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REPORT ON THE FISHES TAKEN BY THE BENGAL FISHERIES STEAMER "GOLDEN CROWN."

PART II.—ADDITIONAL NOTES ON THE BATOIDEI.

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent, Indian Museum.*

Since my report on the Batoidei was published (*Mem. Ind. Mus.*, ii, pp. 1—60), a considerable number of interesting specimens of this group have been obtained by the "Golden Crown," whose operations have now been brought to a close so far as the Government of Bengal is concerned, and I have had the opportunity of examining some of the Indian rays in the British and the Royal Scottish Museums. It has therefore become advisable in some cases to supplement, and in one to correct my former statements in the light of additional knowledge. I have nothing to add to what I said as regards the Pristidae and Rhinobatidae, but the Trygonidae and Myliobatidae need further comment, while as regards the Torpedinidae I may note that a considerable number of specimens of *Bengalichthys impennis* of both sexes have recently been taken in Balasore Bay, and one small female on the shore at Puri.

My great and increased obligations in this work to Dr. J. T. Jenkins must be acknowledged, and also my sense of the courteous [illegible] which I met in the British Museum at the hands of Mr. G. A. Boulenger.

Family TRYGONIDAE.

Trygon uarnak (Forskål).

Mem. Ind. Mus., ii, p. 22.

Bleeker's specimen of *T. undulatus* (one of the types of that "species") in the British Museum (specimen M in Günther's Catalogue) appears to be a young example of *T. uarnak* in which the spots have already begun to coalesce. At this stage I am unable to distinguish the colour variety *variegatus* from the typical form. Several of the synonyms in the Catalogue must undoubtedly be transferred from this species to *T. gerrardii*; but a more careful examination of Bleeker's specimens than I had time to undertake in Europe would be necessary to elucidate this point fully. *T. pareh* seems to me to be distinct from either species, although it is probably identical with my own *T. alcockii*, which of course, should this prove to be the case, must be sunk as a synonym. It may be noted that in dried or shrivelled specimens of *T. alcockii* the flat scales on the dorsal surface become more conspicuous than is the

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case in fresh specimens. They do not, however, even in a dried skin assume the regular pattern with well-defined outlines so characteristic of *T. gerrardii* and *T. bleekeri*.

The measurements of the disk of the young specimen of *T. uarnak* given on page 30 of my report are unusual, the disk being broader than is commonly the case. The following measurements were taken from a single batch of somewhat older specimens in which the spots had already begun to coalesce and the ground colour of the back to darken:—

	♂	♂	♂	♀	♀	♀	♀
Length of disk	40·0 cm.	38·75 cm.	35·0 cm.	37·5 cm.	40·0 cm.	38·75 cm.	41·25 cm.
Breadth of disk	50·0 ,,	47·5 ,,	42·5 ,,	46·25 ,,	50·0 ,,	48·75 ,,	51·25 ,,

Trygon gerrardii, Gray.

Mem. Ind. Mus., ii, p. 24.

Two species are confused under this name in the British Museum Catalogue, a half-grown specimen from Japan being certainly distinct from the types of the species. The latter are young stuffed specimens, but I am pretty sure that they are identical with what I call *T. gerrardii*.[1] In *T. gerrardii* the spots never extend to the anterior half of the disk, as they do in the half-grown Japanese specimen, in which there are traces of a mid-dorsal row of spines resembling those of *T. akajei*.

A large adult male of *T. gerrardii* was recently captured off the Madras coast which had the ventral surface suffused with dark pigment. Its measurements were as follows:—

Breadth of disk	..	..	..	86·25 cm.
Length of	..	..	..	72·5 ,,
Length fro vent	..	..	..	43·75 ,,
Breadth yes	..	..	..	12·5 ,,
I	..	..	..	7·5 ,,

This is by far the largest specimen of the species I have seen, but the pale spots, which were confined to the posterior margin of the disk, were quite distinct.

Trygon fluviatilis (Ham. Buch.).

(Plate i, fig. 1.)

Size fairly large (a female from the sea measured 4 ft. 7½ in. across the disk).

Disk slightly broader than long without the pelvic fins, very flat, with the lateral angles very broadly and gradually rounded, so that the whole body, including the

[1] But see Dr. Günther's remarks in his "Fische der Südsee," pt. ix, p. 492 (1910). He is of the opinion that the species of these type specimens cannot be recognized. It is only after comparing large numbers of specimens in different conditions of preservation that I venture to differ from him.

pelvic fins, has an oval outline. The snout acutely pointed and much produced, more than twice as long as the distance between the eyes.

Colour.—Dorsal surface a dark livid purplish grey, changing to dull ochraceous in the middle of the disk. Ventral surface white with a broad, irregular, deeply pigmented margin, which is more or less interrupted in front.

Eyes small, not very prominent.

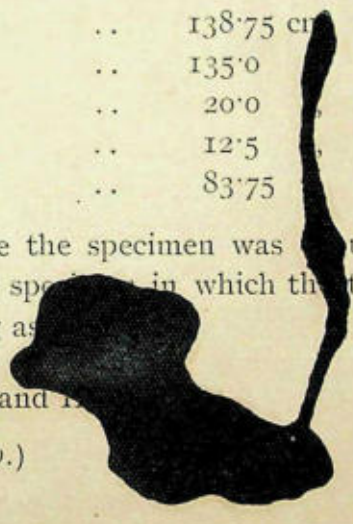
Skin tough; the entire dorsal surface (except that of the pelvic fins) and a considerable part of the ventral covered by small indistinctly stellate scales, the projecting points of which are for the most part blunt. These scales are larger for the most part on the head than on the rest of the disk, but on the posterior half of the body some of them are markedly larger than the rest and bear sharp, straight spines; on the fins and on the ventral surface they are very small.

This species is closely allied to Blyth's *T. marginatus*, from which its produced and pointed snout will at once distinguish it. It also occurs in the R. Ganges, and is evidently the species named by Hamilton *Raja fluviatilis*. On this point I shall have more to say on another occasion.

A specimen was taken off the Madras coast from between 20 and 30 fathoms in November, 1909. Its measurements were as follows:—

Breadth of disk	138·75 cm.
Length of disk	135·0 ,,
Breadth between eyes	20·0 ,,
Breadth of mouth	12·5 ,,
Length from mouth to vent	83·75 ,,

The tail had unfortunately been removed before the specimen was brought to the Museum, but we have recently obtained another specimen in which the tail was apparently complete, but was less than twice as long as the



Urogymnus asperrimus, Müller and H[illegible]

(Plate ii, figs. 1, 1*a*, 1*b*.)

Mem. Ind. Mus., ii, p. 37.

Another large female specimen of this fish was taken off the Madras coast in September, 1909. Curiously enough its tail was mutilated in exactly the same way as was the case in the individual of the same species previously described. Its measurements were as follows:—

Breadth across disk	120·0 cm.
Length of disk	121·25 ,,
Breadth between eyes	23·75 ,,
Breadth of mouth	16·25 ,,
Mouth to vent	100·0 ,,

This specimen had on the floor of the mouth, in addition to three finger-like processes in the centre, a shorter process on either side.

On the same voyage as that on which the large individual was taken, a young one, perhaps born from it prematurely, was also captured. It differed from the adult in the total absence of scales from the pectoral fins and snout and in possessing only blunt scales on the body and tail. Although there was no trace of a spine on the latter, the place in which it would have been in a *Trygon* was occupied by a distinct naked groove (pl. ii, fig. 1*b*)—an interesting piece of evidence as regards the descent of *Urogymnus* from a genus such as *Trygon* with a poison-spine on the tail. On the snout a few soft tubercles were visible, which appeared to be developing spines with a flat base.

Family MYLIOBATIDAE.

Aëtobatis narinari (Euphrasen).

(Plate ii, fig. 2.)

A. narinari, *Mem. Ind. Mus.*, ii, p. 55 (♀).

A. guttata, *ibid.*, p. 56 (♂).

It becomes clear from an examination of specimens from localities outside the Bay of Bengal and of individuals taken recently by the "Golden Crown" off the Madras coast, that I was wrong in two particulars as regards the species of *Aëtobatis*; firstly, in thinking that the form I called *A. narinari* was peculiar to the Atlantic, and secondly, in regarding it as specifically distinct from the common Indian form. For some reason all the specimens I had examined in a fresh condition were males, in which the snout appears to be normally more pointed than it is in females; and it is evident that the coloration of the species is more variable than I realized. In Edinburgh and London there are Indian specimens that agree closely with American and [redacted] specimens in the British Museum, while an old female from the Madras coast [redacted] more respects than one from all other specimens I have seen. It appears, however, that if very old and very young individuals, in both of which [redacted] are obscure or absent, are omitted from consideration, three colour varieties may be distinguished as follows:—

Var. A.—Entire dorsal surface of disk, including the snout, spotted.

Var. B.—Spots on the dorsal surface confined to the post-spiracular part of the disk.

Var. C.—Spots confluent into short transverse streaks.

Var. B is the common variety in the northern parts of the Bay of Bengal, but is by no means confined to Indian seas. Var. A is found off the Coromandel and Malabar coasts as well as in the Atlantic and South Pacific; while var. C is probably liable to occur in diverse places as an individual sport.

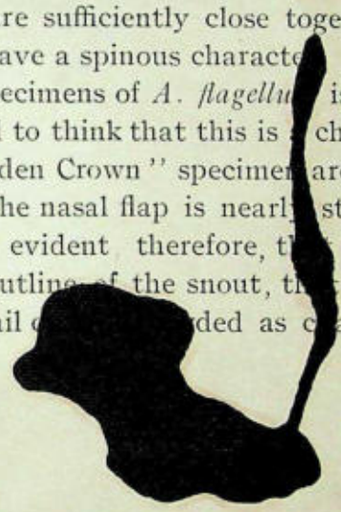
The large female recently taken by the "Golden Crown" is practically devoid of spots, which appear to have become almost obsolete. Very young individuals are also unspotted; but in them the spots are just commencing to appear. For the following measurements of the large specimen I am indebted to Dr. Jenkins

and Mr. G. H. Tipper. They were taken on the fresh fish, while I have only been able to examine the skin in spirit. Unfortunately the snout was not measured, but it has evidently been extremely broad, short, and blunt. The measurements of young males were taken from two specimens captured together in the Bay of Bengal and preserved in spirit. Unfortunately the snout is much distorted in the smaller of the two, which was probably born prematurely:—

	♀	♂ (juv.)	♂ (juv.)
Breadth of disk	205·0 cm.	23·2 cm.	20·4 cm.
Length of disk	132·5 ,,	13·7 ,,	12·4 ,,
Length of tail	275·0 ,,	57·0 ,,	47·5 ,,
Mouth to vent	..	9·6 ,,	8·5 ,,
Breadth of snout at base	..	12·7 ,,	..
Length of snout	..	12·6 ,,	..

