter than the merus. The palm is not so strongly compressed as in *P. scabriculus* and *P. dolichodactylus*, with the result that it is much longer than broad, the proportion being four to one; it is wider than the distal end of the carpus, and much longer than the fingers. The fingers which are equal are considerably thinner and their tips are much less strongly incurved than in the other two species; the tubercles on the fingers are considerably smaller and fewer: there being only from 12 to 18 on the mobile finger and 11 to 15 on the immobile.

The measurements given on page 304 are taken from the large chelipedes of certain individuals which we regard as adult.

It will be seen from the measurements that there is less variation in the joint-lengths of the chelipedes in the present form than in *P. scabriculus* and *P. dolichodactylus*.

We give on page 305 the joint measurements of three specimens which we are unable to satisfactorily assign to one or other form but which appear to connect *P. scabriculus* and *P. dubius*.

Colours when fresh.—In the males of *P. dubius* there is a median dorsal pale band as in *P. scabriculus*. The fingers of the shorter chelipede are doubly banded with blue as in the females of *P. scabriculus*; those of the larger chelipede are dark blue, with the extreme tips almost white.

Localities.—A large series from Walajabad, Saidapet and other localities in the Chingleput District.

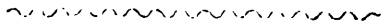
Note.—Though we have allowed the last three forms to remain distinct, the following considerations strongly incline us to the view that they may all belong to one and the same species. Adult males of *P. scabriculus* and *P. dolichodactylus* were found living together at Walajabad, Red Hills and Saidapet, and all three forms were obtained from the same tanks at Palghat and Walajabad, while young males obtained along with them were all alike. All the female specimens collected under the same conditions were also identical. Finally we possess specimens which we are forced to regard as connecting links between the three types of male.

ADDENDUM.

Since the previous pages were written we have received from Villivakkam, a village in the neighbourhood of Madras, an addition to our list in the species which de Man, from an examination of Bengal specimens (*Records, Indian Museum*, vol. ii, part 3, p. 222, 1908), has identified as *P. lamarrei*, Milne-Edw. Many of the specimens are females with ova, measuring from 40 mm. to 45 mm. in total length, and the eggs, which are unusually large

for such a small species, measure approximately 1·75 mm. in length and ·75 mm. in breadth.

We succeeded in hatching out a number of the eggs, and ascertained that development is direct in *P. lamarrei*, the young prawn entering upon its free life with the full complement of thoracic and abdominal appendages, except the last pair of the latter, and the abdominal appendages are uniramous. A similar abbreviated metamorphosis was long ago observed by Fritz Müller in the case of *P. potiuna* (*Zool. Anzeig.* Jahrg. iii, 1880).



No.	Locality.	LONG CHELIPED.							SHORT CHELIPED.					Total length of body.	Total length of long che-lipede.	Total length of short che-lipede.
		Right or left.	Ischium.	Merus.	Carpus.	Palm.	Mobile finger.	Immobile finger.	Ischium.	Merus.	Carpus.	Palm.	Finger.			
I	River in Nilambur forest, Malabar.	R	8	14	16	16	26	25	7	10.5	11.5	8	13	59	80	50
II	„ „ ..	R	7	10	11	10.5	17	17	6	7	7.5	6.25	9	60	55.5	35.75
III	„ „ ..	L	8	15	16.5	18	28	28	7	10	11.5	8.5	14	62	85.5	51
IV	„ „ ..	L	8	15	17	19	broken	27	7	11	12.5	10	16	67	86	67
V	Walajabad ..	L	9	17.5	17	22	26	27	7	13	12	13	13.5	71	92.5	58.5
VI	Palghat „ ..	L	9	16.5	17.5	23.5	27.5	27.5	8.5	12	14	11	16	73	94	61.5
VII	„ ..	L	10	18	20	21	33.5	35	8.5	14	15	12	17	75	104	66

No.	Locality.			LONG CHELIFEDE.						SHORT CHELIFEDE.					Total length of body.	Total length of long che-lipede.	Total length of short che-lipede.
				Right or left.	Ischium.	Merus.	Carpus.	Palm.	Finger.	Ischium.	Merus.	Carpus.	Palm.	Finger.			
I	Red Hills	..	..	R	6	10	8·5	13·5	9·5	6	8	7·5	7·5	7·5	62	47·5	36·5
II	Saidapet	..	..	L	6·5	10	9·5	12·5	10	6·25	8·5	7·75	7·25	8	63	48·5	37·75
III	„	..	..	L	7	11	11	15·5	12·5	6·5	8·5	8	8	8·5	66	57	39·5
IV	„	..	..	L	7·25	12	10·25	17·5	11·5	6·5	9	8	8·25	8·5	67	58·5	40·25
V	Walajabad	..	..	R	7	12	11	17·5	12·5	6·5	9·5	8·5	9	8·5	71	60	42
VI	„	..	..	L	8	14	12·5	21	15	7	10·5	9·5	10	10	73	70·5	47
VII	Saidapet	..	..	R	7·5	14·5	13·5	23	15	7·25	10·5	10	9·25	10	75	73·5	47

No.	Locality.			LONG CHELIPED.						SHORT CHELIPED.					Total length of body.	Total length of long che-lipede.	Total length of short che-lipede.
				Right or left.	Ischium.	Merus.	Carpus.	Palm.	Immobile finger.	Ischium.	Merus.	Carpus.	Palm.	Immobile finger.			
I	Madras	..	..	R	5	8	7.5	9.5	8.5	5	7	6	5	6	53	38.5	29
II	Palghat	..	..	R	6.5	9.5	10	12	11	6.5	8	8.5	7	7.5	61.5	48.5	37.5
III	„	..	..	L	7.5	12	12.5	18	15.5	7	9	9.5	8	9.5	70.5	65.5	42.5

EXPLANATION OF PLATE XV

FIG. 1.—*Palaemon carcinus*, Fabr.

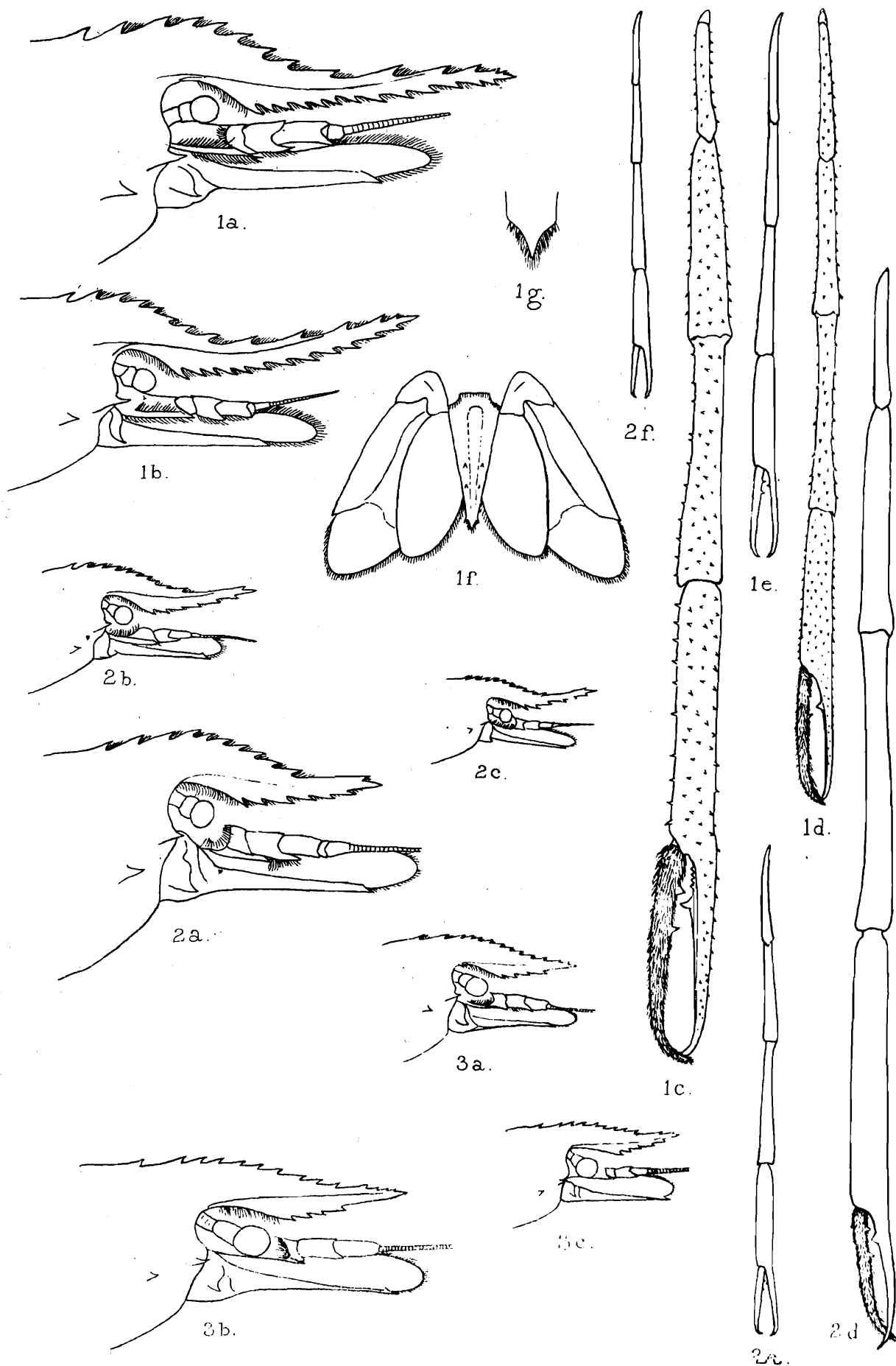
- „ 1a.—Cephalic region, $\frac{3}{4}$ nat. size (♂ measuring 295 mm.).
- „ 1b.—Cephalic region, $\frac{3}{4}$ nat. size (♀ measuring 232 mm.).
- „ 1c.—Right chelipede, nearly $\frac{3}{8}$ nat. size (♂ measuring 295 mm.).
- „ 1d.—Right chelipede, nearly $\frac{3}{4}$ nat. size (♀ measuring 232 mm.).
- „ 1e.—Right chelipede of young, nat. size (♂ measuring 139 mm.).
- „ 1f.—Caudal fin, nat. size (♂ measuring 174 mm.).
- „ 1g.—Apex of telson $\times 3$ (♂ measuring 174 mm.).

FIG. 2.—*Palaemon malcolmsonii*, Milne-Edw.

- „ 2a.—Cephalic region, nat. size (♂ measuring 191 mm.).
- „ 2b.—Cephalic region, nat. size (♀ measuring 118 mm.).
- „ 2c.—Cephalic region, nat. size (♂ measuring 87 mm.).
- „ 2d.—Right chelipede, $\frac{1}{2}$ nat. size (♂ measuring 191 mm.).
- „ 2e.—Right chelipede, nat. size (♀ measuring 118 mm.).
- „ 2f.—Right chelipede, nat. size (♂ measuring 86 mm.).

FIG. 3.—*Palaemon idæ*, Heller.

- „ 3a.—Cephalic region, nat. size (♂ measuring 110 mm.).
- „ 3b.—Cephalic region, with the four terminal upper rostral teeth close together $\times 2$.
- „ 3c.—Cephalic region of ♀, nat. size.



1a-g. *Palaemon carinus*, Fabr. 2a-f. *Palaemon malcolmsoni*, Milne-Edw.

3a-c. *Palaemon idae*, Heller.

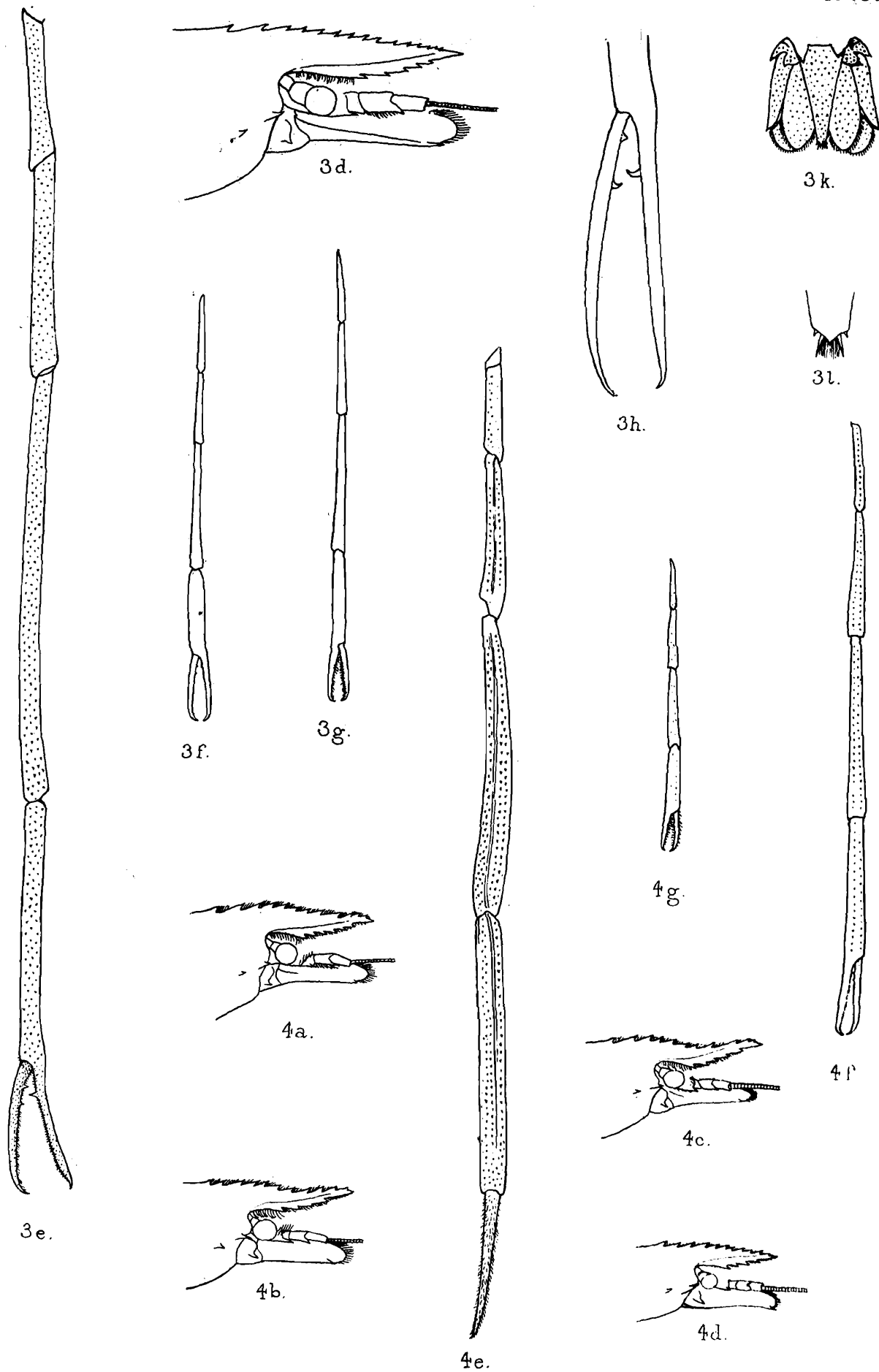
EXPLANATION OF PLATE XVI.

FIG. 3.—*Palaemon idæ*, Heller.

- „ 3*d*.—Cephalic region of ♀ × 2.
- „ 3*e*.—Right chelipede, nat. size (♂ measuring 110 mm.).
- „ 3*f*.—Right chelipede, nat. size (♀ measuring 89 mm.).
- „ 3*g*.—Left chelipede, nat. size (young ♂ measuring 77 mm.).
- „ 3*h*.—Fingers of a Mangalore ♂ to show the teeth × 2.
- „ 3*k*.—Caudal fin, nat. size (♂ measuring 110 mm.).
- „ 3*l*.—Apex of telson × 3 (♂ measuring 110 mm.).

FIG. 4.—*Palaemon sulcatus*, n. sp.

- „ 4*a*.—Cephalic region, nat. size (♂ measuring 93 mm.).
- „ 4*b*.—Cephalic region, nat. size (♂ measuring 82 mm.).
- „ 4*c*.—Cephalic region, nat. size (♂ measuring 82 mm.).
- „ 4*d*.—Cephalic region of ♂, nat. size (measurement lost).
- „ 4*e*.—Right larger chelipede, nat. size (♂ measuring 93 mm.).
- „ 4*f*.—Left short chelipede, nat. size (♂ measuring 93 mm.).
- „ 4*g*.—Left chelipede, nat. size (♀ measuring 71 mm.).



3d-l. *Palaemonidae* Heller.

G.M. del.

4a-g. *Palaemon sulcatus*, nsp.

Lith. by, A.C. Chowdhary.

EXPLANATION OF PLATE XVII.

FIG. 5.—*Palaemon rudis*, Heller.

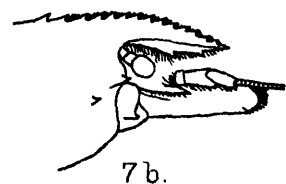
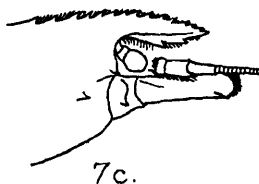
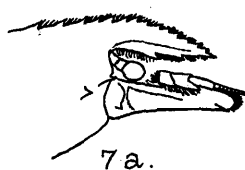
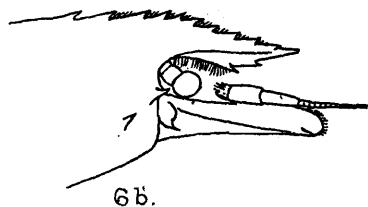
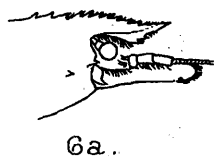
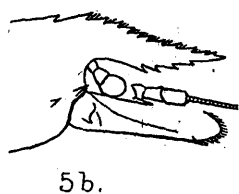
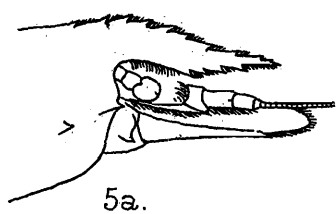
- „ 5a.—Cephalic region, nat. size (♂ measuring 117 mm.).
- „ 5b.—Cephalic region of ♀, nat. size.
- „ 5c.—Right larger chelipede, nat. size (♂ measuring 117 mm.).
- „ 5d.—Left short chelipede, nat. size (♂ measuring 117 mm.).
- „ 5e.—Right chelipede, nat. size (♀ measuring 86 mm.).
- „ 5f.—Regenerated chelipede, nat. size (♂ measuring 105 mm.).
- „ 5g.—Right chelipede showing dilatation of palm, nat. size
(Cocanada ♂ measuring 74 mm.).
- „ 5h.—Apex of telson × 3 (♂ measuring 117 mm.).

FIG. 6.—*Palaemon nobilii*, n. sp.

- „ 6a.—Cephalic region, nat. size (♂ measuring 64 mm.).
- „ 6b.—Cephalic region, × 2 (♀ measuring 54·5 mm.).
- „ 6c.—Left larger chelipede, nat. size (♂ measuring 64 mm.).
- „ 6d.—Left chelipede, nat. size (♀ measuring 54·5 mm.).
- „ 6e.—Apex of telson × 3 (♂ measuring 64 mm.).

FIG. 7.—*Palaemon scabriculus*, Heller.

- „ 7a.—Cephalic region of ♂, nat. size
 - „ 7b.—Cephalic region of ♂, nat. size
 - „ 7c.—Cephalic region of ♂, nat. size
- } showing variation in
shape of rostrum.



5a-h. *Palaemon rudis*, Heller.

7a-c. *Palaemon scabriculus*, Heller.

6a-e. *Palaemon nobilii*, nsp.

G.M.del.

Lith. by, A.C. Chowdhary.

EXPLANATION OF PLATE XVIII.

FIG. 7.—*Palaemon scabriculus*, Heller.

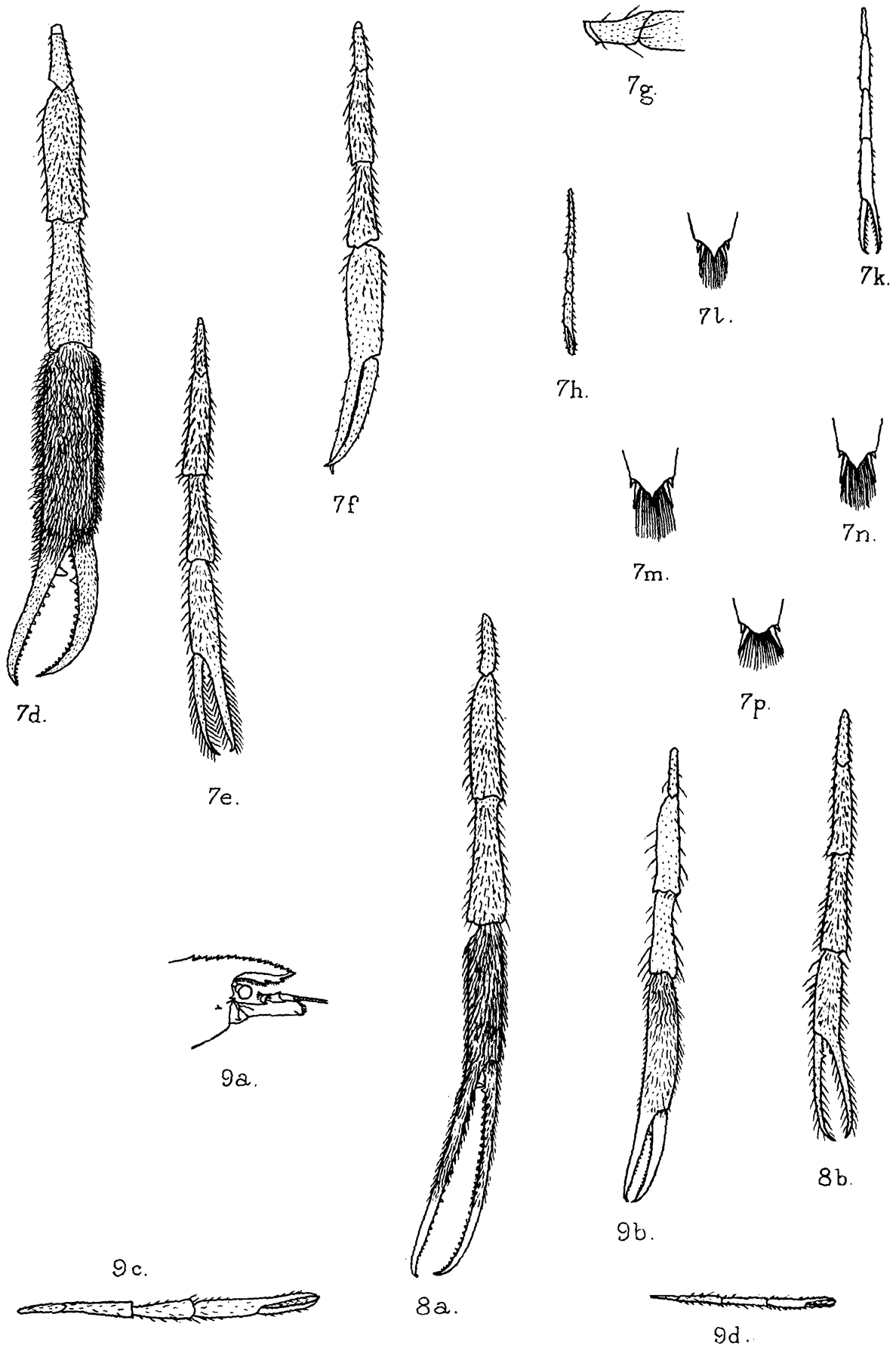
- „ 7d.—Left larger chelipede of ♂, nat. size.
 - „ 7e.—Right short chelipede of ♂, nat. size.
 - „ 7f.—Left larger chelipede of ♂, nat. size.
 - „ 7g.—Ischium of ♂, nat. size.
 - „ 7h.—Right larger chelipede, nat. size (♀ measuring 46 mm.).
 - „ 7k.—Right regenerated chelipede, nat. size (♂ measuring 53 mm.).
 - „ 7l.—Apex of telson × 3 (♂ measuring 62 mm.)
 - „ 7m.—Apex of telson × 3 (♂ measuring 75 mm.)
 - „ 7n.—Apex of telson × 3 (♂ measuring 45 mm.)
 - „ 7p.—Apex of telson of ♂ × 3
- } showing
variation
in telson
tip.

FIG. 8.—*Palaemon dolichodactylus*, Hilg.

- „ 8a.—Left larger chelipede, nat. size (♂ measuring 75 mm.).
- „ 8b.—Right short chelipede, nat. size (♂ measuring 75 mm.).

FIG. 9.—*Palaemon dubius*, n. sp.

- „ 9a.—Cephalic region, nat. size (♂ measuring 75 mm.).
- „ 9b.—Left larger chelipede, nat. size (♂ measuring 75 mm.).
- „ 9c.—Right short chelipede, nat. size (♂ measuring 75 mm.).
- „ 9d.—Right chelipede, nat. size (♀ measuring 43 mm.).



7d-p. *Palaemon scabriculus*, Heller.

8a-b. *Palaemon dolichodactylus*, Hilg.

9a-d. *Palaemon dubius*, n.sp.

XXIX. *ALLUAUDELLA HIMALAYENSIS*,
A NEW SPECIES OF DEGENERATE (♂)
COCKROACH.

WITH AN ACCOUNT OF THE VENATION FOUND IN THE GENERA
Cardax AND *Alluandella*.

By F. H. GRAVELY, M.Sc., Assistant Superintendent, Indian
Museum.

Introductory.

The genus *Cardax* was founded by Mr. Shelford in the year 1908 for the reception of a little *Embia*-like cockroach, male specimens of which were attracted to the lights in Mr. Green's bungalow at Peradeniya in Ceylon. They were forwarded to Mr. Shelford by Dr. Willey, and received the name *Cardax willeyi*. During the present year Mr. Shelford has described a similar male cockroach from the Kulumusi Caves near Tanga, in German East Africa. For this species he has founded a separate genus, the full name of the species being *Alluandella cavernicola*. From his descriptions the generic distinctions appear to be: the smaller size of the eyes in the latter; the form of the pronotum, which covers the vertex of the head in the former but not in the latter; and differences in the venation.

During a recent visit of Dr. Annandale to Kurseong, in the Darjiling district of the Eastern Himalayas (4,700 ft.), a single male specimen of yet another species of *Embia*-like cockroach was found. Like *Cardax willeyi* it was attracted to the light of a house, where it was captured. This specimen has the eyes well-developed as in *Cardax*, but has no ocelli; the vertex of the head is free of the pronotum, as in *Alluandella*, whilst the venation is unlike that of either genus.