The length of disk includes that of the snout.

The large female differs not only in its inconspicuous coloration, very large size and short rounded snout from other specimens sent to the Museum from the "Golden Crown," but also in having the dorsal surface and the whole of the tail covered with small, star-shaped denticles. On the head these are sufficiently close together to form a regular pavement, while on the tail they have a spinous character. Müller and Henle have noticed that the tail of very large specimens of *A. flagellum* is sometimes rough (*Plagiostomen*, p. 180), and I am inclined to think that this is a character denoting extreme old age. The teeth in the "Golden Crown" specimen are transverse, and not pointed at the tip in the lower jaw; the nasal flap is nearly straight; there is no trace of a serrated spine on the tail. It is evident therefore, that neither the shape of the tooth-band of the lower jaw, the outline of the snout, the form of the nasal flap, nor the number of spines present on the tail can be regarded as characters of specific importance.



PART III.—PLECTOGNATHI AND PEDICULATI.

By N. ANNANDALE, *D.Sc., F.A.S.B., Superintendent, Indian Museum, and* J. T. JENKINS, *B.Sc. (Lond.), D.Sc. (Wales), Ph.D. (Kiel), Superintendent, Lancashire and Western Sea Fisheries, late Fishery Adviser, Government of Bengal.*

INTRODUCTION.

As comparatively few sharks and dog-fish have been taken by the "Golden Crown," and as the collection of Selachians in the Indian Museum is by no means complete, we have thought it best to defer the consideration of this group. Moreover, to describe the Teleostei in the collection of the "Golden Crown" in an adequate manner will mean little less than a revision of the Indian representatives of all the families of which specimens have been obtained, and this work cannot yet be undertaken as regards the larger groups. We have therefore decided to deal, in the first instance, with those groups that are compact and of moderate size without reference to their exact systematic position. As a beginning we here discuss the suborders Plectognathi and Pediculati, in our arrangement of which we follow Mr. Boulenger's account of the Teleostei in the *Cambridge Natural History*, vol. vii (1904).

Most of the specimens of these suborders that Day has figured in his *Fishes of India* are in the collection of the Indian Museum, including the types of several species. In the "Golden Crown" collection the Triacanthidae and Tetrodontidae of the Bay of Bengal are fairly well represented, but the Balistidae, Diodontidae, and Pediculati poorly. The Balistidae and Diodontidae are mainly species which frequent coral reefs, but coral reefs do not occur in the northern part of the Bay of Bengal, and only near the southern limits of the trawler's cruises, that is to say, off the east coast, that Balistidae have been taken. Their presence there is probably due to large masses formed by molluscs of the genera *Siliquaria* and *Spiroglyphus* and almost comparable to coral reefs in growth. The Indian Pediculati, on the other hand, are mostly deep-sea forms; the majority of the species that belong to our fauna have been described by Col. Alcock or by Capt. Lloyd from the "Investigator" collections, the types being in the Indian Museum.

We must express our obligations to Prof. Max Weber of Amsterdam for valuable notes on the genera *Triacanthus* and *Halieutaea*.

I.—Suborder *PLECTOGNATHI*.

LIST OF THE PLECTOGNATHI OF INDIAN SEAS.

[The names of species not represented in the collection of the Indian Museum are printed in italics. Those of species taken by the "Golden Crown" are distinguished

by a *, those of species of which the types are in the Indian Museum with a †, and those of species not recorded or recognized as distinct by Day in the "Fauna" with a §.]

SCLERODERMI.

Fam. Triacanthidae.

1. Triacanthus brevirostris.*
2. ,, oxycephalus.*§
3. ,, strigilifer.*
4. ,, weberi.*§†
5. Triacanthodes ethiops.§†
6. Halimochirurgus centriscoides.§†

Fam. Triodontidae.

7. *Triodon bursarius.*

Fam. Balistidae.

8. Balistes stellaris.*
9. ,, maculatus.
10. ,, vetula.
11. ,, niger.
12. ,, mitis.
13. *Balistes conspicillum.*
14. Balistes viridescens.
15. ,, fuscus.
16. ,, flavimarginatus.
17. *Balistes ellioti.*
18. Balistes
19. ,,
20. ,,
21.
22. odon.
23. Monacanthus oculatus.§
24. *Monacanthus nematophorus.*§
25. ,, *setifer.*
26. Monacanthus choerocephalus.
27. ,, tomentosus.
28. Aluteres monoceros.*
29. ,, scriptus.*
30. *Aluteres nasicornis.*§
31. Anacanthus barbatus.

Fam. Ostraciontidae.

32. Ostracion gibbosus.*
33. ,, cubicus.
34. Ostracion punctatus.
35. ,, nasus.*
36. ,, cornutus.
37. *Ostracion fornasini.*§

GYMNODONTES.

Fam. Tetrodontidae.

38. Tetrodon lunaris.*
39. ,, inermis.*
40. ,, sceleratus.
41. ,, hypselogenion.
42. ,, oblongus.*
43. ,, spinosissimus.§
44. ,, patoca.*
45. ,, cutcutia.
46. ,, immaculatus.*
47. ,, nigropunctatus.
48. ,, stellatus.*
49. ,, reticularis.*
50. ,, hispidus.
51. ,, leopardus.†
52. ,, viridipunctatus.†
53. ,, fluviatilis.
54. Tropidichthys investigatoris, sp. nov.§†
55. *Tropidichthys valentini.*§
56. ,, *bennettii.*§
57. Tropidichthys margaritatus.*

Fam. Diodontidae.

58. Diodon hystrix.
59. *Diodon maculatus.*
60. Diodon orbicularis.*§

Fam. Molidae.

61. *Orthagoriscus*, sp.

Of the 61 species in the above list, only 17 have been taken by the "Golden Crown," although 34 of the 54 Batoidei known from Indian seas were obtained. This is evidently due to the fact that the great majority of the Plectognathi are reef-haunting species not found in water suitable for the operations of a trawler. Three species in the list (*Triacanthodes ethiops*, *Halimochirurgus centriscoides* and *Ostracion fornasini*) have been added to the Indian fauna by Col. Alcock,[1] while five have recently been recorded from the south-western limits of the Indian seas by Mr. Tate Regan in his account of the fish taken off the Maldives and in other parts of the Indian Ocean by Prof. Stanley Gardiner.[2] These five species, only the first of which is represented in the collection of the Indian Museum, are *Monacanthus oculatus*, *M. nematophorus*, *Aluteres nasicornis*, *Tropidichthys valentini* and *T. bennettii*. Two additional species have recently been taken by the R.I.M.S. "Investigator" in fairly deep water, both new to the fauna, namely, *Tetrodon spinosissimus* and *Tropidichthys investigatoris*, sp. nov. The former was described by Mr. Tate Regan from the Saya de Malha Bank in the Indian Ocean, and is represented in the Indian Museum by several specimens from the Gulf of Martaban and from Hongkong. Two species of *Triacanthus* and one of *Diodon*, not recognized by Day, have been taken by the "Golden Crown." Most of the forms dealt with in this paper are, however, well known; only two new species are described here (*Tropidichthys investigatoris* and *Halieutaea indica*), while a third (*Triacanthus weberi*) has recently been described by Mr. B. L. [illegible] audhuri.

The families and genera of the Plectognathi have so often been discussed that in most cases it will be unnecessary for us to describe their peculiarities, which are fully described in Günther's *Catalogue of the Fishes in the British Museum*, vol. [illegible]iii.

Sclerodermi.

Key to the Families and Indian Genera [illegible]*ni.*

Family I, TRIACANTHID[illegible]

Skin covered with small scales; body compressed; a spi[illegible] consisting of at least two spines; a pair of stout moveable ventral spine[illegible]

A.—Snout moderately produced; teeth small, conical, in a double series .. .. .. *Triacanthodes.*

B.—Snout moderately produced; teeth of the outer series incisor-like .. .. .. *Triacanthus.*

C. Snout produced into a long, curved, perfectly tubular organ .. .. .. *Halimochirurgus.*

---

[1] *Journ. Asiat. Soc. Bengal* (ii), vol. lxiii, p. 137, pl. vii, fig. 6 (1894), and vol. lxv, p. 338 (1896); *Proc. Asiat. Soc. Bengal*, 1899, p. 78; *Illustr. Zool. R.I.M.S.* "*Investigator*," Fishes, pl. xv, fig. 9, and pl. xxxi, fig. 3.

[2] Gardiner's *Fauna and Geogr. Maldive and Laccadive Arch.*, vol. i, p. 279, and *Trans. Linn. Soc. London* (2), xii, p. 252.

Family II, Balistidae.

Skin rough or with moveable scales; body compressed; not more than three spines in the dorsal; ventral reduced to a single spine or absent.

A.—Three dorsal spines present .. .. *Balistes.*

B.—One perfect and usually one rudimentary dorsal spine.

(*b*) Ventral spine present or absent; no barbel; less than 40 rays in the anal fin .. .. *Monacanthus.*

(*b'*) No ventral spine; no barbel; more than 40 rays in the anal fin .. .. .. *Aluteres.*

(*b''*) No ventral spine; a fleshy barbel on the lower jaw .. .. *Anacanthus.*

Family III, Ostraciontidae.

The scales modified into a firm and inflexible carapace formed of mosaic-like scutes; spinous dorsal and ventral fins absent.

Teeth small, slender, in a single series .. .. *Ostracion.*

The above key is based on the one given by Günther in his Catalogue (vol. viii, p. 208), but only Indian forms are included and certain modifications have been rendered necessary by more recent work on Oriental ichthyology.

Family TRIACANTHIDAE.

Genus Triacanthus, Cuvier.

Key to the Indian species of Triacanthus.

A.—Second dorsal spine much more than half as long as the first.

First dorsal spine shorter than the head; membrane of the dorsal fin tipped with black .. *T. strigilifer.*

B.—Second dorsal spine less than half as long as the first.

(*b*) Membrane of dorsal fin entirely pale; first dorsal spine distinctly longer than the head; snout fairly stout; dorsal profile of head sinuous .. *T. oxycephalus.*

(*b'*) Membrane of dorsal fin black; first dorsal spine not longer than the head; snout stout, with the dorsal profile nearly straight .. *T. brevirostris.*

(*b*″) Membrane of dorsal fin edged with black; first dorsal spine not or barely longer than the head; snout slender, with the dorsal profile distinctly concave and the ventral profile sinuous .. *T. weberi*.