During a recent visit to Peradeniya I had the good fortune to obtain several specimens of *Cardax willeyi*, all of which were males taken at light in Mr. Green's bungalow. These show considerable variation in their venation, and lead me to suppose that the differences in venation between *Cardax willeyi*, *Alluandella cavernicola*, and the Kurseong species are of much less importance than appears at first sight. I propose therefore in the present paper to describe this variability in the venation of *Cardax willeyi*; to emphasize the fundamental uniformity found in the venation of the three species; to point out the probable relation of this type of venation to that found in other cockroaches; to

describe the Kurseong specimen under the name *Alluaudella himalayensis*; and to redefine the genera *Cardax* and *Alluaudella* in accordance with the fresh facts brought forward.

I have to thank Mr. Green for lending me his series of specimens of *Cardax willeyi*, including several of the collection of which the part sent to Shelford formed the basis of the original description of the species.

Variation in the venation of CARDAX WILLEYI, Shelford.

The venation of both the tegmina and wings of *Cardax willeyi* consists of a series of well-defined veins whose origin is practically coincident with the origin of the tegmen (or wing), and which run direct to the margin of that organ, giving off but few branches in their course; and of a series of "secondary" veins having as a rule no defined origin and lying singly between these "primary" veins as they may be termed. The branching of the primary veins is of two kinds. Firstly, branching near the origin, to form in all six long veins which it will be convenient to refer to as primary veins

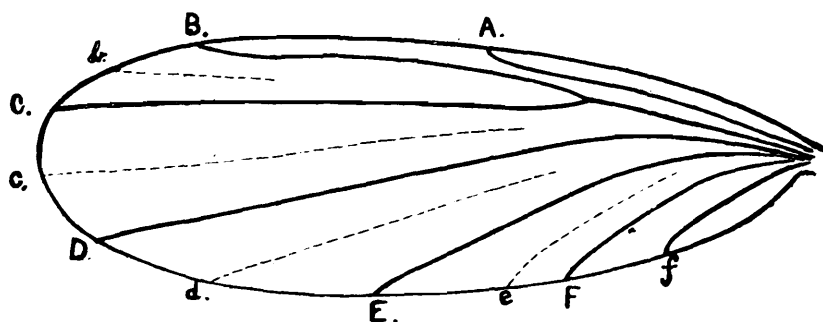


Diagram of the venation of the tegmen of *CARDAX WILLEYI* (♂).

The lettering of the veins corresponds to that used provisionally in the text; the probable relation of these veins to those found in more highly organized cockroach wings is described on p. 310. In the tegmen of *Cardax willeyi* the only difference between the nomenclature here advocated and that adopted by Shelford in his description is that Shelford regards "vein C" as a fork of the radial instead of as a distinct vein corresponding to the *vena spuria*. Primary veins are indicated by heavy lines; secondary ones by dotted lines. Vein *f* is shown by a heavy line, as it is at least as likely to correspond to a true branch of the anal (*i.e.*, to correspond strictly to an axillary vein of other forms) as to be one of the series of secondary veins which are here supposed to have possibly arisen *de novo* in the degenerate forms.

A—F respectively¹ (see text fig.); these branches arise in a manner which appears to be constant, and to be the same in all three species of cockroach particularly dealt with in the present paper, differing, however, in the tegmina and wings. And, secondly, branching which occurs nearer the margin of the wing, which is variable—except perhaps in the case of vein E of the wing which in every specimen I have seen is forked, the division occurring further

¹ In order to avoid confusion: the relation of these veins to those of more typical cockroaches will be considered later.

from the margin than in the case of any other vein. Thus vein D of the tegmen (anterior ulnar of Shelford's nomenclature) may be forked near the end (see fig. 1), and Shelford states that the posterior ulnar (vein E) may be similarly forked; and in the wing vein C may (figs. 1, 2 and 3) or may not (fig. 4B) be forked; and in the wing vein C may (figs. 1, 2 and 3) or may not (fig. 4) be forked.

But it is in the secondary veins (*b-f*) that the variations occur which are of special importance in connection with the relation between the types of venation found in these three species. These veins are usually connected with the primary veins between which they lie by a series of more or less ill-defined and very irregular cross-veins. The cross-veins are quite irregular in position, in number, and in intensity; and in some cases the secondary veins may appear to arise as definite branches of some primary vein, and in others very nearly to do so. Thus in the tegmen vein *b* often appears as a branch of vein B (see figs. 2 and 4A) or of vein C (see fig. 2); and in the specimen shown in fig. 3 vein *e* of both tegmina (but one more than the other) tends to appear as a branch of vein E and vein *c* of the right wing shows a strong tendency to appear simply as a branch of C and *d* of E.

Having thus established the fact that in *Cardax willeyi* the venation consists of a series of constant primary veins (any of which may, however, bifurcate near the margin of the wing), alternating with secondary veins, which show a tendency to fuse with them and so to appear as branches from them, the venation of *Alluaudella carvernica* and *A. himalayensis* can easily be shown to consist of the same elements somewhat more definitely combined. But before doing this it will be necessary to describe the new species *Alluaudella himalayensis*.

Description of ALLUAUDELLA HIMALAYENSIS, sp. n.

(Figs. 5A and 5B.)

♂ (one specimen only): size, pubescence and antennae as in *Cardax willeyi*; eyes well developed and far apart; ocelli absent; vertex of head not covered by pronotum; pronotum trapezoidal, punctured and pubescent behind and at the sides, with longer hairs more sparsely scattered over a central area extending as a narrow strip to the anterior margin; shape of pronotum, however, not so distinctly transverse as in *Cardax willeyi*. Tegmina and wings resembling those of *Cardax willeyi* in shape, size, texture and pubescence; mediastinal vein very short in tegmina, in the wings rudimentary (in one) or absent (in the other); radial vein rather faint in the tegmina, coincident with a longitudinal crease; no secondary vein developed in front of vein C (= *vena spuria*, see below p. 310) in tegmen or wing; base of vein C received by vein B (= radial) in the tegmen very close to the origin; vein E (= posterior ulnar) in the tegmen receives the base of the succeeding secondary vein (*e*), which is strongly developed and appears simply as a branch of it. Legs long and slender; apical spines of tibia

EXPLANATION OF PLATE XX.

o = ocellus.

x = rudimentary vein.

Fig. 1. *Cardax willeyi*, $\times 8$. Dried specimen; from above.

Fig. 2. *Cardax willeyi*. Specimen mounted in Canada balsam; from above; the head extended forwards by pressure.

A. The whole, $\times 8$.

B. Posterior end of abdomen, $\times 30$.

Fig. 3. *Cardax willeyi*. Specimen mounted in Canada balsam; from below; the head extended forwards by pressure.

A. The whole, $\times 8$.

B. Posterior end of abdomen, $\times 30$.

Fig. 4. *Cardax willeyi*.

A. Left tegmen, $\times 8$.

B. Right wing, $\times 8$.

From a dried specimen.

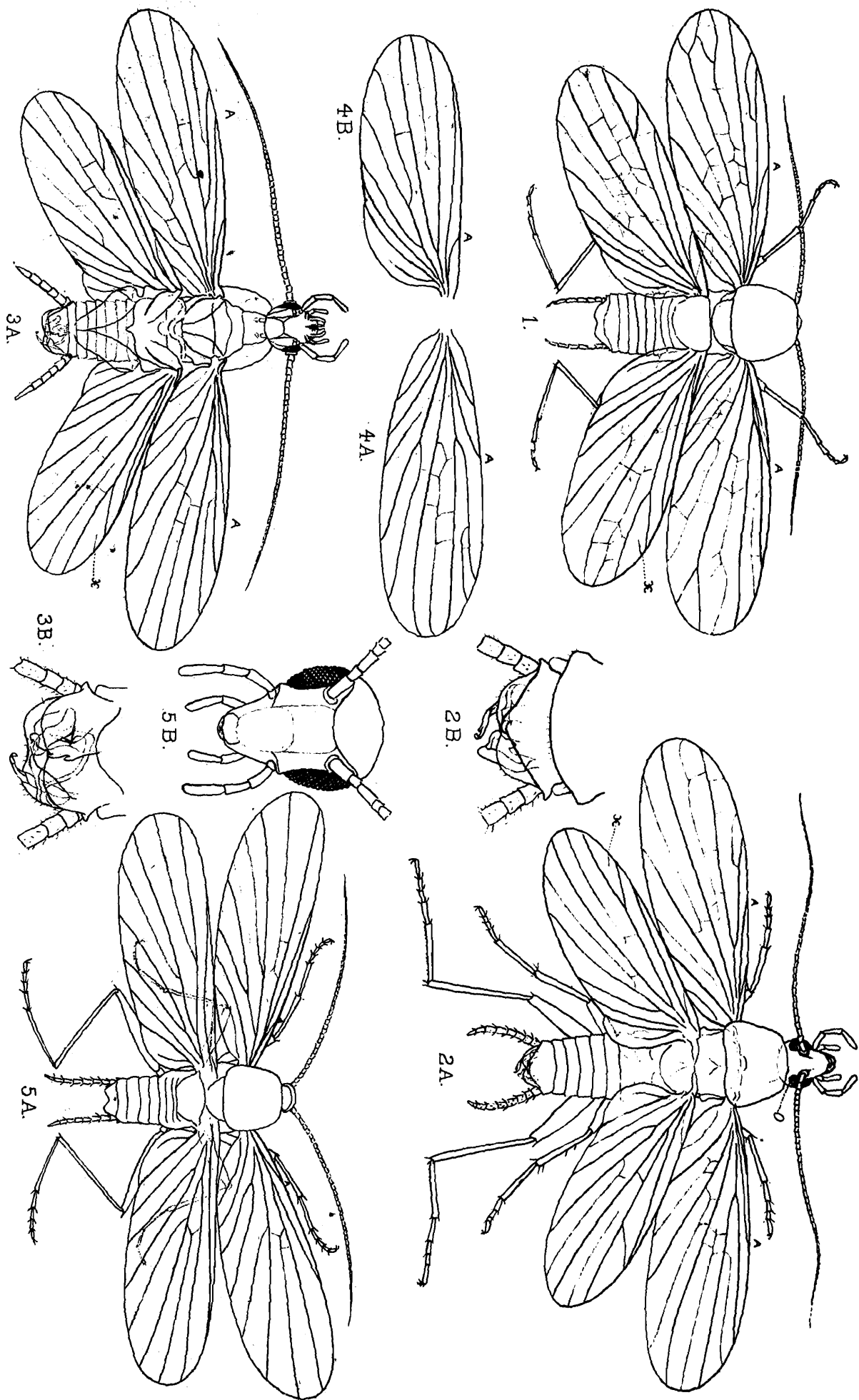
Fig. 5. *Alluaudella himalayensis*.

A. The whole from above, $\times 8$.

B. The head from in front, $\times 35$.

From a dried specimen (the type).

The specimens here figured are all preserved in the collection of the Indian Museum.



XXX. RHYNCHOTA MALAYANA.

PART III.

By W. L. DISTANT.

In this contribution some new species and genera are described and figured from Borneo, but its principal aim is to revise the current enumeration of two sub-families of the Fulgoridæ so far as they are represented in the Malayan Region. In 1901-1902 Dr. Melichar published his "Monographie der Acanaloniiden und Flatiden," a contribution to a knowledge of the Homopterous Rhynchota for which all students were grateful. Unfortunately, however, he worked without any direct knowledge of the numerous species described by Walker in these sub-families, and thus, not unexpectedly fell into dire confusion as to their proper location. I have now dealt with all the Malayan species described and recorded by these two writers, and have sought to correct that part of Melichar's work. The genera and species from extra-Malayan habitats have been discussed in "Ann. and Mag. Nat. Hist." Ser. 8, vol. v, pp 297—322 (1910).

HETEROPTERA.

Fam. PENTATOMIDÆ.

Sub-fam. Phlœinæ.

Genus SERBANA.

Serbana, Dist., Ann. Soc. Ent. Belg., 1906, p. 405.

Type, *S. borneensis*, Dist.

Serbana borneensis. (Pl. xxi, figs. 10, 10a.)

Serbana borneensis, Dist., Ann. Soc. Ent. Belg., 1906, p. 405.

Hab.—Borneo ; Kuching, Santubong.

This is at present the only known Malayan representative of the Neotropical family Phlœinæ and is now figured.

Fam. LYGÆIDÆ.

ABGARUS, gen. nov.

Head with the eyes distinctly and strongly stylate projecting distinctly beyond the anterior angles of the pronotum, behind the ocelli narrowed into a very distinct neck which is about half as

long as broad, ocelli between the eyes and much nearer to their insertion than to each other, in front of the ocelli the head is centrally longitudinally grooved; antennæ with the first joint stoutest and passing apex of head, second and third subequal in length, fourth longest; rostrum reaching the intermediate coxæ, first joint reaching the anterior margin of the prosternum; pronotum subquadrate, transversely constricted before middle, before the constriction centrally foveately impressed, behind the constriction very coarsely punctate and somewhat obliquely tumid to base; scutellum longer than broad, punctate; corium a little longer than greatest length of membrane, the costal margin moderately evenly sinuate, the apical angle subacute; membrane with five straight longitudinal veins; legs of moderate length, posterior tarsi with the first joint longer than second and third together.

Allied to *Scopiastes*, Stål, and *Æthalotus*, Stal, but differing principally from both by the produced neck behind the ocelli.

Abgarus typicus, sp. n. (Pl. xxi, figs. 4, 4a.)

Head, anterior area of pronotum and the prosternum pale sanguineous; antennæ, apices of eyes, posterior area of pronotum, scutellum, corium, meso- and metasterna, abdomen, rostrum and legs black or blackish; coxæ, bases of femora and margins to the last three abdominal segments pale stramineous; membrane pale fuliginous, subhyaline, the veins pale fuscous, moderately passing the abdominal apex; basal joints of the tarsi more or less stramineous; structural characters as in generic diagnosis.

Long. 7 mm.

Hab.—Borneo; Kuching (Hewitt).

Genus ÆTHALOTUS.

Æthalotus, Stål., En. Hem., iv, p. 98, 1874.

Type, *Æ. afzelii*, Stål.

Æthalotus borneensis, sp. n. (Pl. xxi, figs. 5, 5a.)

Black; bases of the stylate eyes, anterior area of pronotum (excluding central black spot), connexivum, head beneath, prosternum and abdomen beneath sanguineous; legs pitchy-black, coxæ and bases and apices of femora brownish-ochraceous; antennæ with the first joint slightly passing apex of head, second and third subequal in length, fourth longest; head centrally longitudinally grooved in front of ocelli; eyes projecting beyond the anterior angles of the pronotum; anterior area of pronotum with a central transverse obliquely curved incised line, near anterior margin a transverse series of punctures in the black spot, posterior area thickly coarsely punctate; membrane very slightly passing the abdominal apex.

Long. $6\frac{1}{2}$ mm.

Hab.—Borneo; Kuching (Hewitt).

Fam. REDUVIIDÆ.**Sub-fam. Holoptilinae.****Genus PTILO CERUS.**

Ptilocerus, Gray, Zool. Misc., p. 34 (1831).

Type, *P. fuscus*, Gray.

Ptilocerus venosus.

Maotys venosus, Walk. Cat. Het., vii, p. 88 (1873).

Maotys guttifer, Walk. loc. cit., p. 89.

Ptilocerus venosus, Dist., Ann. Mag. Nat. Hist. (7), x, p. 192 (1902).

Ptilocerus ochraceous, Montand., Ann. Mus. Nat. Hung, v, p. 419 (1907).

Hab.—Bangkok, Singapore, Borneo.

Walker separated his two species on the very variable character of the number of marginal cells to the membrane, I have now Dr. Montandon's authority for including his species in the synonymy.

Fam. CAPSIDÆ.**Sub-fam. Isometopinae.****SKAPANA, gen. nov.**

Head broader than long, rounder in front with the apical margin laminately reflexed, the lateral margins laminately roundly produced in front of and a little before each eye and moderately reflexed; eyes large and prominent situate on each side of base, two distinct ocelli at base between the eyes; antennae with the first joint very short and thick, hidden beneath the head, second joint long, thickened, finely setose, about as long as pronotum, longer than third and fourth together; rostrum reaching the intermediate coxae; pronotum about twice as broad as long, the lateral margins rounded and moderately amply produced, their edges a little reflexed, the anterior angles obtusely angulately prominent, anterior margin truncate, posterior margin slightly sinuate; mesonotum exposed; scutellum elongate, about as long as breadth at base, convexly tumid, transversely incised near apex; corium broad, the costal area laminately roundly produced; clavus long and slender, reaching the apex of the scutellum; cuneus large a little broader than long; membrane somewhat short but considerably passing the apex of the abdomen, apical margin rounded, an obliquely transverse cell at base; legs short and slender, the posterior femora strongly thickened.

Allied to *Turnebus* Dist.

Skapana typica, sp. nov. (Pl. xxi, figs. 8, 8a.)

Ochraceous; apical margin of head, eyes, central disk of pronotum, exposed mesonotum, clavus, interior area of corium, and narrow lateral and apical margins to cuneus, black or blackish; scutellum castaneous, its extreme apex blackish; membrane fuliginous; antennæ black the third joint pale; rostrum black; body beneath and legs (imperfectly seen in typical specimen) ochraceous, the posterior femora pale castaneous; head finely punctate; pronotum, corium, clavus and cuneus coarsely punctate; scutellum finely punctate; other structural characters as in generic diagnosis.

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

Hab.—Borneo; Kuching (Hewitt).

HOMOPTERA.

Family CICADIDÆ.

Genus PURANA.

Purana, Dist., Ann. Mag. Nat. Hist. (7), xv, p. 60 (1905).

Type, *P. tigrina*, Walk.

Purana conspicua, sp. nov. (Pl. xxi, figs. 7, 7a, 7b.)

Head, pronotum and mesonotum brownish-ochraceous; head with the front anteriorly transversely blackly striate, the striations not meeting centrally and bounded by two black marginal lines, vertex with a large central angulate (narrowing posteriorly) black spot, enclosing the ocelli, with a curved anterior black spot on each side and the inner margin to the eyes black; pronotum with two central longitudinal narrow black fasciæ, united posteriorly, the fissures more or less black and with a transverse spot of the same colour on each lateral margin; mesonotum with five longitudinal black stripes, the central straight and the one on each side of it shortest, a rounded black spot near each anterior angle of the basal cruciform elevation; abdomen above black, greyishly pilose, the lateral margins more or less brownish-ochraceous; body beneath and legs brownish-ochraceous; the transverse striations and apex to face, an oblique stripe on each side between face and eyes, apical halves of cheeks, lateral areas of clypeus, sternal spots and apex of abdomen, black; tegmina hyaline, costal membrane and venation brownish-ochraceous or piceous, the transverse veins at apices of first and second ulnar areas broadly black, and the longitudinal veins to the first three apical areas piceously spotted near their apices, basal cell and base of claval area ochraceous; wings hyaline, the veins brownish ochraceous; head including eyes as wide as base of mesonotum, as long as space between eyes, tympanal coverings in ♂, broader at base than long; face globose, strongly transversely striate; rostrum reaching the poste-

rior coxæ, its apex black; opercula in ♂, short, ochraceous, inwardly more or less margined with piceous, outwardly obliquely rounded, inwardly concave, apices broadly, angularly rounded; tubercles to the second and third ventral segments elongate and slightly curved.

Long. excl. tegm. ♂, 35, ♀, 25 mm. Exp. tegm. ♂, 95, ♀, 90 mm.

Hab.—Borneo; Kuching, Sarawak (Moulton).

A large and conspicuous species.

Genus MOGANNIA.

Mogannia, Amy. and Serv., Hist., Hém., p. 467 (1843).

Type, *M. conica*, Germ.

Mogannia moultoni, sp. nov. (Pl. xxi, figs. 6, 6a, 6b.)

Head chocolate-brown; ocelli red; pronotum olivaceous-green, the anterior and posterior margins narrowly paler green; mesonotum olivaceous-green, with four small obconical spots on anterior margin (the two central spots largest) and a longitudinal fascia on each lateral area, chocolate-brown; abdomen above dark chocolate-brown with a longitudinal fascia on the lateral areas of second, third and fourth segments and a transverse fascia on fifth segment silvery-white; body beneath and legs brownish-ochraceous, the lateral areas of the body silvery-greyishly pilose, intermediate and posterior tibiæ greenish; clypeus black, the cheeks longly, silvery pilose; tegmina and wings hyaline, the veins greenish or piceous, costal membrane to tegmina reddish-brown; head strongly, conically produced in front; posterior margin of pronotum lobately, backwardly produced at each lateral angle; anterior femora spined beneath.

Long. excl. tegm. ♂ and ♀, 13 to 15 mm. Exp. tegm. 40 mm

Hab.—Borneo; Bau and Lawas, Sarawak (Moulton).

Genus LEMURIANA.

Lemuriana, Dist., Ann. Mag. Nat. Hist. (7), xvi, p. 32 (1905).

Type, *L. apicalis*, Germ.

Lemuriana connexa, sp. nov. (Pl. xxi, figs. 12, 12a, 12b.)

Body shining brown, shortly ochraceously pilose; posterior disk of face and clypeus blackish or black; cheeks and sternum very thickly ochraceously pilose; femora and disk of abdomen beneath suffused with darker brown; tegmina hyaline, costal membrane greenish, post-costal area and the venation piceous, transverse veins at the bases of the three upper apical areas infuscated on each side; wings hyaline, the venation and the abdominal area (excluding apex) piceous; face globose, transversely striate and centrally longitudinally sulcate on its upper half;

opercula nearly reaching apex of first abdominal segment, well separated internally, the apices broadly rounded; rostrum almost reaching the posterior coxæ.

Long. excl. tegm. ♀, 16 mm. Exp. tegm. 45 mm.

Hab.—Borneo; Lawas, Sarawak (Moulton).

Fam. FULGORIDÆ.

Sub-fam. Derbinæ.

Genus AFAKIA.

Arfaka, Dist., Ann. Mag. Nat. Hist. (7), xix, p. 397 (1907),
nom. præocc.

Afakia, Kirk. Canad. Ent., xli, p. 391 (1909), *n. nom.*

Kirkaldy proposed the above new name for my genus on erroneous reasons. He wrote "presuming it to be derived from the Papuan village 'Afak' (or as it used to be called 'Offak') Distant has written an intrusive 'r,' which I have omitted in the replacing name."

The Arfak Mts. of New Guinea are usually well known; the "Arfaks" who live there are not unknown to ethnologists, while the word is quite familiar to most naturalists, for few indeed have not read Wallace's "Malay Archipelago." However as the word *Arfaka* has previously been used for a genus of Cicadidæ, Kirkaldy's name is available.

Afakia decisa. (Pl. xxi, figs. 9, 9a.)

Arfaka decisa, Dist., Ann. Mag. Nat. Hist. (7), xix, p. 398 (1907).

Hab.—New Guinea (Wallace, Brit. Mus.).

Sub-fam. Issinæ.

Genus LOLLIVS.

Lollius, Stål, Hem. Afr., iv, p. 209 (1866).

Type, *L. australicus*, Stål.

Lollius pryeri, sp. nov. (Pl. xxi, figs. 11, 11a.)

Vertex brownish-ochraceous with darker brown spots between the eyes, at apex two foveate spaces the margins of which are ridged, each containing a small tubercle and with a black streak on their posterior margins; pronotum brownish-ochraceous finely spotted with darker brown; abdomen above ochraceous, the lateral and apical areas more or less suffused with fuscous-brown; body beneath and legs ochraceous, the latter more or less annulated with fuscous-brown; face fuscous-brown, mottled with ochraceous, its posterior disk longitudinally foveately impressed, its basal lateral angles slightly but distinctly angularly acute, lateral margins sinuate, broadening to behind eyes, thence oblique to clypeus which is

strongly tumid; posterior tibiae with two strong spines before apex; tegmina ochraceous, spots on costal, apical and claval margins, a large spot on clavus continued across corium as an irregular oblique fascia to near apex, and a subcostal spot near middle, fuscous brown; wings pale fuliginous, the inner and apical areas darker fuliginous.

Long. excl. tegm. 10 mm. Exp. tegm. 25 mm.

Hab.—North Borneo (Pryer—Coll. Dist.).

Sub-fam. Ricaninae.

Genus RICANIA.

Ricania, Germ. Mag. Ent. LII, p. 221 (1818).

Type, *R. fenestrata*, Fabr.

Ricania hewitti, sp. n. (Pl. xxi, figs. 1, 1a.)

Head, pronotum and abdomen brownish-ochraceous, mesonotum pale chocolate-brown, body beneath and legs brownish-ochraceous; tegmina pale yellowish, the costal membrane and radial area a little darker and more opaque; costal membrane for about two-thirds its length, apical costal area and the whole of apical margin more or less chocolate-brown with the extreme outer edges spotted with pale yellow, a broken, irregular, transverse macular fascia beyond middle, between which and base are a number of small irregular spots, chocolate-brown; wings hyaline, the apical and posterior margins fuscous-brown; face centrally and sublaterally ridged, none of the ridges reaching the posterior margin; pronotum centrally longitudinally carinate; mesonotum centrally straightly carinate and with a sublateral carinate line on each side which bifurcates from about middle to anterior margin; apical margin of tegmina about as long as inner margin.

Long. excl. tegm. $5\frac{1}{2}$ mm. Exp. tegm. 22 mm.

Hab.—Borneo; Kuching (Hewitt).

Genus MINDURA.

Mindura, Stål, Rio. Jan. Hem., ii, p. 64 (1862).

Type, *M. alligata*, Walk.

Mindura confusa, sp. n. (Pl. xxi, figs. 2, 2a.)

Head, pronotum and abdomen above ochraceous; mesonotum brownish-ochraceous; body beneath and legs ochraceous; tegmina pale ochraceous, about basal half of costal membrane, continued downward as a transverse fascia to near apex of clavus and a sub-apical spot to costal membrane continued downwards as a sub-apical transverse marginal fascia, castaneous brown, clavus tinged with brownish; wings subhyaline, the veins and an apical and marginal fascia fuscous-brown; mesonotum finely tricarinate; face

about one and a half times as long as broad, concavely sinuate at inner margins of eyes, two distinct central carinations which neither reach base nor apex and which moderately converge posteriorly, a broader but less sharply defined sublateral carination on each side.

Long. excl. tegm. 7 mm. Exp. tegm. 22 mm.

Hab.—Borneo; Kuching (Hewitt).

Allied to *M. interrupta*, Walk. from Singapore.

Mindura simiana, sp. n. (Pl. xxi, figs. 3, 3a.)

Body above brownish-ochraceous; body beneath and legs a little paler; margins of face and clypeus narrowly castaneous-brown; tegmina shining fuscous-brown, the basal area more or less paler and more ochraceous, two spots on apical half of costal membrane, one at apex, two linear before apical margin, a larger irregular spot before apex of clavus, and a variable cluster of smaller spots nearer base, white; wings subhyaline, the veins, apex and margin fuscous-brown; face shorter and comparatively broader than in the preceding species *M. confusa*, the carinations similar; mesonotum finely tricarinate; lateral margins of vertex acute.

Long. excl. tegm. 8 mm. Exp. tegm. 22 mm.