Triacanthus strigilifer, Cantor.

Day, Faun. Brit. Ind., Fishes, vol. ii, p. 472.

This species, which does not appear to be quite so common in the Bay of Bengal as *T. brevirostris*, is easily distinguished by the length of the second dorsal spine. Should this spine be broken, as is sometimes the case, the characteristic form of the snout, midway between that of *T. brevirostris* and *T. weberi*, will serve as diagnostic.

T. strigilifer has been taken on both sides of the Bay by the "Golden Crown" and is represented in Day's collection.

Triacanthus oxycephalus, Bleeker.

Bleeker, Atlas Ichthyologique, vol. v, p. 90, pl. ccxx, fig. 3.

This species is regarded by Günther as synonymous with *T. biaculeatus*, but is apparently distinguished from the latter not only by the outline of its snout and the great length of the anterior dorsal spine, but also by distinct differences in coloration and in form of body. Prof. Max Weber has been kind enough to compare a specimen with Bleeker's original specimens.

T. oxycephalus is not represented in Day's collection. It has been taken off the coast of Orissa by the "Golden Crown" and also occurs off that of Lower Burma as well as in the Malay Archipelago.

Triacanthus brevirostris, Temm. and

Day, Faun. Brit. Ind., Fishes, vol. ii, p. 471.

T. brevirostris is perhaps the commonest species of the genus of Bengal. In Lake Chilka it occurs in brackish water. It is easily distinguished from other species by its comparatively stout snout and by the almost complete blackness of the membrane of the dorsal fin.

Triacanthus weberi, Chaudhuri.

T weberi, *Chaudhuri, Journ. Asiat. Soc. Bengal* (N.S.), vol. vi, p. 497, pl. xxxii (1910).

This species is not represented in Day's collection; indeed, all the specimens in the collection of the Indian Museum were taken by the "Golden Crown." Possibly it inhabits rather deeper water than the other species.

The peculiar form of the snout, which it is difficult to express accurately by means of measurements, will at once distinguish the species. The dark pigment on the snout, moreover, forms a narrower and better defined band on the sides than is the case in *T. strigilifer*, *T. brevirostris* or *T. oxycephalus*.

Family BALISTIDAE.

Genus Balistes, Lacépède.

Balistes stellaris, Bloch and Schneid.

This is the only species of the genus that has been taken by the "Golden Crown." It is apparently not uncommon on the *Siliquaria* grounds off the Madras coast at a depth of from 20 to 30 fathoms.

Genus Monacanthus, Cuvier.

No species of this genus (*sensu stricto*) has been taken by the "Golden Crown." As, however, two new species have recently been added to the Indian fauna, the following key may prove useful. All the Indian species are fully described in Günther's Catalogue:—

Key to the Indian species of Monacanthus.

A.—Ventral spine moveable; the ventral protuberance not extending beyond it.	
(*a*) Upper profile of snout concave; scales minute, each with four or five spines on the margin ..	*M. tomentosus.*
(*a'*) Upper profile of snout concave; scales minute, not very rough, sometimes mixed with minute cirri	*M. setifer.*
(*a''*) Upper profile of snout nearly straight; skin velvety, with long fringed filaments ..	*M. nematophorus.*
—Ventral spine absent.	
Body subcircular, marked with purplish ocelli ..	*M. oculatus.*

Genus Aluteres, Bleeker.

Key to the Indian species of Aluteres.

[illegible]e not in front of the orbit.	
[illegible] profile of snout convex; caudal fin much shorter than the head	*A. monoceros.*
(*a'*) Dorsal profile of snout concave; caudal fin nearly as long as or longer than the head ..	*A. scriptus.*
B.—Dorsal spine distinctly in front of the orbit.	
Dorsal profile of snout convex; dorsal spine nearly as long as the head	*A. nasicornis.*

Aluteres monoceros (Osbeck).

Monacanthus monoceros, *Day, Faun. Brit. Ind.*, Fishes, vol. ii, p. 482.

This species has been taken by the "Golden Crown" on several occasions. It appears to be not uncommon, together with *Balistes stellatus*, on the *Siliquaria* grounds off the Madras coast.

An abnormal specimen in the collection, while agreeing in other respects with typical examples, shows no trace of the dorsal spine.

Aluteres scriptus (Osbeck).

Monacanthus scriptus, *Day*, *op. cit.*, p. 483.

At least one specimen was taken by the "Golden Crown" on the same grounds as the last species.

Family OSTRACIONTIDAE.

Genus OSTRACION, Artedi.

The only species of this genus taken by the "Golden Crown" are *O. gibbosus* (the *O. turritus* of Day's books) and *O. nasus*. The two species do not appear to have quite the same distribution in the Bay of Bengal, for while *O. nasus* has been taken in considerable numbers in the muddy waters opposite the mouths of the Ganges, *O. gibbosus* appears to be characteristic rather of the *Siliquaria* grounds off the Madras coast and the rocky bottom off Arakan. Both species occur, however, in the Andamans.

Alcock (*Journ. Asiat. Soc. Bengal* (ii), vol. lxv, p. 338) has added *O. fornasini*, a species widely distributed in the Indian Ocean, to the fauna of British Ind[illegible]; but we have been unable to find his specimen, which was taken off Ceylon in 34 f[illegible]thoms, in the collection of the Indian Museum. The species is easily distinguished f[illegible]om its ally *T. cornutus* by its much shorter superciliary spines, which are parallel or s[illegible]ightly convergent, and by the fact that it possesses a large, conical, compressed s[illegible]ne in the middle of the back.

Gymnodontes.

The families here recognized are clearly disting[illegible] Day as "[illegible]roups," except that he does not separate the Diodontidae, wh[illegible]ly a sing[illegible]e tooth in each jaw, from the Tetrodontidæ, which have two.

Family TETRODONTIDAE.

Considerable difference of opinion exists among ichthyologists as to the number of genera that should be recognized in this family. We are able to distinguish three among the Indian forms, as follows: –

A.—Back rounded or flat; nostrils conspicuous.
  (*a*) Dorsal and anal fins with more than 20 rays each .. .. *Xenopterus.*
  (*a'*) Dorsal and anal fins with not more than 16 rays each .. .. *Tetrodon.*

B.—Back compressed into a ridge; nostrils very inconspicuous.
  Dorsal and anal fins with not more than 16 rays each .. .. *Tropidichthys.*

Genus TETRODON, Linn.

Tetrodon inermis, Schlegel.

A specimen of this species was taken by the "Golden Crown" off the mouth of the Eastern Channel (R. Hughli), in November, 1909. The sides of the fresh specimen are of a bright golden-green colour.

Tetrodon lunaris, Bloch and Schneid.

There seems to be every gradation between *T. lunaris* and *T. spadiceus*, Richardson. The only difference is the extent to which the spines on the dorsal surface extend backwards. *T. lunaris* is one of the commonest species in the Bay and was frequently taken on the "Golden Crown." Young individuals from 2 cm. in length were taken in large numbers on the shore at Puri at the commencement of February, 1909. In fresh specimens the back is dark bluish or greenish grey, sometimes obscurely marbled with a paler shade. The sides and belly are white.

Tetrodon oblongus, Bloch.

A common species in the Bay of Bengal frequently recorded on the "Golden Crown."

The length of the largest specimen is 28 cm.

Tetrodon spinosissimus (Tate Regan).

(Plate i, fig. 2.)

Spheroides spinosissimus *Tate Regan, Trans. Linn. Soc. Lond.* (2) Zool., vol. xii, part i, p. 253, [illegible] 5.

There are two specimens in the collection of the Indian Museum from the Gulf of Martaban, taken in the "Investigator" from a depth of 100 fathoms. They differ from Tate Regan's description in having very much shorter spines, and one of them has numerous small black spots on the tail.

Several specimens from Hongkong agree closely with the original figure.

The species may be distinguished from all those described by Day, in the group with two nasal apertures on each side, by the uniform pale brown coloration of its dorsal surface.

Tetrodon patoca, Ham. Buch.

Two large specimens were taken by the "Golden Crown," one off the Orissa coast in August, 1908, the other off Gopalpur (Madras Presidency) in September, 1909, the latter measuring 14½ inches in length. The species is common in the estuaries of the Ganges.

There are also several small specimens from Karachi in the collection. In these the pale spots are somewhat obscure. This, however, may be due to the fact that they were originally preserved in formalin.

Tetrodon viridipunctatus, Day.

This appears to be a species of doubtful validity, as Day's descriptions and figures differ from those of *T. patoca* mainly as regards markings. The type is a painted skin, and no other example is known; moreover, the artificial markings on the type do not at all agree with Day's figure. The specimen, therefore, is hardly even of historical value.

Tetrodon immaculatus, Bloch and Schneid.

Several specimens have been recorded from both sides of the Bay. The largest specimen in the collection is 21·5 cm. long. The spines in this species are covered with a thick cuticular investment. None of the specimens in the collection have barred sides.

Tetrodon nigropunctatus, Bloch and Schneid.

This species was not recorded on the "Golden Crown."

There are two specimens in the collection. One is covered with fairly long spines, the other almost naked. In the latter the skin is covered with small, closely set, soft tubercles.

The spiny specimen has no history: the other is from Port Blair in the Andamans.

Tetrodon stellatus, Bloch and Schneid.

Recorded from the "Golden Crown" on several occasions.

In a series of specimens it does not seem possible to draw any real distinction between Günther's varieties α and β, except that variety α probably consists of old and variety β of young individuals.

Of Günther's var. γ (the *Crayracion astrotaenia* of) we have examined two small specimens; but we do not feel justified in an opinion, in the absence of intermediate forms, as to its distinctness.

Tetrodon fluviatilis, Ham. Buch.

This species, which appears to be entirely littoral, estuarine and fluviatile, was not obtained by the "Golden Crown," but a large series of specimens has been examined.

There are two well-marked varieties in the river Ganges and on the Indian coasts.

In var. A (figured by Hamilton in his *Fishes of the Ganges*) there are well-defined pale bars across the back, and the caudal fin is more or less definitely spotted or barred. The ventral surface is usually unpigmented.

In var. B (figured by Day in his *Fishes of India*) the markings are much less distinct, the dorsal surface being marbled rather than barred. The ventral surface is usually pigmented.

Var. B has not yet been examined by us from fresh water, but var. A occurs on the Orissa coast as well as far up the Ganges (Sara Ghat).