Hab.—Borneo; Kuching (Hewitt).

Fam. FULGORIDÆ.

Sub-fam. Acanalonünæ.

Genus ORYXANA, gen. nov.

Vertex a little longer than broad, the lateral margins strongly ridged; eyes very large, only a little shorter than vertex, reaching base but not overlapping the pronotum, face posteriorly about as broad as long, obliquely widened from base and suddenly obliquely directed inwardly a little before clypeus, centrally longitudinally carinate, the carination continued through the clypeus and with a short curved carination on each side scarcely reaching middle; pronotum centrally about as long as vertex, the anterior margin angularly produced between eyes, the posterior margin convexly rounded; mesonotum about as long as pronotum, posteriorly angularly produced; tegmina about one-third longer than broad, the costal margin and apical angle broadly convex, apical margin obliquely truncate, the inner angle acute, claval margin nearly straight, costal membrane, wider than radial area, with oblique but furcate veins, remaining area of tegmina more or less reticulately veined; wings considerably shorter than tegmina, two transverse veins on upper apical area.

Type, *O. subacuta*, Walk.

Oryxana subacuta. (Pl. xxii, figs. 6, 6a.)

Flata subacuta, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 179 (1868); Melich. Ann. Hof. Mus. Wien., xvii, p. 230 (1903).

Hab.—Mysol. (Brit. Mus.)

Oryxana lutea.

Nephesa lutea, Walk., Journ. Linn. Soc. Lond. Zool., 1, p. 161 (1857).

Oryxa truncata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 50 (1903).

Hab.—Borneo, Sarawak (Wallace—Brit. Mus.).

Sub-fam. Flatinae.

Genus PHROMNIA.

Phromnia, Stål, Rio. Jan. Hem., 11, p. 68 (1858).

Type, *P. pallida*, Oliv.

Phromnia montivaga.

Phromnia montivaga, Dist., Trans. Ent. Soc. Lond., 1892, p. 284, t. xiii, f. 5, *id.* Faun. B. I. Rhynch., 111, p. 401 (1906).

Flata floccosa, Melich. (part), Ann. Hofmus. Wien, xvi, p. 208 (1901).

Flata rubescens, Melich. (part), *loc. cit.*, p. 209.

Dr. Melichar has made this identification very difficult. Under *P. floccosa*, Guer., he has included my *P. montivaga* of which he correctly gives the reference; but under *P. rubescens* he has included my *P. parmata* to which he has again referred the figure of *P. montivaga*. The same figure he has thus made to represent what he proposes as synonyms of two distinct species.

Hab.—Borneo, Siamese Malay States (Annandale and Robinson).

Phromnia flaccida.

Flata flaccida, Walk., Ins. Saund. Hom., p. 50 (1858).

Phromnia hamifera, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 181 (1870).

Flata hamifera, Melich. Ann. Hofmus. Wien, xvi, p. 211, (1901).

Flata floccosa, Melich. (part), *loc. cit.*, p. 208.

Hab.—Sumatra, Java, Borneo.

Genus FLATOSOMA.

Flatosoma, Melich., Ann. Hofmus. Wien., xvi, p. 244 (1901).

Type, *F. signoreti*, Melich.

Flatosoma melichari, sp. n.

Flatosoma comma, Melich. (nec Walk.), Ann. Hofmus. Wien, xvi, p. 244 (1901), T. vii, f. 14 (1902).

Hab.—Borneo.

This is the species described and figured by Melichar as *F. comma*, Walk., a species which forms the type of my genus *Chaturbujia*. In fresh specimens the colour of the tegmina is virescent, in faded examples it is ochraceous.

Genus ORYXA.

Oryxa, Melich., Ann. Hofmus. Wien, xvii, p. 50 (1903).
Type, *O. truncata*, Linn.

Oryxa truncata.

Fulgora truncata, Linn. Syst. Nat., ii, ed. xii, p. 704, 8 (1767).

Oryxa truncata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 50 (1903).

Oryxa truncata, Dist., Faun. B. I. Rhynch., iii, p. 439, fig. 233 (1906).

Pæcilopectera addita, Walk., List. Hom., ii, p. 448 (1851).

Pæcilopectera plana, Walk., loc. cit., p. 463.

Colobesthes falcata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 43 (1903).

Hab.—Java, Borneo, India.

Genus MELICHARIA.

Melicharia, Kirk., Entomologist, xxxiii, p. 294 (1900).
Type, *M. quadrata*, Kirby.

Melicharia tripars.

Nephesa tripars, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 161 (1857).

Hab.—Borneo.

Allied to *M. quadrata*, Kirby.

Melicharia luteimargo.

Pæcilopectera luteimargo, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 92 (1857); Melich., Ann. Hofmus. Wien, xvii, p. 230 (1903).

Hab.—Singapore.

Melicharia niveina.

Pæcilopectera niveina, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 92 (1857); Melich., Ann. Hofmus. Wien, xvii, p. 230 (1903).

Nephesa deducta, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 161 (1857).

Ormenis deducta, Melich., Ann. Hofmus. Wien, xvii, p. 85 (1903).

Hab.—Malacca, Borneo.

Ormenis ? *baramia*, sp. n. (Pl. xxii, figs. 12, 12a.)

Head, pronotum and mesonotum virescent, abdomen above and body beneath and legs pale ochraceous, the dorsal surface of the abdomen thickly whitey tomentose; tegmina pale greenish, the costal, apical and inner margin as far as claval apex, rather broadly ochraceous, at apex of clavus a comparatively large piceous spot; wings creamy-white with a slightly greenish tint; face with the

central longitudinal carination not extending beyond middle; vertex a little more than twice broader than long, centrally and longitudinally carinate; tegmina about twice as long as broad, costal margin a little arched, apical margin subtruncate, the apical and posterior angles rounded, inner margin slightly angularly sinuate at apex of clavus; two transverse lines formed of transverse veins on apical area, the outermost enclosing a rather larger space than that between the outermost and innermost, claval area strongly granulose and a few smaller granules on basal disk.

Long. excl. tegm. ♀, 5 mm. Exp. tegm. 14 mm.

Hab.—N. W. Borneo; Baram (Brit. Mus.).

The genus *Ormenis* was by Melichar made to include the genus *Melicharia*, a course to which I dissent. The above species, however, has apparently all the characters of *Ormenis* (which I regard as of Neotropical and Nearctic distribution), and in fact has a strong resemblance to *Ormenis obtusa* from Bogota, described and figured by Dr. Melichar.

LOMBOKIA, gen. nov.

Vertex about as long as pronotum, obliquely deflected on each side, subconically narrowed to apex, strongly, longitudinally, centrally sulcate, eyes projecting over anterior margins of pronotum; face longer than broad, centrally longitudinally carinate, base obliquely narrowed, lateral margins laminately reflexed, posteriorly obliquely narrowed to clypeus which is centrally carinate; pronotum centrally longitudinally carinate, obliquely deflected on each side, posterior margin angularly concave; mesonotum mutilated in typical specimen; legs somewhat short, posterior tibiae with a single spine beyond middle; tegmina less than twice as long as broad, about basal half of costal margin strongly arched and then somewhat sinuately, obliquely directed to apex, apical margin obliquely truncate, posterior margin angularly sinuate at claval apex, costal membrane narrower than radial area, two longitudinal veins from basal cell, the uppermost with about five oblique veinlets, the whole surface more or less distinctly transversely veined, the claval area strongly granulose; wings a little narrower than tegmina, two transverse veins before apex.

Lombokia everetti, sp. n. (Pl. xxii, figs. 16, 16a.)

Body and legs greenish-ochraceous, anterior and intermediate tibiae slightly tinged with sanguineous; tegmina virescent with numerous dull reddish spots of which the largest is discal and a little beyond middle, the spots smaller and more numerous in and beyond costal membrane, the margins from base to claval apex finely spotted with dull reddish, the granules in claval area piceous; wings milky-white.

Long. excl. tegm. 5 mm. Exp. tegm. 17 mm.

Hab.—Lombok (Everett—Brit. Mus.).

Genus EUPHANTA.

Euphanta, Melich., Ann. Hofmus. Wien, xvii, p. 38 (1903).

Type, *E. munda*, Walk.

Melichar has enumerated three species under this genus, but has not indicated the type. One of the three *P. munda*, Walk., I have selected as type, for it is the only one known to me at present, and I have to take it as representing the genus.

Euphanta pokiana, sp. n.

Head, pronotum and mesonotum pale green, the central continuous carination to each dull reddish, on mesonotum often ochraceous; abdomen above and body beneath dull ochraceous, legs paler with the apices of tibiæ and the tarsi ochraceous; tegmina pale virescent, the costal margin from apex of costal membrane and apical margin continued to claval apex very narrowly and often obsoletely sanguineous; wings milky-white; vertex about as long as pronotum, centrally longitudinally strongly carinate; face with the sublateral carinations becoming obsolete before reaching base of clypeus; pronotum centrally strongly longitudinally carinate; mesonotum tricarinate, the central carination much the strongest; tegmina twice as long as broad, moderately arched at base, apical margin slightly roundly truncate, posterior margin angularly sinuate at apex of clavus which is sub-prominently granulose.

Long. excl. tegm. ♂ and ♀, 7 to $8\frac{1}{2}$ m. Exp. tegm. 19 to 22 m.

Hab.—Brit. New Guinea; Pokia Mailu (Brit. Mus.).

Euphanta chlorospila. (Pl. xxii, figs. 10, 10a.)

Nephesa chlorospila, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 173 (1868).

Cromna chlorospila, Melich. (part), Ann. Hofmus. Wien, xvii, p. 61 (1903).

Hab.—Mysol; New Guinea (Brit. Mus.).

Euphanta quadripunctata.

Cromna quadripunctata, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 182 (1868).

Cromna chlorospila, Melich. (part), Ann. Hofmus. Wien, xvii, p. 61 (1903).

Hab.—Mysol (Brit. Mus.).

Euphanta monoleuca.

Nephesa monoleuca, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 177 (1868).

Cromna chlorospila, Melich. (part), Ann. Hofmus. Wien, xvii, p. 61 (1903).

Hab.—New Guinea (Brit. Mus.).

COLGAROIDES, gen. nov.

Allied to *Colgar*, Kirk., but differing by the structure of the face, which is much the same shape as in *Colgar* but possesses five

carinations, *viz.*, one central straight and longitudinal, one on each lateral area commencing on lateral margin about midway between base and eyes and curved inwardly before clypeus, and a short longitudinal one commencing on each side of base and not reaching middle, the lateral margins from eyes laminately reflexed; clypeus less convex than in *Colgar* and obliquely reflexed on each side, centrally longitudinally strongly carinate.

Type, *C. acuminata*, Walk.

Colgaroides acuminata.

Pæcilopectera acuminata, Walk., List. Hom., ii, p. 460 (1851).

Cromna frontalis, Melich., Ann. Hofmus. Wien, xvii, p. 59 (1902).

Cromna surrecta, Melich. (part), *loc. cit.*

Hab.—“New Holland” (Brit. Mus.); New Guinea; Port Moresby (Brit. Mus.).

Colgaroides everetti, sp. n. (Pl. xxii, figs. 8, 8a.)

Body, legs and tegmina bright ochraceous; abdomen above and body beneath more or less greyishly tomentose; eyes black; tegmina with the costal margin from tip of costal membrane and the apical margin continued to apex of clavus, sanguineous; wings milky-white; vertex a little longer than pronotum, centrally longitudinally carinate, apically moderately recurved; face with five carinations, arranged as in *C. acuminata*, Walk.; pronotum with a strong central longitudinal carination; mesonotum strongly tricarinate, the central one much the strongest, the sub-lateral carinations converging posteriorly; tegmina twice as long as broad, costal margin slightly arched at base, apical margin obliquely truncate, posterior margin somewhat strongly sinuate; clavus sub-prominently granulose.

Long. excl. tegm. ♂ and ♀, 8 to 10 mm. Exp. tegm. 19 to 23 mm.

Hab.—Philippines; Savu (Everett—Brit. Mus.).

Genus LAWANA.

Phyma, Melich., Ann. Hofmus. Wien, xvii, p. 43 (1903); *nom. præocc.*

Lawana, Dist., Faun. B. I. Rhynch., III, p. 420 (1906); *nom. nov.*

Type, *L. candida*, Fabr.

Lawana exaltata.

Colobesthes exaltata, Walk., Journ. Ent., I, p. 312 (1862).

Hab.—Timor.

Lawana optata.

Phyma optata, Melich. (excl. syn.), Ann. Hofmus. Wien, xvii, p. 49, t. iv, f. 12 (1903).

Hab.—Penang, Singapore, Sumatra, Java.

Lawana modesta, sp. n. (Pl. xxii, figs. 1, 1a.)

Body and legs dull ochraceous, abdomen and sternum distinctly paler; tegmina pale subhyaline, talc-like, the venation, costal membrane and claval area pale ochraceous, an oblique discal series of four somewhat indistinct milky-white spots beyond middle, the lower spot the largest; wings milky-white; vertex broadly subconical, moderately upwardly and forwardly produced, non-carinate; mesonotum tricarinate; tegmina about twice as long as broad, apically ampliate, costal margin moderately rounded near base, apical margin truncate, posterior angles subacutely produced.

Long. excl. tegm. 11 mm. Exp. tegm. 35 mm.

Hab.—Malay Peninsula; Pahang (Atkinson Coll.—Brit. Mus.).

This species is apparently allied to the *L. (Phyma) hyalina*, Schmidt, from North Borneo, but does not agree with the characters given for that species—“Deckflügel mit drei undeutlichen Subapicallinien und ohne Punkt im corium.”