The two varieties were taken together in a trawl on December 6th, 1909, in brackish water in the Sattermukhi River, Ganges delta.

Genus Tropidichthys, Bleeker.

Key to the Indian species of Tropidichthys.

A.—A large black ocellus present at the base of the dorsal fin.	
(*a*) Pale ocelli on the snout, sides and caudal fin ..	*T. margaritatus.*
(*a'*) Pale ocelli absent from the caudal fin ..	*T. bennettii.*
B.—No dark ocellus at the base of the dorsal fin.	
(*b*) Dark markings consisting solely of delicate longitudinal and transverse lines; no pale ocelli	*T. investigatoris.*
(*b'*) Somewhat irregular dark bands present; sides with pale ocelli	*T. valentini.*

Bleeker in 1854 referred those species with ridged back and inconspicuous nasal organs to a genus *Tropidichthys*. In 1865 he called the species with these characters *Psilonotus*. Günther regarded them as a subgenus of *Tetrodon* under the name of *Anosmius*, Peters, 1855; and Day treated them as a division of *Tetrodon*.

Tropidichthys margaritatus, Rüpp.

(Plate i, fig. 3.)

There are four specimens in the Museum, all taken by the "Golden Crown" off the Mad[illegible]s coast. The lines under the eye are nearly horizontal, and not radiating. There a[illegible]no horizontal lines on the lower part of the head, and the small ocelli on the tail [illegible]now a tend[illegible]n together and form ventral bars. Those on the ventral surface a[illegible]re very fa[illegible]can be distinguished at all.

Tropidichthys investigatoris, sp. nov.

(Plate i, fig. 4.)

Two specimens from the Andamans (St. 239 of the "Investigator") at a depth of 55 fathoms.

D. 9-10. P. 15. A. 10. C. 11.

Outline of back distinctly angular, the highest point being just above the gill-opening. Depth of body very variable. The whole of head and body, except the tail, covered with small spines which lie parallel to the skin. Each spine with two roots.

No dark spot at base of dorsal fin. Fins practically colourless. Back and sides pale brown. Three narrow somewhat sinuous dark lines crossing the snout in front of the eye, the two posterior ones bending inwards towards the orbit; a fourth line joining the orbits near the centre; at least one similar line across the

back; two or three transverse lines on upper part of each side behind the pectoral; several short vertical lines beneath the eye. Ventral surface cream-coloured.

II.—Suborder *PEDICULATI.*

LIST OF THE PEDICULATI OF INDIAN SEAS.

Fam. LOPHIIDAE.

1. Lophius indicus.†§
2. ,, gracilimanus.†§
3. ,, mutilus.†§[1]
4. ,, lugubris.†§
5. ,, triradiatus.†§

Fam. CERATIIDAE.

6. Lophodolus indicus.†§
7. Melanocoetus sp.§
8. Ceratias bispinosus.§
9. Oneirodes glomerosus.†§

Fam. ANTENNARIIDAE.

10. Chaunax pictus.§
11. ,, apus.†§
12. Antennarius hispidus.*
13. ,, nummifer.
14. ,, commersonii.§

Fam. MALTHIDAE.

15. Malthopsis lutea.†§
16. ,, triangularis.†§
17. Halieutaea indica.*†§
18. ,, nigra †§
19. ,, coccinea.†§
20. ,, stellata.*†§
21. ,, fumosa.†§
22. Halicmetus ruber.†§
23. Dibranchus nasutus.†§
24. ,, micropus.†§
25. ,, nudiventer.†

Of the Indian Pediculati, out of a total of 25 species, 20 are deep-s[illegible] forms. Only three have been taken by the "Golden Crown," *viz.*, *Antennarius [illegible]spidus*, *Halieutaea stellata* and *H. indica*. The last is described as a[illegible]cies. All th[illegible] Indian species are, however, represented in the collection of [illegible]an Museum. The deep-sea forms of which the types are in this collection are [illegible]escribed either in Col. Alcock's *Descriptive Catalogue of Deep-Sea Fishes in the [illegible]um*, or in Capt. Lloyd's appendix,[2] and are figured in the *Illustrations [illegible]y of the R.I.M.S. "Investigator."*

Key to the Indian Families and Genera of Pediculati.

I.—Head and body depressed, more or less disk-like.

A.—Gill opening in lower axil of pectoral.

Family I, LOPHIIDAE.

Genus *Lophius.*

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[1] This and other species of Lophiidae which have the second portion of the spinous dorsal obsolescent are placed by Goode and Bean in a new genus *Lophiodes*: see "Oceanic Ichthyology," *Bull. U. S. Nat. Mus.*, 1895, p. 537.

[2] *Mem. Ind. Mus.*, vol. ii, No. 3 (1909).

B.—Gill opening above pectoral.

Family II, Malthidae.

a.—A soft dorsal present.

(*a*) Palate edentulous; 2 gills .. .. *Dibranchus.*
(*a'*) Palate edentulous; 2½ gills .. .. *Halieutaea.*
(*a''*) Teeth on palate and vomers .. .. *Malthopsis.*
b.—No soft dorsal .. .. *Halicmetus.*

II.—Head and body compressed or rounded.

A.—Pectoral fin straight.

Family III, Ceratiidae.

a.—Skin smooth.

(*a*) A pair of cephalic spines; a jointed dorsal filament situated behind the head .. .. *Lophodolus.*
(*a'*) Dorsal filament on snout .. .. *Melanocoetus.*
(*a''*) Two dorsal filaments .. .. *Oneirodes.*
b.—Skin covered with minute prickles .. .. *Ceratias.*

B.—Pectoral fin distinctly elbowed.

Family IV, Antennariidae.

(*a* Body not much compressed; spinous dorsal consisting of 1 or 2 unprotected tentacles .. *Chaunax.*
(*b*) Body compressed and elevated; spinous dorsal consisting of 3 spines, of which the first is ...ular .. .. .. *Antennarius.*

Family MALTHIDAE.

Genus Halieutaea, Cuv. & Val.

Key to the Indian species of Halieutaea.

I.—Under surface of disk covered with perfectly smooth, glandular, nearly transparent skin.
Five rays in the dorsal fin .. .. *H. fumosa.*

II.—Under surface of disk bearing minute stellate spines or granules covered with skin which is opaque or slightly translucent.

A.—Four rays in the dorsal fin.

(*a*) Roof of tentacular cavity extending forward as far as the edge of the disk; caudal and pectoral fins not edged with black .. *H. indica.*

(*a'*) Roof of tentacular cavity not extending to the margin of the disk; caudal and pectoral fins edged with black .. .. *H. stellata.*

B.—Five rays in the dorsal fin.

(*b*) Disk flat .. .. .. *H. nigra.*

(*b'*) Disk distinctly convex in front .. *H. coccinea.*

Halieutaea indica, sp. nov.

(Plate ii, fig. 4.)

H. stellata, *Day* (nec *Kühl*), *Faun. Brit. Ind.*, Fishes, p. 234, fig. 85.

D. 4. V. I, 5. A. 4. P. 13. C. 9.

Tail, excluding the caudal fin, from $\frac{1}{4}$ to $\frac{1}{3}$ length of disk. Caudal usually slightly longer than the tail, occasionally of the same length. Length and width of disk approximately equal. Dorsal surface covered with numerous strong subequal spines, many of which are bifid; at the edge many are trifid. Most of the spines have four roots; at the edge of the disk they project freely and are accompanied by delicate cuticular processes. The anterior extremity of the roof of the tentacular cavity reaches or is slightly in advance of the anterior extremity of the disk, and the aperture of the cavity is vertical, so that the cavity is concealed from above. The strong spine at each side of it projects beyond the margin of the disk. Superciliary ridge with strong spines. Interorbital space equals or slightly exceeds diameter of eye. The ventral surface with minute scattered spines.

Colour (in spirit). Dorsal surface white, densely covered with very minute black dots, which are grouped together in places to form thin lines and reticulated patterns. Ventral surface white (somewhat translucent) with scattered minute black and opaque white dots. Pectoral fins colourless, caudal fin clouded with grey, occasionally with white, vertical bands. Colour of dorsal surface of living specimens pink.

This is undoubtedly the species figured by Day as *H. stellata* of Kühl, but it differs from the latter species, amongst other characters, in the following points:—

(1) The spines on the dorsal surface are less strongly developed.

(2) The extremity of the roof of the tentacular cavity extends at least as far forwards as the edge of the disk.

Professor Max Weber, who has been kind enough to examine a specimen, agrees with us in regarding this species as distinct.

Halieutaea stellata, Kühl.

(Plate ii, fig. 3.)

D. 4. V. I, 5. A. 4. P. 13. C. 9.

Tail, excluding the caudal fin, $\frac{1}{3}$ length of disk. Caudal fin nearly the same length as the tail.

Disk distinctly broader than long. Dorsal surface covered with stout stellate spines, most of which have more than four roots. They vary considerably in size, but none are very small. Over the greater part of the disk the spines are single At the edge, where they are accompanied by numerous cuticular processes, they have at least four sharp points. The anterior extremity of the roof of the tentacular cavity *does not reach the edge* of the disk. The *aperture of the cavity slopes downwards and forwards*, so that it is partly visible from above. The disk is much flatter than in *H. coccinea*. Superciliary ridge with strong simple spines. Interorbital space distinctly broader than diameter of eye. Ventral surface with very minute and widely scattered spines.

Colour (in spirit). Dorsal surface pinkish grey with numerous black spots, the centre of each of which is much darker than the periphery. These spots tend to be arranged in eight groups, four on each lateral half of the disk. The most marked group is that on each side of the centre of the mid-dorsal region. The whole of the dorsal surface is covered with minute pigment cells; the ventral surface white. In life the ground colour of the dorsal surface is a deep red.

Pectoral and caudal fins white, broadly edged with black. Dorsal fin black, edged with white.

This species appears to reach a much larger size than *H. indica*. In some respects it resembles *H. coccinea*, but the disk is much flatter, the spines on the dorsal surface are stouter, and those on the ventral surface are smaller or more widely scattered. The coloration is also different, and there are only 4 rays in the dorsal.

We had proposed to describe this species as new, but notes that Prof. Max Weber has been kind enough to send convince us that we would have been wrong in so doing.

Family ANTENNARIIDAE.

Genus Antennarius, Cuv.

Key to the Indian species of Antennarius.