PHYMOIDES, gen. nov.

Vertex about as long as pronotum, broadly subconical, moderately upwardly and forwardly produced, strongly centrally longitudinally carinate, the posterior lateral margins oblique and spinous on each side, face much longer than broad, centrally longitudinally strongly ridged, the lateral margins strongly acutely ampliate, narrowing to clypeus and only extending a little above eyes, thence the margins are ridged, non-ampliate, and narrowing to base; pronotum tricarinate, anterior margin truncate, the basal margin concave; mesonotum finely tricarinate; tegmina about half as long again as broad, apically ampliate, costal margin somewhat roundly arched, apical margin subtruncate, the posterior angles subacutely produced, costal membrane and radial area subequal in width, beyond the costal membrane the veins are broadly bifurcate and ridged at margin, all the veins bifurcate, in some cases trifurcate on apical margin, basal area and clavus strongly granulate; wings subequal in breadth to tegmina, a few transverse veins before apical area; the venation of tegmina and wings fully shown in figure of type.

Allied to *Lawana* but differing in the shape and structure of vertex, and face and in the venation of the tegmina.

Type, *P. rubromaculatus*, Dist.

Phymoides rubromaculatus, sp. n. (Pl. xxii, figs. 2, 2a.)

Body and legs pale ochraceous; tegmina opaque creamy-white with a longitudinal central series of three sanguineous spots situate regularly but somewhat widely apart; wings creamy-white; other structural characters as in generic diagnosis.

Long. excl. tegm. 10 mm. Exp. tegm. 30 mm.

Hab.—Aru Islands (Wallace—Brit. Mus.).

Phymoides atromaculatus, sp. n.

Body and legs dull ochraceous; tegmina creamy-white with a slightly ochraceous tint on basal area and clavus, two central slightly elongate black spots one near base and the other at about middle; wings creamy-white.

A smaller species than *P. rubromaculatus* with the face a little broader and its lateral margins distinctly angularly sinuate before middle; tegmina marked with two black spots, and not with three red spots as in preceding species.

Long. excl. tegm. $7\frac{1}{2}$ mm. Exp. tegm. 25 mm.

Hab.—Dorey (Wallace—Brit. Mus.).

Genus DAKSHA.

Daksha, Dist., Faun. B. I. Rhynch., iii, p. 425 (1906).

Type, *D. marginata*, Walk.

Daksha pryeri.

Flata (*Colobesthes*) *pryeri*, Dist., Trans. Ent. Soc. Lond., p. 153 (1880).

Phyma divisa, Melich., Ann. Hofmus. Wien, xvii, p. 48 (1903).

Hab.—Borneo.

PARADAKSHA, gen. nov.

Head excluding eyes a little broader than anterior margin of pronotum, slightly convex, truncate in front, wider at apex than at base, centrally and laterally carinate, the angles at the base spinous and produced behind the eyes and along the anterior lateral margins of the pronotum; face longer than broad, centrally longitudinally carinate, the lateral margins laminately reflexed and for about one-third from base where the margin is roundly oblique, narrowing at base; pronotum about as long as vertex, the anterior and posterior margins truncate, the lateral margins strongly oblique; mesonotum tricarinate; tegmina about half as long again as broad, convexly arched at base, the apical margin roundly truncate, the posterior angles moderately subacutely produced, the venation generally as in *Phymoides* from which genus it differs by the anteriorly truncate head, different facial structure, and the rounded apical margin to the tegmina.

Type, *P. meeki*, Dist.

Paradaksha meeki, sp. n. (Pl. xxii, figs. 3, 3a.)

Body and legs dull ochraceous; tarsi apically black; tegmina greyish-white, the margins narrowly, somewhat faintly fuscous; two discal black spots, one near base, the other near middle, the base and claval area moderately ochraceous; wings milky-white; structural characters as in generic diagnosis.

Long. excl. tegm. 9 mm. Exp. tegm. 30 mm.

Hab.—Queensland; Cedar Bay, S. of Cooktown (Meek—Brit. Mus.).

NEODAKSHA, gen. nov.

Vertex subquadrate, truncate anteriorly, strongly centrally longitudinally carinate, the lateral margins ampliatly and upwardly carinate, their anterior angles acute; face longer than broad, centrally longitudinally carinate, the base angulate, the lateral margins ampliatly reflexed, their anterior angles acute, and narrowing towards clypeus which is subequal in length to face; pronotum a little longer than vertex, tricarinate, anterior margin subtruncate, not wider than vertex, posterior margin slightly concave; mesonotum tricarinate (somewhat mutilated in type); legs moderate in length, sulcate, posterior tibiæ moderately curved; tegmina about half as long again as broad, costal membrane a little broader than radial area, transversely veined, the series more or less continued on apical margin, the whole surface with more or less distinct transverse veins; wings about as broad as tegmina, three transverse veins before apical area.

Type, *N. quadriguttata*, Walk.

Neodaksha quadriguttata. (Pl. xxii, figs. 9, 9a.)

Flata quadriguttata, Walk., Journ. Linn. Soc. Lond., x, p. 179 (1868).

Colgar quadriguttata Melich., Ann. Hofmus. Wien, xvii, p. 115 (1903).

Hab.—New Guinea.

The anterior and intermediate tibiæ and tarsi are black.

CIRCUMDAKSHA, gen. nov.

Vertex broader than long, tricarinate, the anterior margin transversely undulate, the lateral margins laminately reflexed, a little narrowed posteriorly; face about as long as broad at base, the lateral margins reflexed and narrowed to clypeus which is very long, about half as long again as face; pronotum not distinctly carinate, anterior margin rounded between the eyes, lateral margins sinuate, posterior margin concave; mesonotum tricarinate, twice as long as pronotum; legs moderate in length, tibiæ sulcate, posterior tibiæ with two spines before apex; tegmina about one and a half times as long as broad, apical margin convex, costal membrane slightly narrower than radial area, the whole surface with numerous indistinct transverse veins, except on apical marginal area; clavus somewhat coarsely granulose; wings about as broad as tegmina, two transverse veins before apex.

Circumdaksha rufosparsa, sp. n. (Pl. xxii, figs. 7, 7a.)

Vertex, pronotum and scutellum greyish-ochraceous; abdomen above whitely tomentose; body beneath and legs very pale ochraceous, the abdomen beneath more or less whitely tomentose,

tarsi black, the clavus castaneous; tegmina white, talc-like, with six or eight red spots arranged in two series, the first in radial area, the second near middle (these spots are inconstant in number, even in the same specimen, as can be seen in the right and left tegmen of the specimen figured); wings milky-white.

Long. excl. tegm. 12 mm. Exp. tegm. 40 mm.

Hab.—Celebes; Macasser (Doherty—Brit. Mus.).

Genus PHYLLYPHANTA.

Phyllyphanta, Amy. and Serv. Hist. Hém., p. 522 (1843).

Type, *P. producta*, Spin.

Phyllyphanta producta.

Pæciloptera producta, Spin. Ann. Soc. Ent. Fr., viii, p. 432 (1839).

Pæciloptera bipunctata, Walk., Journ. Ent., 1, p. 312 (1862).

Phyllyphanta sinensis, Melich. (part), Ann. Hofmus. Wien, xvii, p. 56 (1903).

Hab.—Malay Archipelago. Siam.

Phyllyphanta albidosparsa, sp. n. (Pl. xxii, figs. 5, 5a.)

Vertex, pronotum and scutellum brownish-ochraceous, the lateral areas longitudinally olivaceous green; abdomen above brownish ochraceous, more or less greyishly tomentose; face dull greenish, body and legs more or less greenish-ochraceous, tarsi brownish-ochraceous; tegmina dull greenish, the margins very narrowly ochraceous, the veins darker, ornamented with small greenish-white spots, the most prominent of which are a double series in radial area, a broken subapical marginal series, a lunate piceous line on disk beyond middle; two clusters on middle disk, and a short curved series above clavus; wings milky-white; vertex about as long as pronotum, angularly produced anteriorly, strongly centrally longitudinally ridged, the sides obliquely declivous; face much longer than broad, smooth, its base angularly narrowed, its lateral margins slightly ridged; tegmina about as broad as wings, apically ampliate, apical margin truncate, its posterior angle acutely produced.

Long. excl. tegm. 13 to 14 mm. Exp. tegm. 38 to 40 mm.

Hab.—Borneo; Brunnei (Brit. Mus.).

NEOCROMNA, gen. nov.

Head subconically produced in front of eyes, its lateral and posterior margins distinctly ridged and with a somewhat obscure central longitudinal carinate line; face narrowed and conical at base for about one-third its length, after which the lateral margins are strongly ampliatly reflexed and obliquely narrowing to clypeus, strongly centrally longitudinally carinate; pronotum a little shorter than vertex, faintly centrally longitudinally ridged, its

posterior margin concave; mesonotum tricarinate; tegmina as broad or slightly broader than wings, twice as broad at apex as at base, the posterior angle subacutely produced, the costal margin arched and convex, the apical margin more or less truncate, costal membrane about as broad as radial area, the former somewhat thickly transversely veined, the latter somewhat reticulately veined, all the tegmen transversely veined, some of the veins reticulate, except on apical margin where the veins are shortly longitudinal defining a marginal series of short cellular areas; clavus transversely veined above the claval vein, beneath it coarsely granulate; wings with one or two transverse veins near apex, many of the longitudinal veins furcate.

Type, *N. bistriguttata*, Stål.

Allied to *Phyllyphanta* from which it differs by the structure of the face which is obliquely narrowed to clypeus and is strongly centrally carinate.

Neocromna bistriguttata. (Pl. xxii, figs. 4, 4a.)

Nephessa bistriguttata, Stål, Trans. Ent. Soc. Lond. (3), 1, p. 591 (1863).

Colgar bistriguttata, Melich., Ann. Hofmus. Wien, xvii, p. 115 (1903), excl. fig.

Hab.—Papua. (Type in Brit. Mus.).

Genus NEOMELICHARIA.

Atella, Stål (part), Hem. Afr., iv, p. 238 (1866); *id.* Berl. Ent. Zeitschr., x, p. 394 (1866), *nom. præocc.*

Neomelicharia, Kirk., Entomologist, xxxvi, p. 79 (1903).

Colgar, Melich. (part), Ann. Hofmus. Wien, xvii, p. 107 (1903).

Type, *N. cruentata*, Fabr.

Neomelicharia erubescens.

Pæcilopectera erubescens, Walk., Journ. Ent., 1, p. 313 (1862).

Nephessa gemmifera, Stål, Trans. Ent. Soc. Lond. (3), 1, p. 592 (1863).

Atella gemmifera, Stål, Berl. Ent. Zeitschr., x, p. 394 (1866).

Colgar gemmifera, Melich., Ann. Hofmus. Wien, xvii, p. 111 (1903).

Hab.—Batchian.

Both Walker's and Stål's types are in the British Museum.

Neomelicharia consociata.

Pæcilopectera consociata, Walk., Journ. Ent., 1, p. 314 (1862).

Nephessa cicatricosa, Stål, Trans. Ent. Soc. Lond. (3), 1, p. 592 (1863).

Atella cicatricosa, Stål, Berl. Ent. Zeitschr., x, p. 394 (1866).

Nephessa consociata, Walk., Journ. Linn. Soc. Lond., x, p. 171 (1868).

Colgar cicatricosa, Melich., Ann. Hofmus. Wien, xvii, p. 112 (1903).

Hab.—Batchian, Ternate.

The types of both Walker and Stål are in the British Museum.

Neomelicharia conficita.

Nephesa conficita, Walk., Journ. Linn. Soc. Lond., x, p. 172 (1868).

Colgar conficita, Melich., Ann. Hofmus. Wien, xvii, p. 109 (1903).

Hab.—Batchian, Gilolo.

Neomelicharia pustulata.

Cicada pustulata, Don. Ins. New Holl., t. 9 (1805).

Colgar pustulata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 109 (1903).

Hab.—Amboina.

Neomelicharia cruentata.

Flata cruentata, Fabr., Syst. Rhyng., iv, p. 46 (1803).

Atella cruentata, Stål, Hem. Fabr., ii, p. 108 (1869).

Nephesa roseigutta, Walk., Ins. Saund. Hom., p. 49 (1858).

Nephesa amœna, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 172 (1868).

Colgar pustulata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 109 (1903).

Colgar cruentata, Melich., *loc. cit.*, p. 110.

Hab.—Papua.

Neomelicharia ocellifera.

Pæcilopectera ocellifera, Walk., List. Hom. Suppl., p. 112 (1858).

Cromna centralis, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 182 (1868).

Colgar ocellifera, Melich., Ann. Hofmus. Wien, xvii, p. 113 (1903).

Colgar diversa, Melich., *loc. cit.*, t. iv, fig. 1.

Hab.—Papua.

Neomelicharia marginalis.

Nephesa marginalis, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 175 (1858).

? *Colgar semilata*, Melich., Ann. Hofmus. Wien, xvii, p. 116 (1903).

Hab.—Papua.

Neomelicharia calochroma.

Pæcilopectera calochroma, Walk., List. Hom. Suppl., p. 113 (1858).

Nephesa calochroma, Stål, Öfv. Vet.-Ak. Förh., xxvii, p. 773 (1870).

Colgar calochroma Melich., Ann. Hofmus. Wien, xvii, p. 109 (1903).

Hab.—Philippines.

Genus NEPHESA.

Nephesa, Amy. and Serv. Hist., Hém., p. 527 (1843).

Type, *N. rosea*, Spin.

Nephesa rosea.

Ricania rosea, Spin., Ann. Soc. Ent. Fr. (1), viii, p. 400 (1839);

Stål, Berl. Ent. Zeit., 1866, p. 393.

Pæcilopectera completa, Walk., List. Hom., ii, p. 451 (1851).

Pæcilopectera extricata, Walk., Ins. Saund. Hom., p. 52 (1858).

Hab.—Java, Sumatra, Borneo.

Stål (*supra*) stated that the *P. completa*, Walk. = *rosea*, Spin. The *P. extricata*, Walk., is an exact synonym of *P. completa*, Walk., or is apparently the ♀ form of the species.

Nephesa rectilinea.

Colobesthes rectilinea, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 180 (1868).

Nephesa truncaticornis, Melich. (part), Ann. Hofmus. Wien, xvii, p. 103 (1903).

Hab.—Sumatra, Borneo.

Nephesa rectimargo.

Pæcilopectera rectimargo, Walk., Ins. Saund. Hom., p. 51 (1858).

Nephesa truncaticornis, Melich. (part), Ann. Hofmus. Wien, xvii, p. 103 (1903).

Nephesa longipennis, Melich., Ann. Hofmus. Wien, xvii, p. 103 (1903).

Hab.—Penang, Malacca.

Melichar has placed this species (firstly) as a synonym of *N. truncaticornis*, Spin., and (secondly) redescribed it (*P. rectimargo*, Walk., ♀) as a n. sp. *N. longipennis*, Melich.

The type and only representative in the Brit. Mus. is a female specimen.

Nephesa rorida.

Pæcilopectera rorida, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 161 (1867); Melich., Ann. Hofmus. Wien, xvii, p. 106 (1903).

Nephesa intrusa, Melich., Ann. Hofmus. Wien, xvii, p. 103 t. iii, f. 7 (1903).

Hab.—Borneo, Sumatra.

Nephesa suffusa.

Pæcilopectera suffusa, Walk., List. Hom., ii, p. 446 (1851).

Nephesa brunnea, Melich., Ann. Hofmus. Wien, xvii, p. 104 (1903).

Hab.—Java.

Nephesa grata.

Nephesa grata, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 160, (1857).

Cromna peracuta, Melich. (part), Ann. Hofmus. Wien, xvii, p. 62 (1903).

Hab.—Borneo.

Nephesa sandakanensis, sp. n. (Pl. xxii, figs. 11, 11a.)

Head and pronotum pale brownish; pronotum with two longitudinal spots on anterior area and two longer spots on disk, fuscous-brown; abdomen above greyishly tomentose; body beneath and legs greyish brown, the body more or less greyishly tomentose; tegmina tawny brown with numerous small white spots, the inner area above clavus a discal sublunate spot beyond middle, above which is an obscure transverse costal spot, pale ochraceous brown, extreme inner margin distinctly darker; wings milky-white; vertex transverse, with three longitudinal ridges; eyes piceous; tegmina about twice as long as broad; clavus distinctly but moderately granulose.

Long. excl. tegm. 11 mm. Exp. tegm. 38 mm.

Hab.—Borneo; Sandakan (Douglas Cator—Brit. Mus.).

Allied to *N. rorida*, Walk.

Genus PARATELLA.

Paratella, Melich., Ann. Hofmus. Wien, xvii, p. 117 (1903).

Type, *P. iodipennis*, Guér.

Paratella decolor.

Nephesa decolor, Walk., Journ. Linn. Soc. Lond., x, p. 176 (1868).

Cromna chlorospila, Melich. (part), Ann. Hofmus. Wien, xvii, p. 61 (1903).

Sephena rufilinea, Melich. (part), loc. cit., p. 127.

Hab.—Mysol, Waigiou.

Closely allied to *P. intacta*, Walk.

Paratella amata.

Nephesa amata, Walk., Journ. Linn. Soc. Lond., x, p. 175 (1868).

Sephena rufomarginata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 129 (1903).

Hab.—Waigiou.

Paratella subcincta.

Paratella subcincta, Walk., MS.

Paratella umbrimargo, Melich., (nec. Walk.) Ann. Hofmus. Wien, xvii, p. 121, t. iv, f. 10 (1903).

Hab.—New Guinea, Ternate.

The species described and figured by Melichar as the *P. umbrimargo*, Walk. is not that species, but *P. subcincta*, Walk. Walker's MS. name therefore becomes available.

Paratella invasa.

Nephesa invasa, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 178 (1868).

Hab.—Waigiou.

Closely allied to *P. subcincta*, Walk.

Paratella umbrimargo.

Pæcilopectera umbrimargo, Walk. (nec. Melich.), List. Hom. Suppl., p. 115 (1858).

Hab.—Sumatra.

KAYANIA, gen. nov.

Vertex transverse, much shorter than broad, centrally and laterally ridged, the anterior margin subtruncate, wider than basal margin; face about as long as broad, tricarinate, the sublateral carinations not reaching the posterior margin, and broader and less acute than the central carination, the lateral margins amply reflexed and sinuately narrowing towards clypeus; clypeus only slightly shorter than face, elongate, its apex truncate, broadly centrally ridged; pronotum longer than vertex, subconically produced between the eyes, lateral margins obliquely rounded, basal margin moderately concave; mesonotum tricarinate, the disk flatly raised; legs of moderate length, posterior tibiæ with a strong spine near apex; tegmina less than twice as long as broad, costal membrane nearly as broad as radial area, the first transversely veined, two series of longitudinal veins on apical area, the outermost bounded by an almost straight series of transverse veins, the innermost irregular in size and bounded by a waved and sinuated series of short transverse veins, remaining area somewhat thickly transversely veined, claval area strongly granulose; wings about as broad as tegmina, two transverse veins before apex.

Type, *K. volens*, Walk.

Allied to *Sephena*, Melich., but differing in the shape of the face and the venation of the tegmina.

Kayania volens. (Pl. xxii, figs. 18, 18a.)

Nephesa volens, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 161 (1857).

? *Colgar volens*, Melich., Ann. Hofmus. Wien, xvii, p. 117 (1903).

Hab.—Borneo; Sarawak (Wallace—Brit. Mus.).

Genus SEPHENA.

Sephena, Melich., Ann. Hofmus. Wien, xvii, p. 123 (1903).

Type, *S. spargula*, Walk.

Sephena rufilinea.

Nephesa rufilinea, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 174 (1868).

Sephena rufilinea, Melich. (part), Ann. Hofmus. Wien, xvii, p. 127 (1903).

Hab.—Mysol.

Melichar has placed the *N. decolor*, Walk. as a synonym of this species, though he had previously (*loc. cit.*, p. 61) located it as a synonym of *Cromna chlorospila*, Walk.

Sephena albescens.

Nephesa albescens, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 177 (1868).

Cromna chlorospila, Melich. (part), Ann. Hofmus. Wien, xvii, p. 61 (1903).

Hab.—Mysol; New Guinea.

Sephena obtusa.

Nephesa obtusa, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 177 (1868).

Cromna obtusa, Melich., Ann. Hofmus. Wien, xvii, p. 61 (1909).

Hab.—New Guinea.

Sephena consentanea.

Ricania consentanea, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 161 (1868).

——— *consentanea*, Melich., Mon. Ricanüd, p. 334 (1898).

Hab.—Mysol.

Walker has rather confused his description of the "transverse veins most numerous beyond the middle where they form five irregular lines"; his statement "fore wings . . . tuberculate at the base and along most of the length of the interior border," clearly places it in the *Flatinae*; the type can be consulted in the British Museum.

Sephena subjecta.

Nephesa subjecta, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 176 (1868).

Idume plicata, Melich. (part), Ann. Hofmus. Wien, xvii, p. 28 (1903).

Hab.—Celebes.

The *N. subjecta*, Walk. has the mesonotum (scutellum) distinctly keeled, a character which will distinguish it from *Idume* as diagnosed by Dr. Melichar.

Genus UXANTIS.

Uxantis, Stål, Ofv. Vet.-Ak. Förh., 1870, p. 776.

Type, *U. consputa*, Stål.

Uxantis plagiata.

Flatoides plagiatus, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 142 (1868); Melich., Ann. Hofmus. Wien, xvii, p. 227 (1903).

Hab.—New Guinea.

Uxantis semialbus.

Flatoides semialbus, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 142 (1868).

Uxantis pyralis, Melich. (part), Ann. Hofmus. Wien, xvii, p. 166 (1903).

Hab.—Aru; Mysol.

Genus ATRACIS.

Atracis, Stal, Hem. Afr., iv, p. 250 (1866).

Type, *A. pyralis*, Guer.

Atracis puncticeps.

Elidiptera puncticeps, Walk., List. Hom. Suppl., p. 73 (1858).

Hab.—Borneo.

Atracis intercepta. (Pl. xxii, figs. 15, 15a.)

Eurybrachys intercepta, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 156 (1857).

Hab.—Borneo.

Atracis surrecta. (Pl. xxii, figs. 13, 13a.)

Eurybrachys surrecta, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 156 (1857).

Hab.—Borneo ; Sarawak (Wallace—Brit. Mus.)

Var. a., Tegmina without the three black spots.

Hab.—Borneo ; Sandakan (Pryer—Coll. Dist.).

The type is figured.

Atracis vetusta.

Eurybrachys vetusta, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 156 (1857).

Hab.—Borneo.

Atracis conserta.

Eurybrachys conserta, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 155 (1857).

Hab.—Borneo.

Atracis rivularis, sp. nov. (Pl. xxii, figs. 14, 14a.)

Body and legs pale ochraceous ; vertex with the lateral margins (not reaching apex) and the apex bright ochraceous, a central longitudinal ochraceous line on posterior half ; pronotum with some irregular linear markings on lateral margins and a central line on basal half, piceous ; mesonotum irregularly speckled and suffused with piceous, these markings darker and more prominent on each side of lateral margins ; tegmina opaque greyish-white, basal third, some irregular markings beyond it and apical and subapical fasciate marginal suffusions, brownish-ochraceous ; wings milky-white, the veins ochraceous ; vertex about as long as broad, the lateral margins broadly ridged to the angles before apex ; face considerably longer than broad, the lateral margins strongly laminately reflexed and slightly sinuate, a short central longitudinal ridge at base ; mesonotum tricarinate ; abdomen above with a central longitudinal ridge ; tegmina about twice as long as broad, narrowing towards apex, the costal margin very strongly sinuately waved from about one-third from base.

Long. excl. tegm. 10 mm. Exp. tegm. 28 mm.

Hab.—Borneo ; Kuching (Hewitt—Coll. Dist.).

Franciscus, gen. nov.

Vertex twice as broad as long, apically truncate, centrally longitudinally and laterally ridged; face a little longer than broad, moderately narrowing towards clypeus, centrally longitudinally carinate for about half its length, basal margin truncate, lateral margins amply ridged and slightly sinuate; pronotum longer than vertex, narrowly rounded anteriorly, angularly concave at base, centrally longitudinally impressed on basal half; mesonotum tricarinate; legs moderate in length, posterior tibiæ with a single strong spine; tegmina about two and a half times as long as broad, costal membrane very much wider than radial area, three series of transverse veins on apical area, defining three series of elongate cells; clavus somewhat coarsely granulose; wings with two transverse veins before apex.

Type, *F. fasciatus*, Walk.

Allied to *Bochara* Dist. from which it differs by the shorter and more transverse vertex, the different shape and structure of face, etc.

Franciscus fasciatus. (Pl. xxii, figs. 17, 17a.)

Flatoides fasciatus, Walk., Journ. Linn. Soc. Lond. Zool. x p. 141 (1868).

Atracis ? fasciata, Melich., Ann. Hofmus. Wien, xvii, p. 200 (1903).

Hab.—Waigiou, Mysol.

Species described by Walker in the Flatinæ but not belonging to that sub-family.

Sub-fam. **Tropiduchidæ**.Genus **FICARASA**.

Ficarasa, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 162 (1857).

Type, *F. pallida*, Walk.

Ficarasa simplex.

Flatoides simplex, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 143 (1868).

Cromna peracuta, Melich. (part), Ann. Hofmus. Wien, xvii, p. 62 (1903).

Hab.—Ceram.

Sub-fam. **Delphacinæ**.Genus **UGYOPS**.

Ugyops, Guer, Voy. Ind-Orient. Bélanger, Zool., p. 477 (1834).

Hygiops, Amy. and Serv. Hist. Hém., p. 511 (1843).

Bidis, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 88 (1857).

Ugyops pictula.

Bidis pictula, Walk., Journ. Linn. Soc. Lond. Zool., i, p. 150 (1857).

Bidis punctifrons, Walk., loc. cit.

Hab.—Borneo.

Fam. CERCOPIDÆ.

Genus SIALOSCARTA.

Sialoscarta, Jacobi, Mitt. Zool. Mus. Berl., iii, p. 23 (1905).

Considia, Dist. nec Stål, Rec. Ind. Mus., ii, p. 132 (1908).

Type, *S. cavata*, Walk.

Sialoscarta cavata.

Triechphora cavata, Walk., List Hom. Suppl., p. 343 (1858).

Sialoscarta concinna, Jacobi, Mitt. Zool. Mus. Berl., iii, p. 23 (1905); Schmidt, Stett. Ent. Zeit., 1910, p. 328.

Considia cavata, Dist., Rec. Ind. Mus., ii, p. 132 (1908).

Hab.—Java.

I had previously considered Jacobi's genus *Sialoscarta* as a synonym of *Considia*, Stål, but I quite agree with Schmidt in considering this a mistake and find that the *T. cavata*, Walk. has but one spine on the posterior tibiæ. This led me into a further mistake in placing another species outside *Sialoscarta*. The three genera *Considia*, *Sialoscarta* and *Colsa* are, however, very closely allied.