I.—Skin devoid of spines
Skin bearing numerous foliaceous processes .. *A. marmoratus.*

II.—Skin covered with minute spines.
A.—Sides pale with numerous dark streaks, which radiate from the eye and from the pectoral fin .. *A. hispidus.*
B.—Sides variously mottled or spotted.
(*b*) First dorsal spine (tentacle) longer than the second .. .. *A. commersonii.*
(*b'*) First dorsal spine not longer than the second *A. nummifer.*

Antennarius hispidus, Bloch and Schneid.

Two specimens have been taken by the "Golden Crown" off the Ganjam coast. There are several others in the collection of the Indian Museum, one of which from

Dhappa near Calcutta (if the locality is correct) must have been taken in brackish water.

The series examined exhibit considerable variation as regards marking, but all the specimens differ from Günther's figure,[1] in that the markings on the posterior part of the sides of the body take the form of streaks instead of spots. There is considerable variation in the length of the tentacles and in the form and size of the tuft at its extremity. Day's figure is taken from a shrivelled and distorted specimen still in the collection of the Indian Museum. The body is much deeper than he represents it.

Antennarius nummifer, Cuv.

(Plate i, fig. 5.)

If Günther[2] is correct as to the synonymy of this species, Day's figure in the *Fishes of India*[3] represents not it but a variety of *A. commersonii*, Günth. There is, however, a specimen in the collection of the Indian Museum that agrees fairly well with Bleeker's figure[4] of *A. coccineus*, which Günther regards as a representation of the true *A. nummifer*. It is by no means improbable that these three forms, as well as several others,[5] will ultimately prove to be conspecific.

Antennarius commersonii (Lacép.).

Day's specimen in the collection of the Indian Museum, although apparently not the one he figured as *A. nummifer* in the *Fishes of India*, belongs perhaps to Günther's *A. commersonii* var. B. The spots, however, are less numerous than in the individuals figured by the latter author. There are several young specimens in the collection (length from 28 to 42 mm.) which agree fairly well with the definition and figure of var. A of the same species, except that the first dorsal spine is distinctly shorter than the second. Perhaps they are the young of that form. These specimens are from Bombay.

[1] "Die Fische der Südsee," vol. v, *Journ. Mus. God.*, Hamburg, 1876—81, pl. 99, fig. A.

[2] *Ibid.*, p. 163, pls. 100—106.

[3] Plate lix, fig. 2.

[4] *Atlas Ichthyologique*, vol. v, pl. cxcvii, fig. 2 (1865).

[5] Notably *A. tridens* (Schlegel); see Pietschmann in *Ann. k. k. Naturh. Hofmus.*, vol. xxiii, p. 1, pl. i (Vienna, 1909).

PART IV.—ON A COLLECTION OF INDIAN PLEURONECTIDAE.

By J. T. JENKINS, *D.Sc.* (*Wales*), *Superintendent, Lancashire and Western Sea Fisheries.*

This collection was for the most part obtained by the Bengal Government's steam trawler the "Golden Crown" in the Bay of Bengal during 1908-09. A few specimens from the Trivandrum Museum, from the Indian Marine Survey collection, and several collected by Dr. Annandale on Puri beach are also included. Most of the species figured in the accompanying plate (pl. iii) have been described in the *Records of the Indian Museum*, vol. v, pp. 123—140 (1910).

So far as the observations of the "Golden Crown" extended it would appear that the Pleuronectidae are not so abundant in the Bay of Bengal between 10 and 35 fathoms as they are on similar ground in British waters. The genus *Pleuronectes*, which is frequently taken in enormous quantities in the seas of Northern Europe, and is a valuable commercial fish, is entirely absent in the Bay, and its place is apparently taken by the genera *Pseudorhombus* and *Psettodes*. At any rate these genera are found in localities which would in England be inhabited by *Pleuronectes*. The habitat of the two common species of *Pseudorhombus*, *P. arsius* and *P. javanicus*, is similar to that of the Dab (*Pleuronectes limanda*), while *Psettodes erumei* may be taken to be the representative of the Flounder (*Pleuronectes flesus*) in Indian waters.

Of the "soles," the genera *Cynoglossus* and *Synaptura* are characteristic of depths between 10 and 35 fathoms, while *Plagusia*, which was rarely taken on the "Golden Crown," would appear to frequent shallower areas since it is commonly taken by the beach fishermen at Puri. The commonest sole in the Bay is *Cynoglossus macrolepidotus*, and this species formed the bulk of the commercial "sole" of the "Golden Crown." So far as the limited observations in the Sunderbuns extended, it seems that *Cynoglossus* extends well into the estuaries, at any rate specimens were captured at Morrelganj and Kan Rondighee. At the latter place the salinity is very slight, the reading with the Kiel araeometer being 1·0090.

PLEURONECTIDAE.

PSETTODES, Bennett.

Psettodes erumei, Bloch and Schneid.

Numerous specimens of this species were obtained by the "Golden Crown." It is especially abundant on the muddy grounds off the entrance to the Eastern Channel (mouth of the Hughli).

Three specimens were added to the Museum collection from the "Golden Crown."

No.	Locality.	Length.
2139.	Off Elephant Pt., Arakan Coast, July, 1909 ..	35·7 cms.
3634.	Off Santapalii, Madras Presidency, October, 1909 ..	17·6 ,,
3644.	Off Gopalpur, ,, ,, . ..	27·3 ,,

PSEUDORHOMBUS, Bleeker.

Three species of *Pseudorhombus* are represented in the collection, *viz.*:—

Pseudorhombus arsius, Bleeker.
Pseudorhombus javanicus, Bleeker.
Pseudorhombus russellii, Gray.

As is the case in British Pleuronectidae, there is a considerable variation in colour and marking within the limits of a single species. This is especially noticeable in the case of the specimens of *Pseudorhombus arsius*. The presence of intermediate specimens between the extreme colour varieties, however, renders it certain that only one species is represented.

Pseudorhombus arsius, Bleeker.

This species is distinguished from the nearly related *P. javanicus* by the larger number of dorsal fin rays (over 70) and the enlarged anterior teeth.

No.	Locality.	Length.
F $\frac{21}{1}$	Off Elephant Pt., Arakan Coast, "Golden Crown"	18·5 cms.
F $\frac{3}{1}$	Puri beach, Dr. N. Annandale	20·8 cms.
F $\frac{3439}{1}$	Ten specimens. Balasore Bay, "Golden Crown"	16·1, 16·9, 19·4, 21·7, 22·8, 23·3, 24·6, 25·8, 26·1, 27·1 cms.
F $\frac{3440}{1}$	Balasore Bay, "Golden Crown"	24·9 cms.
F $\frac{3442}{1}$	Five specimens, namely :— P_1, P_2, P_3, P_4 and P_5. Puri beach, Dr. N. Annandale	15·7, 18·4, 19·5, 21·5, 21·6 cms.
F $\frac{3443}{1}$	S. Orissa, "Golden Crown"	17·8 cms.

Pseudorhombus javanicus, Bleeker.

Day in his description of this species says "A well-developed pre-anal spine," whereas in *P. arsius* the "pre-anal spine, when present, is but slightly apparent."

According to my observations this spine is occasionally well-developed (*vide* Nos. F $\frac{2145}{1}$ or F $\frac{3442}{1}$, P_4) and more often absent (*vide* other specimens). Possibly

this is a sexual difference; at any rate it does not serve as a specific distinction from *P. arsius*. It will be noticed that the specimens of *P. javanicus* are on the average smaller than those of *P. arsius*.

No.	Locality.	Length.
F $\frac{2143}{1}$	Off Elephant Point, Arakan Coast, "Golden Crown"	12·9 cms.
F $\frac{3441}{1}$	Puri beach, Dr. N. Annandale	16·6 cms.
F $\frac{3442}{1}$	Four specimens—P_4, P_5, P_6, P_7. Puri beach, Dr. N. Annandale	11·4, 13·3, 13·7, and 16·4 cms.

Pseudorhombus russellii, Gray.

Day evidently regards this species as identical with *P. arsius*, but from an examination of this collection I am convinced that the species are distinct.

12242. Off Orissa Coast, Marine Survey.

The Indian species of *Pseudorhombus* may be distinguished by the following characteristics:—

Anterior teeth enlarged	Dorsal fin rays over 70 ..	*P. arsius*, Bleeker.
	Dorsal fin rays 70 or less ..	*P. javanicus*, Bleeker.
Teeth minute ..	Longest dorsal rays at commencement of posterior half of fin	*P. russellii*, Gray.
	Anterior dorsal rays elevated	*P. triocellatus*, Bl. Sch.

The following table gives the height, length, ratio of height to length of body (inclusive of caudal) and the number of dorsal and ventral fin rays in the various specimens of *Pseudorhombus* examined:—

No.	Length, mm.	Height.	Ratio H. to L.	Dorsal fin rays.	Ventral fin rays.	Species.
2142	185	83	2·2	74	6	*P. arsius*.
3438	208	90	2·3	71	6	,,
3439[15]	271	120	2·2	74	6	,,
,, [15a]	246	104	2·4	75	6	,,
,, [15b]	258	108	2·4	75	6	,,
,, [15c]	261	115	2·3	73	6	,,
,, [15d]	233	95	2·5	74	6	,,
,, [15e]	194	81	2·4	76	6	,,

No.	Length, mm.	Height.	Ratio H. to L.	Dorsal fin rays.	Ventral fin rays.	Species.
3439 18	228	94	2·4	74	6	*P. arsius.*
,, 15g	217	92	2·3	73	6	,,
,, 15h	161	69	2·3	75	6	,,
,, 15i	169	71	2·4	73	6	,,
3440	249	105	2·4	76	6	,,
3442 p1	157	63	2·5	74	6	,,
,, p2	216	89	2·4	73	6	,,
,, p3	184	83	2·2	75	6	,,
,, p8	215	91	2·4	71	6	,,
,, p9	195	87	2·2	?	6	,,
3443	178	73	2·4	76	6	,,
2143	129	53	2·4	69	6	*P. javanicus.*
3441	166	70	2·4	70	6	,,
3442 p1	133	56	2·4	68	6	,,
,, p5	137	58	2·4	69	6	,,
,, p6	164	69	2·4	68	6	,,
,,	114	48	2·4	69	6	,,
12242	107	45	2·4	69	6	*P. russellii.*

PLATOPHRYS, Swainson.

Platophrys was sparingly obtained by the "Golden Crown." Occasionally it was met with in rough ground off the Arakan Coast in the neighbourhood of Oyster Island. One species only was taken.

Platophrys pantherinus, Rüpp.

2622. Arakan Coast, January, 1909. Length, 9·6 cms.

RHOMBOIDICHTHYS, Bleeker.

At least two species are met with in the "Golden Crown" collection, both being obtained off the Arakan Coast in January, 1909, in the same locality as *Platophrys pantherinus*. Neither species had previously been recorded from the Arakan Coast.

Rhomboidichthys valderostratus, Alcock.

2623. Arakan Coast, January, 1909. Length, 8·2 and 7·5 cms.

2624. ,, ,, ,, ,, ,, 6·2, 7·1, 7·7 and 7·7 cms.

Rhomboidichthys azureus, Alcock.

2625. Arakan Coast, January, 1909. Length, 7·6 cms.

BRACHYPLEURA, Günther.

Brachypleura xanthosticta, Alcock.

This species was recorded from the Ganjam Coast, whence Alcock's type specimens were obtained, and also off the entrance to the Eastern Channel at the mouth of the Hughli.

			Length.
F 3426,	♀	Off Gopalpur, Ganjam Coast, 24 fathoms, Feb., 1909 ..	11·2 cms.
F 3426*a*,	♀	,, ,, ,, ,, ..	10·1 ,,
F 3449,	♂	,, ,, ,, ,, ..	9·5 ,,
F 3427,	♀	Off Pilot Ship, Eastern Channel, 25th Feb., 1909 ..	7·2 ,,

PSETTYLIS, Alcock.

This genus was established by Alcock[1] in 1890 for a number of Pleuronectids allied to *Rhomboidichthys*. One of the generic characters as given by Alcock is "no scales"[2] but I agree with Johnstone[3] that the body is covered with scales which are cycloid, except at the bases of the dorsal and anal fins, on the ocular side, where they are ctenoid. The single specimen in the collection is *Psettylis ocellata*.

Psettylis ocellata, Alcock.

F $\frac{41}{1}\frac{83}{}$, Indian Marine Survey Station 387, 49-40 fathoms.
Lat. N. 15° 25′. Long. E. 93° 45′.

SCIANECTES, Alcock.

Scianectes macrophthalmus, Alcock.

This species was described by Alcock[4] from a specimen taken at a depth of 100 fathoms off Akyab. It was obtained in much shallower water by the "Golden Crown" off Puri on March 15th, 1909.

		Length.
F 3436,	Puri, Orissa Coast, March, 1909	12·3 cms.
F 3436*a*	,, ,, ,, ...	10·1 ,,

F $\frac{41}{1}\frac{80}{}$, $\frac{41}{1}\frac{81}{}$, $\frac{41}{1}\frac{82}{}$, $\frac{41}{1}\frac{84}{}$, Indian Marine Survey Station 387, 49-40 fathoms.
Lat. 15° 25′ N. Long. 93° 45′ E.

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[1] *Ann. Mag. Nat. Hist.* (6), vi, 1890, p. 436.

[2] *Ibid.*, p. 437, and *Descriptive Catalogue of the Indian deep-sea Fishes in the Indian Museum*, Calcutta, 1899, p. 124.

[3] *Rep. Ceylon Pearl Oyster Fish.*, pt. ii, p. 207 (Roy. Soc. Lond., 1904).

[4] See *Journ. As. Soc. Beng.*, vol. lviii, pt. ii, No. 3, 1889.

SOLEA, Klein.

When fishing off the Ganjam Coast on the "Golden Crown," the trawl brought up a specimen of what at first sight appeared to be a *Synaptura zebra* or allied species. The caudal fin was, however, distinctly separate from the vertical fins. Subsequently another specimen was obtained in the same locality.

The term "*Synaptura*" was first applied by Cantor,[1] to distinguish a subgenus of *Solea*, in which the caudal, dorsal and anal fins are all united. In other respects the subgenus has the general structure of *Solea*.

Subsequently, when looking through some of the "Investigator" Pleuronectidae, three specimens were found provisionally labelled "*Synaptura quagga*," one of which was undoubtedly *Synaptura cornuta* (Kaup) (see below), and the other two showed the same distinction of the caudal fin, and are consequently referred, together with the two "Golden Crown" specimens, to a new species of *Solea*, here described as *Solea synapturoides*.

Solea synapturoides, sp. nov. (Plate iii, figs. 4, 4*a*, 4*b*.)

Type specimen F $\frac{3430}{1}$.

D. 76. V. 5. P. 11. A. 61. L.l. *circa* 90-93. C. 14.

Length of head $5\frac{1}{2}$, height of body 3 in total length inclusive of caudal.

The eyes are situated close together less than half a diameter apart, the upper being slightly in advance of the lower. Diameter 5 in length of head and about a diameter of slightly more from end of snout.

Nostrils on coloured side at end of tube, which is situated just anterior to the lower orbit.

Fins.—Dorsal and anal rays unbranched. Both pectorals present.

Colour.—Slate-coloured, with nine dark transverse unbranched bands on body and seven or eight on head.

Locality.—Off Ganjam Coast, 24-30 fathoms. Obtained on the Steam Trawler "Golden Crown."

ACHIRUS, Lacépède.

One specimen of this genus was identified in the "Golden Crown" collection, namely, *Achirus maculatus*, Bl. Schn., taken off the Ganjam district of the Madras Presidency in March, 1909.

Achirus maculatus, Bloch and Schneid.

F 3428. Ganjam Coast, off Sonapur, March, 1909. Length 10·0 cms.; depth 20 to 25 fathoms.

SYNAPTURA, Cantor.

There are four species of *Synaptura* represented in the collection, and of these two were recorded on the "Golden Crown."

[1] "Catalogue of Malayan Fishes," *Journ. As. Soc. Bengal*, vol. xviii, p. 1204.

Synaptura commersoniana, Lacép.

F 2328. Off Burmese (Arakan) Coast, 17th November, 1908. Length, 23·4 cms. "Golden Crown."

Synaptura altipinnis, Alcock.

A specimen of this species was taken by the "Golden Crown" off the Ganjam Coast in from 24–30 fathoms. Alcock's type was recorded from the Vizagapatam Coast from similar depths (25 fathoms).

F 2472. Ganjam Coast, 24—30 fathoms, February, 1909. Length, 18·0 cms. "Golden Crown."

Synaptura orientalis, Bloch and Schneid.

F $\frac{41}{1}\frac{79}{}$, Quilon, Trivandrum Museum, R. S. N. Pillay coll.
F $\frac{41}{1}\frac{86}{}$, Trivandrum ,, ,,

Synaptura cornuta (Kaup).

A specimen of this species occurs in the collection. It had been labelled provisionally "*Synaptura quagga*." There can, however, be no doubt, from the cycloid scales and the first dorsal ray being thickened and prolonged, that the specimen belongs to this species.

	Length.
F $\frac{825}{1}$, Off Malabar Coast, 68 fathoms, Marine Survey ..	12·[illegible] cms.

PLAGUSIA, Cuvier.

The genus *Plagusia* appears to be an inshore genus At any rate it is far commoner on Puri beach than in the "Golden Crown" hauls. *P. bilineata* was occasionally taken on the "Golden Crown." Both species are represented in the collection.

Plagusia bilineata, Bloch.

	Length.
F 3431, Ganjam Coast, "Golden Crown," March, 1909. ..	19·7 cms.
F 3431*a*, ,, ,, ,, ..	16·2 ,,

Plagusia marmorata, Bleeker.

F $\frac{41}{1}\frac{77}{}$, young specimen, Puri beach, Dr. Annandale.

APHORISTIA, Kaup.

There is one damaged Pleuronectid in the collection which is referable to the above genus. In this specimen the head is badly damaged, and it is not possible to determine the extension of the mouth-cleft with reference to the eyes. Both sides of the body are coloured, and there are no cross-bands, consequently the species is either *Aphoristia wood-masoni*, Alcock, or *Aphoristia gilesii*, Alcock. The fact that

the anal fin commences a little way behind the ventral and not closely adjacent to it leads me to place this specimen in the former species, which has previously been recorded from the Andaman Sea.[1]

Aphoristia wood-masoni, Alcock.

F $\frac{11}{1}\frac{40}{}$, Station 332, Indian Marine Survey, 279 fathoms.
Lat. N. 10° 21′. Long. E. 92° 46¼′.

CYNOGLOSSUS, Ham. Buch.

At least three species were obtained on the "Golden Crown" and of these *Cynoglossus macrolepidotus* was by far the commonest, this species being the commercial "sole" of the "Golden Crown."

Cynoglossus macrolepidotus, Bleeker.

F 3648, Off Pilot Ship, Eastern Channel, mouth of Hughli, Feb., 1909 .. .. Length. 31·5 cms.
F 3445, Off Puri, Orissa Coast, September, 1908 .. 23·0 ,,
F 3[illegible]5*a*, ,, ,, ,, ,, .. 23·0 ,,

Cynoglossus semifasciatus, Day.

F 343[illegible] Puri Coast, "Golden Crown," March, 1909 .. Length, 11·4 cms.

Cynoglossus quadrilineatus, Bleeker.

F 3[illegible]4, Elephant Pt., Arakan Coast, "Golden Crown," July, 1908 .. .. .. Length, 26·7 cms.

Cynoglossus puncticeps, Richardson.

F $\frac{11}{1}\frac{85}{}$, Trivandrum, Trivandrum Museum.
F $\frac{11}{1}\frac{87}{}$, ,, ,, ,,

Cynoglossus lida, Bleeker.

There are two specimens in the collection from the Trivandrum Museum which more nearly resemble this species than any other. The number of rows of scales between the lateral lines on the coloured side is slightly higher than that given by Day as characteristic for the species, being from 16 to 17 instead of 13. In other respects the resemblance is very close. One of the specimens (F $\frac{11}{1}\frac{88}{}$) has the coloured side marked with blackish dots. There is, however, a great amount of colour

[1] See Alcock, *Journ. As. Soc. Beng.*, vol. lviii, part ii, No. 3, 1889, p. 294.

variation amongst Pleuronectids, and consequently it would be safer to regard both these specimens as belonging to the same species.

F $\frac{41}{1}\frac{78}{}$, Trivandrum, Trivandrum Museum.

F $\frac{41}{1}\frac{88}{}$, ,, ,, ,, (var. *punctatus*).

STUDIES IN POST-LARVAL DEVELOPMENT AND MINUTE ANATOMY IN THE GENERA *SCALPELLUM* AND *IBLA*.

By F. H. STEWART, *M.A., D.Sc., M.B., Captain, Indian Medical Service, formerly Surgeon Naturalist to the Marine Survey of India, Honorary Assistant in the Indian Museum.*

I.—SUMMARY OF PREVIOUS LITERATURE.

1. The development of hermaphrodite and male forms of Cirripedes.
2. Anatomy of the male.
3. Question of sexual purity of the male and female forms.