Sialoscarta krugeri.

Sialoscarta krugeri, Schmidt, Stett. Ent. Zeit., 1906, p. 279.

Colsa matanga, Dist., Rec. Ind. Mus., ii, p. 134. Pl. vii, f. 8 (1908).

Synonymic Notes.

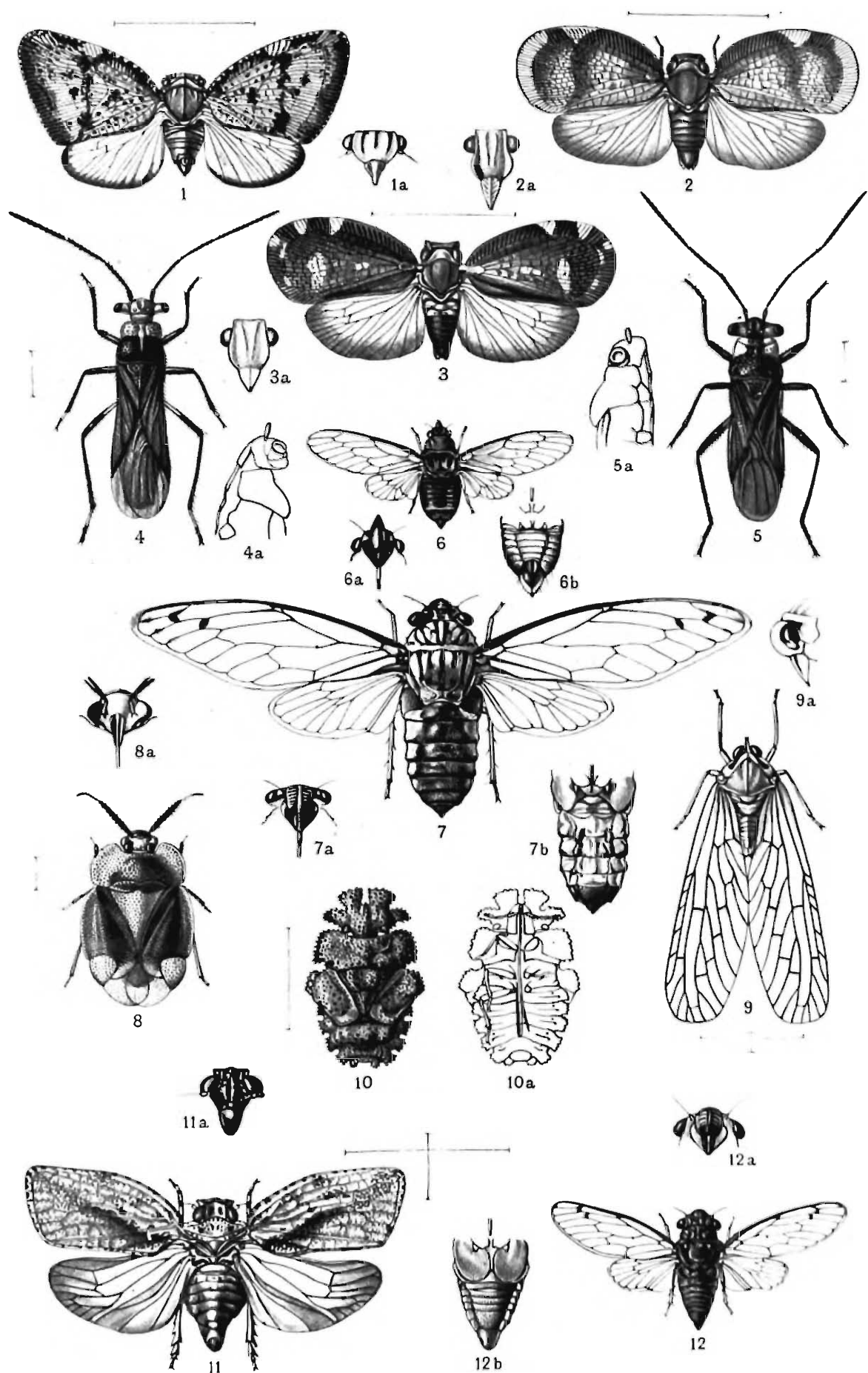
The generic name *Catara* was twice used by Walker in the same year (1868), in BLATTIDÆ and FULGORIDÆ.

Catara, Walk., Cat. Blatt., p. 52 (1868).

Catara, Walk., Journ. Linn. Soc. Lond. Zool., x, p. 115 (1868).

As regards the Fulgorid name there is no difficulty as to the exact date of publication which is August 7th. Walker's Catalogue of Blattidæ was received in the British Museum Library on July 8th of the same year, so could not have been published later. Consequently the name is available for Blattidæ but not for Fulgoridæ. I therefore propose for the latter Fam. Fulgoridæ; sub-fam. Lophopinæ, the generic name of *Neocatara* which at present comprises two species, viz. :—

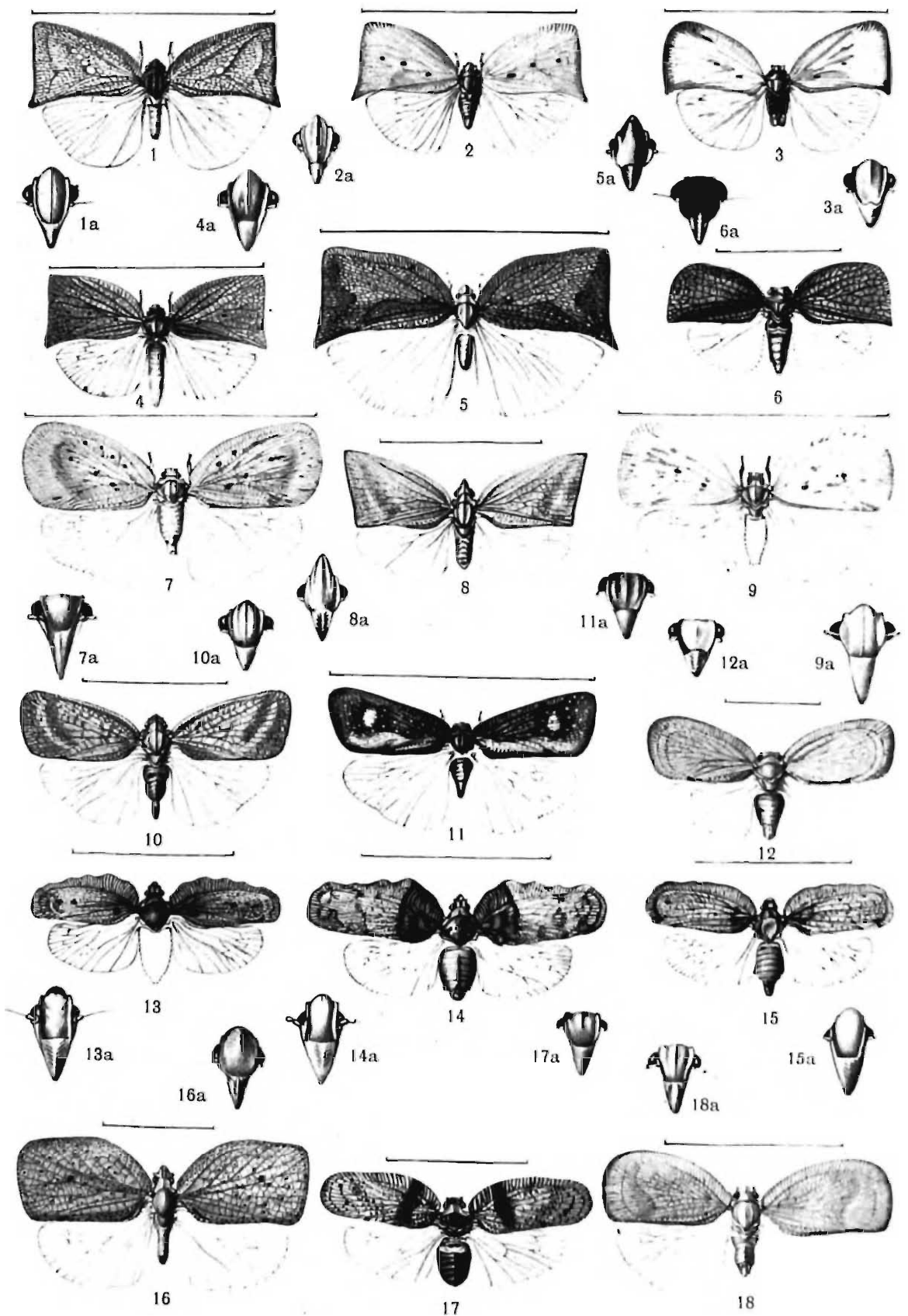
Type *Neocatara subdivisa*, Walk. (*Catara*), Journ. Linn. Soc. Lond. Zool., x, p. 115 (1868), Morty Isld., and *Neocatara philippinensis*, Dist. (*Catara*), Rec. Ind. Mus., iii, p. 172, Pl. xi, f. 12a (1909), Philippine Islands.



Horace Knight, del.

West, Newman, pro.

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|---------------------|---------------------------|-------------------------|
| 1. RICANIA HEWETTI. | 6. AETHALOTUS BORNEENSIS. | 9. AFAKIA DECISA. |
| 2. MINDURA CONFUSA. | 7. MOCANNIA MOULTONI. | 10. SERBANA HORNEENSIS. |
| 3. " SIMIANA. | 8. PURANA CONSPICUA. | 11. LOLLIUS PRYERI. |
| | 9. FEMURIANA CONNEXA. | |



Horace Knight, del.

West, Newman prece

1. LAWANA MODESTA.
2. PHYMIOIDES RUBROMACULATUS.
3. PARADAKSHA MEEKI.
4. NEOCROMNA BISTRIGUTTATA.
5. PHYLLYPHANTA ALBIDOSPARSa.
6. OXYANA SUBACUTA.

7. CIRCUMDAKSHA RUFOSPARSa.
8. COLGAROIDES EVERETTI.
9. NEODAKSHA QUADRIGUTTATA.
10. EUPHANTA CHLOROSPILA.
11. NEPHEsa SANDAKENSIS.
12. ORMENIS? BARAMIA.

13. ATRACIS SURRECTA.
14. " RIVULARIS.
15. " INTERCEPTA.
16. LOMBOKIA EVERETTI.
17. FRANCISCUS FASCIATUS.
18. KAYANIA VOLENS.

Miscellaneous Zoological Publications.

	Rs.	As.		Rs.	As.
Account of the Deep-sea Brachyura collected by the R.I.M.S. "Investigator." By A. Alcock, M.B., C.M.Z.S.	6	0	Echinoderma of the Indian Museum: Littoral Holothuriodea collected by the R.I.M.S. "Investigator." By R. Koehler and C. Vaney	2	0
Account of the Deep-sea Madreporaria collected by the R.I.M.S. "Investigator." By A. Alcock, M.B., C.M.Z.S.	4	0	Echinoderma of the Indian Museum: Deep-sea Ophiuroidea collected by the R.I.M.S. "Investigator." By R. Koehler	10	0
Account of the Triaxon (Hexactinellid) sponges collected by the R.I.M.S. "Investigator." By F. E. Schulze, Ph.D., M.D.	16	0	Echinoderma of the Indian Museum: Shallow-water Ophiuroidea collected by the R.I.M.S. "Investigator." By R. Koehler	4	0
Account of the Alcyonarians collected by the R.I.M.S. "Investigator." Part I. By J. Arthur Thomson, M.A., and W. D. Henderson, M.A., B.Sc.	16	0	Echinoderma of the Indian Museum: Part V: An account of the Deep-sea Asteroidea collected by the R.I.M.S. "Investigator." By R. Koehler	12	0
Account of the Alcyonarians collected by the R.I.M.S. "Investigator." Part II. By J. Arthur Thomson, M.A., and J. J. Simpson, M.A., B.Sc.	20	0	Echinoderma of the Indian Museum: Part VI: An account of the Shallow-water Asteroidea. By R. Koehler	20	0
Aids to the identification of Rats connected with Plague in India. By W. C. Hossack, M.D.	0	8	Figures and Descriptions of nine Species of Squillidæ from the Collection of the Indian Museum. By J. Wood-Mason, F.Z.S., etc., edited by A. Alcock, M.B., C.M.Z.S.		
Annotated List of the Asiatic Beetles in the Indian Museum. Part I. Family Carabidæ, Subfamily Cicindelinae. By N. Annandale, D.Sc., and W. Horn	1	0	Guide to the Zoological Collections exhibited in the Bird Gallery of the Indian Museum. By F. Finn, B.A., F.Z.S.	0	
Catalogue of Indian Crustacea. Part I.—Introduction and Brachyura Primaginia. By A. Alcock, M.B., LL.D., F.R.S.	7	0	Guide to the Zoological Collections exhibited in the Fish Gallery of the Indian Museum. By A. Alcock, M.B., C.M.Z.S.		
Catalogue of the Indian Decapod Crustacea. Part II.—Anomura. Fasciculus I.—Pagurides. By A. Alcock, M.B., LL.D., F.R.S., C.I.E.	14	0	Guide to the Zoological Collections exhibited in the Invertebrate Gallery of the Indian Museum. By A. Alcock, M.B., C.M.Z.S. (Out of print.)		
Catalogue of the Indian Decapod Crustacea. Part III.—Macrura. Fasciculus I.—The Prawns of the Penaeus Group. By A. Alcock, M.B., LL.D., F.R.S., C.I.E.	7	0	Guide to the Zoological Collections exhibited in the Reptile and Amphibian Gallery of the Indian Museum. By A. Alcock, M.B., C.M.Z.S. (Out of print.)		
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