1. The development of cirripedes has been dealt with chiefly by Darwin (5) and Hoek (8). Darwin (5, pp. 8 and 9) gave a summary of preceding literature (Vaughan Thompson, Burmeister, Goodsir, Spence Bate) and described the development from the nauplius, passing through the cyprid stage to the adult. In regard to that portion of the metamorphosis with which we are concerned, namely, that from the cyprid stage to the adult, he wrote: "My chief examination has been directed at this stage of development to the larvae of *Lepas australis* which are of unusual size, namely, from ·065 to even almost ·1 of an inch in length. I examined, however, the larvae of several other species of *Lepas*, of *Ibla* and of *Balanus*, with less care, but sufficiently to show that in all essential points of organisation they were identical." His descriptions are, of course, not based on the examination of sections so that some gaps still remained to be filled up in regard to the more histological aspect of the metamorphosis. He also fell into the error, which was pointed out at a later time by Krohn and Claus, of mistaking the cement cells for incipient ovaria.

Hoek (8, p. 5) again described the cyprid of *Lepas australis* and compared it with the similar larva of the male of *Scalpellum regium*. In addition to excellent descriptions he also published drawings of the two organisms and traced the evolution of the male from the cyprid

Aurivillius (2) refers to the post-larval development of *Scalpellum crosum*, Aur., *S. obesum*, Aur., and some others, but confines himself to the external characters. He figures the cyprid larva of *S. obesum* and that of the male of *S. scorpio*, Aur. (*Vet. Akad. Handl.*, vol. 26).

My work, although it dealt with species different from those investigated by Darwin and Hoek, has given results which in general do not differ from the conclusions of these two distinguished observers. Only a brief summary of the general outlines of the development is therefore given. Indeed, my chief excuse for publishing any note on this subject lies in the fact that I have been able to obtain some

excellent drawings of the different stages owing to the abundance and excellent state of preservation of the material at my disposal. These drawings will supply that which is chiefly lacking in previous accounts, since the illustrations of the metamorphosis in Darwin's work do not exhibit more than the external outlines of the larvae, and in Hoek's report in the "Challenger" series the only larvae figured are those of *Lepas australis*, Darwin, *Scalpellum regium* and *triangulare*, Hoek (8, pl. ii, figs. 1—4). This author's report on the "Siboga" expedition contains an illustration of the pupa of *S. stearnsi*, Pilsbry (9, pl. vi, fig. 10).

On the other hand, the development of the different organs—cement glands, ovaries and testes—from the cyprid to the adult has not been thoroughly traced as yet, and although Hoek (8) describes correctly the cement glands and the ovaries in both the cyprid and the adult, he does so with some doubt as to the correctness of his identification. I have been able to obtain a complete series of examples from the cyprid to the fully grown adult.

2. The anatomy of the parasitic males has also been somewhat fully dealt with. Darwin (5) described *Scalpellum vulgare, ornatum, rostratum, peronii, villosum,* and *Ibla cumingii* and *quadrivalvis*, with plates of *Ibla cumingii*, of *Scalpellum vulgare, peronii, villosum* and *rostratum*. Hoek (8) classifies the males in three groups according to their condition of degeneracy and refers to twenty-four species of *Scalpellum*. He describes minutely the male of *Scalpellum regium* (Wy. Th.), which in many respects is identical with that of *S. gruvelii*. The males of the three species described in the present paper would be referred, in the case of *S. squamuliferum*, to Hoek's class I, as showing a distinct capitulum and peduncle; in the case of *S. gruvelii*, to class III, without division to capitulum and peduncle and without rudimentary valves; *S. bengalense* should be placed in class II.

In the report on the "Siboga" expedition (9) Hoek describes the external characters of the males of *Ibla sibogae*, H., with figures, of *Scalpellum pollicipedoides*, H., *acutum*, H., *rostratum*, D., *uncus*, H., *stearnsi*, Pilsbry, *chilinosum*, H., *inflatum*, H., *javanicum*, H., *polymorphum*, H., *distinctum*, H., *pellicatum*, H., *crinitum*, H., *gracile*, H., *hexagonum*, H., *fissum*, H.

Gruvel in the *Arch. de Biol.* (6) gives a full account of both the external and internal anatomy of the male of *Scalpellum vulgare*, and in the reports on the "Travailleur" and "Talisman" collections (7) he deals with those of *Scalpellum peronii*, Gray, *villosum*, Leach, *longirostrum*, Gruvel, *gigas*, H., *hoeki*, Gru., *striatum*, Gru., *lutium*, Gru., and *velutinum*, H.

3. The cirripedia have a special interest for students of biological theory, in that they offer examples of the evolution of dioecism from hermaphroditism. The facts of the case, as is well known, were first brought to light by Darwin (5), who showed that within the group there occurred (1) true hermaphrodites—*e.g.*, *Lepas*; (2) andro-dioecious forms—such as *Scalpellum peronii*; and (3) dioecious forms—*Scalpellum ornatum* and *Ibla cumingii*.

Hoek (8, p. 18) elaborated this idea. By cutting serial sections of *Scalpellum regium* he confirmed Darwin's view as to the purely female nature of the large form

of certain barnacles, while, on the other hand, he established the fact that the large form of the apparently andro-dioecious species was truly and functionally hermaphrodite (*S. vulgare*).

In regard to the sexual purity of the apparently male dwarf forms, Darwin (5, p. 289) wrote: "I was not able to discover a vestige of ova or ovaria in the two male Iblas (*quadrivalvis* and *cumingii*); and I can venture to affirm positively that the parasites of *Scalpellum peronii* and *villosum* are not female." Hoek also appears to have no doubt as to the purely male characters of these little forms. Gruvel, on the other hand, claims to have found rudimentary female organs in the male of *Scalpellum peronii* (7, p. 121). "Or j'ai rencontré, dans des coupes transversales du pédoncule, quelques cellules arrondies, à noyau assez gros et nucléole très brillant, ne ressemblent nullement à des cellules cémentaires et que je crois être quelques cellules ovariennes non développées, reste, évidemment, de la forme hermaphrodite ancestrale." This is the only species in which he has found cells of this nature.

Such a discovery would be of very great theoretical importance, since it would suggest that the evolution of the unisexual from the hermaphrodite [illegible] occurred gradually by the slow progressive diminution of one set of sexual organs. Such a change would in all probability be due to either (1) a disuse atrophy, the progressive diminution of activity being primary and the diminution in structural development secondary; or (2) in the present case the semiparasitic habit of the incipient male might have caused it to diminish in size with a consequent diminution in the structural development of the ovaries. (See also G. Smith, 11, p. 35.)

It therefore appeared desirable that the matter should be further investigated, and, in order to arrive at a conclusion as to the nature of the various cells found, it was necessary (1) to trace the development of the ovary in a hermaphrodite and female and thus to become acquainted with the various appearances of the ova in their successive stages from the earliest point at which they can be recognized; having done this, to examine the different cells to be found in the male and its larval stages, and to compare them with the developing ova: (2) to trace the development of the testis in a hermaphrodite and to ascertain if anything similar could be found in a "female."

To obtain the best results, it was also clearly desirable to examine males and females, which differed in the least degree possible from the hermaphrodite type.

For this purpose the male of *Scalpellum squamuliferum*, Welt., and the female of *Ibla cumingii*, Darwin, were chosen. The former differs from its hermaphrodite chiefly in size and in the absence of peduncular plates and latera. The separation of the capitulum from the peduncle is quite as marked as in *Scalpellum peronii*, and the six chief capitular valves are well developed. The latter, *Ibla cumingii*, has a close ally in *I. quadrivalvis*. Darwin (5), in defining the latter species, wrote: "All the external parts (of the hermaphrodite) so closely resemble those of *S. cumingii* that it would be superfluous to describe more than the few points of difference" (p. 204). Indeed, the chief point of distinction of the two species lies in the fact that the large form of *Scalpellum quadrivalvis* is hermaphrodite and possesses a penis, whereas the

large form of *S. cumingii* has no penis and appears to be devoid of any male organs. We have then in these two forms a male and a female, which have evolved from the hermaphrodite condition only comparatively recently, and in which, if anywhere, we would expect to find some trace of the lost female and male organs.

A large number of excellently preserved specimens of *Scalpellum squamuliferum* bearing numerous males was stored in the "Investigator" collections in the Indian Museum, and I obtained a considerable number of *Ibla cumingii* on the reefs of Diamond Island off the coast of Burma during the winter of 1909. I was also so fortunate as to obtain an excellent specimen of the male of *Scalpellum peronii* for comparison with those of *S. squamuliferum*.

The development of the ovaries and testes of the hermaphrodite was followed out in *S. squamuliferum*.

The determination of the species of the specimens used is in all cases the work of my friend Dr. Annandale, to whom my thanks are due for much assistance in this investigation. For the definition of the species this author's work should be consulted (1).

II.—Post-larval development of *Scalpellum squamuliferum*, Welt., and anatomy of the male.

A.—General outlines of the development.

(i) The hermaphrodite—

(1) The pupa.

(2) The young adult.[1]

(ii) The male—

(1) The pupa.

(2) The young adult.

(3) The adult.

B.—Histology and development of the organs of the peduncle.

(1) The vesicular spaces of the peduncle of the pupa.

(2) Rostral duct and lymph spaces of the adult.

(3) The connective tissue cells and fibres.

(4) The yolk.

(5) The cement cells and ducts.

(6) The ovaries.

(6*a*) Absence of rudimentary ovaries in the male.

(7) The cells of unknown function.

III.—Absence of rudimentary ovaries in the male of *Scalpellum peronii*.

IV.—Anatomy of the male of *Scalpellum bengalense*.

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[1] The term adult is used for all the stages after the casting off of the pupal coverings and the extension of the capitulum on the peduncle. This is, of course, not pedantically correct since in the earlier of these stages the animal is not truly adult, it has, however, assumed the outward form of the adult.

V.—Post-larval development and anatomy of the male of *Scalpellum gruvelii*.

(1) The cyprid larva.

(2) The pupa.

(3) The adult.

VI.—*Ibla cumingii*.

A.—Anatomy of the male.

B.—Absence of rudimentary testes in the female.

VII.—Sensory hairs of *Scalpellum squamuliferum*, *bengalense* and *gruvelii*, and of *Ibla cumingii*.

II.—POST-LARVAL DEVELOPMENT OF *SCALPELLUM SQUAMULIFERUM*, WELT., AND ANATOMY OF THE MALE.

The expression post-larval development is intended to include the various stages from the fixation of the cyprid larva to the attainment of adult form and complete sexual maturity.

A.—GENERAL OUTLINES OF THE DEVELOPMENT.

(i) The Hermaphrodite.

(1) The Pupa.

The general outlines of the development are so well known as to call for little reference.[1] Plate iv, fig. 1, represents the cyprid during the course of the first ecdysis. A younger cuticle bearing the hairs characteristic of the later stage has actually been formed under the bivalve shell of the cyprid, but is only visible in sections. The two larval eyes (*e.*) are being cast off. The antennae are embedded in a mass of cement. The alimentary canal (*oes.* and *st.*) is already patent, the stomach filled with a mass of excretory matter. The rudimentary testes can be distinguished in sections as two minute cell-masses, one on either side of the stomach. The nervous system consists of the cerebral ganglion (*ce.g.*) and the five ganglia of the ventral chain (*vn.c.*). The larval integuments are not furnished with sensory hairs. The outlines of the terga, scuta, carina and rostrum can already be distinguished, but are not represented in the figure.

The pupa measures 1·1 mm. in length.

(2) The young Adult.

Figure 1 should be compared with pl. iv, fig. 2, taken from a young hermaphrodite measuring 2·5 mm. in length: *ant.* are again the embedded antennae. The oesophagus now has a strong coat of circular muscles. The two caeca which arise from the anterior end of the stomach were not visible in the preparation. All the

[1] Compare description of cypris of *Lepas australis*, Hoek (8, p. 6).

V.—Post-larval development and anatomy of the male of *Scalpellum gruvelii*.

(1) The cyprid larva.

(2) The pupa.

(3) The adult.

VI.—*Ibla cumingii*.

A.—Anatomy of the male.

B.—Absence of rudimentary testes in the female.

VII.—Sensory hairs of *Scalpellum squamuliferum*, *bengalense* and *gruvelii*, and of *Ibla cumingii*.

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[1] Compare description of cypris of *Lepas australis*, Hoek (8, p. 6).

capitular valves are represented as well as some of the peduncular plates. The young hermaphrodite can thus be readily distinguished from the male, which only possesses terga, scuta, the carina and rostrum. Figure 3 is from a section through a similar specimen, showing the stomach (*al.c.*), testes (*t.*), ventral nerve cord and the sensory hairs on the outer surface of the capitulum (*h.*). The letters *r.d.* indicate the rostral duct—the main blood or lymph channel from the prosoma to the peduncle, which is again shown in pl. v, fig. 5, from a transverse section through the peduncle of a specimen of similar size.

Development of the testes in the hermaphrodite.—The testes can be clearly distinguished in sections of the pupa as two small syncytial bodies lying at the sides of the stomach. Plate iv, fig. 3, represents a transverse section through the prosoma of an adult measuring 2·5 mm., in which *t.* indicates the testes. It will be seen that they lie somewhat on the ventral side of the stomach. Each testis is clothed by a fine membrane. There are no cell outlines in their protoplasm. The nuclei contain either one or two nucleoli and numerous minute chromatin granules.

(ii) The Male.

(1) The Pupa.

I was sufficiently fortunate to obtain a specimen of a male pupa in the same stage as the hermaphrodite figured in pl. iv, fig. 1; that is, in the course of the first ecdysis after fixation. Plate iv, fig. 4, is taken from this specimen. On comparing it with the hermaphrodite it will be observed to be much shorter in comparison to its height, and the peduncular region is proportionately greater in comparison with the capitular region.[1] It measures ·75 mm. in length.

The stomach is not clearly visible, as it is overlaid by the left testis (*t.*). The testis is, even in this early stage, much larger than in the hermaphrodite. The mouth is open, but there is as yet no anus, the intestine being closed posteriorly. The stomach contains matter which is apparently excretory. The condition of the valves in this stage is shown in pl. iv, fig. 5.

(2) The young Adult.

Plate iv, fig. 6, represents a later stage, after the completion of the ecdysis. The only remaining portion of the larval integument is to be seen at the base of the antennae. The capitulum has become extended on the peduncle into the adult attitude.

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[1] In connection with the views of Geoffrey Smith (11, p. 37) as to the nature of the parasitic males, it is important to note that the male differs from the hermaphrodite before fixation (compare the proportional measurements of the cyprid shell in the male with those of the hermaphrodite). Maleness is therefore not the result of the position of attachment.

It is hardly necessary to bring forward this proof, since in *S. squamuliferum* hermaphrodites occur attached to all parts of other hermaphrodites, including the margin of the pallial aperture. That is to say, they occur in that position which Smith considers to be the cause of the non-development of the hermaphrodite character in the "males."

(3) THE ADULT.

The anatomy of the male of Scalpellum squamuliferum.

The shape of these animals is sufficiently indicated by pl. v, fig. 1. Mounted specimens measure from 1 mm. to 1·4 mm. in length, with a maximum horizontal measurement of ·7 mm.

The outer surface is covered with hairs, which will be fully described later, together with those of the hermaphrodite.

The alimentary canal is a tube of uniformly narrow calibre. The oesophagus is endowed with a sheath of circular muscular fibres. The stomach is narrow, not dilated, as in the pupa. Throughout its course the canal lies dorsal to and between the testes, seminal vesicles and ducti. It opens at the end of the body immediately dorsal to the base of the penis.

Nothing in the nature of food, faecal or excretory matter, was to be found in any part of the intestine. The caeca, two simple epithelial tubes, arise from the anterior end of the stomach and run for a short distance forward along the oesophagus.

The reproductive system consists of two simple tubular organs, uniting close to their external aperture at the tip of the penis. The different regions—testes, seminal vesicles and ducti—are distinguished only by the nature of their contents, the wall consisting of a fine layer of endothelium throughout, except close to the external aperture, where there is a sphincter.

B.—HISTOLOGY AND DEVELOPMENT OF THE ORGANS OF THE PEDUNCLE IN THE HERMAPHRODITE AND MALE.

It will be necessary to discuss this matter in some detail since the constitution of the tissues, especially in the pupa, is somewhat complex, and since it is not easy to follow out the development of the separate elements owing to the fact that they change their appearance considerably in the successive stages.

Darwin (5, p. 20) was the first to give an account of the development of these organs, taking *Lepas australis* as the chief object of his study. He, however, regarded the cement glands as the incipient ovaria. The true relations of the cement glands and the ovaries were first defined by Krohn and Claus.

Hoek (8) gives an excellent account of the condition of these organs in the cypris of *Lepas australis*, with a figure which clearly distinguishes the cement apparatus, the young ovaries, the yolk masses, and the vesicular spaces of the peduncle. He also describes the cyprid larva of the male of *Scalpellum regium*, but confounds the testis with a yolk mass.

He describes the cement glands and ovaries of the adult from the study of a *Lepas*, of *Scalpellum vulgare* and *regium*, of *Conchoderma virgatum* and of a *Balanus*. Gruvel (7a, p. 448) also gives a short account of the cement glands and ovary of the cyprid of *Lepas australis*; he appears, however, to regard the vesicular spaces of the

peduncle as giant cells—"cellules jaunes de la pedoncule." The claim of this investigator to have found ovarian cells in the "male" of *Scalpellum peronii* (7, p. 121) has been referred to above and will be considered again later.

Surveying all the stages of development in both the male and the hermaphrodite, the various elements which are found in the peduncle are as follows :—

(1) The vesicular spaces of the pupa.
(2) The rostral duct and the lymph-spaces of the adult.
(3) The connective tissue cells and fibres.
(4) The yolk.
(5) The cement cells and ducts.
(6) The ovaries.
(7) The coarsely granular cells of unknown function.

Before proceeding to consider these elements separately, it would be well to glance at pl. v, fig. 4, which gives a general view of the peduncular region of the [illegible] male. The vesicular spaces (*sp.*) occur throughout the region. The connective tissue cells are marked *f.g.* Yolk is marked *y.* and *f.g.* The cement cells (*c.*) are chiefly aggregated just above the larval eyes, and the coarsely granular cells (*x*) occur in the dorsal midline.

(1) *The vesicular spaces of the pupa* are always spherical, and it is hardly possible to doubt that they have been distended by some fluid. Their walls are formed by fine membrane or by any of the cellular elements. It is not clear whether they develop into the lymph-spaces of the adolescent and adult or not.

(2) *The rostral duct and the lymph-spaces of the post-pupal stages.*—The rostral duct is found in the hermaphrodite from the pupa onward (pl. vi, figs. 1, 2, 3) and in a developed condition in the adult male. In the adult hermaphrodite it extends from the root of the prosoma to the base of the peduncle in the rostral midline and lies immediately internal to the muscular wall. At the base of the peduncle it curves inward to the centre of the peduncle and opens out into the network of the lymph-spaces. Small branches also pass off from it throughout the whole of its course. In the young 2·5 mm. adult its wall is identical in character with that of the lymph-spaces, being formed of delicate membrane with fine connective tissue nuclei. In the adult it acquires a thickened sheath of connective tissue.

In the male the rostral duct is shorter, reaching only from the root of the prosoma to the upper quarter of the peduncle.

This system of spaces forms an erectile tissue, by means of which the animal sways to and fro and elongates or shortens its peduncle.

(3) *The connective tissue cells and fibres.*—In the pupa, especially in the pupa of the male, the connective tissue cells are often of large size with a considerable mass of protoplasm and a rounded nucleus. In this condition they may also be loaded with yolk-granules, and it is not easy to distinguish them from the cement cells. Their protoplasm, however, does not stain at all with carmine, while that of the cement cells does take up this stain faintly. The more common form of connective tissue cell and

the only form in the later stages is the usual connective tissue nucleus with scanty protoplasm, occurring among the fibres and membranes.

(4) *The yolk* is the chief cause of confusion in separating the cellular elements from one another. It is most abundant in the pupa of the male; somewhat less abundant in that of the hermaphrodite. Some yolk masses are still to be found in the adult male. It is not entirely confined to the peduncle, as it occurs around the stomach and ventral nerve cord in the prosoma. It is of a pale yellow colour and stains intensely with iron haematoxylin or eosin—not at all with basophil colours or carmine. It occurs chiefly in the connective tissue, which surrounds the vesicular spaces in the peduncle of the pupa. In its most dense form it stains intensely and uniformly with iron haematoxylin (*y.*, pl. v, fig. 4): after it has been partly absorbed, it has a finely granular appearance (*f.g.*, pl. v, fig. 4). When it completely surrounds a vesicular [illegible] the latter has somewhat the appearance of a yellow cell—hence the "cellules [illegible] la pedoncule" of Gruvel (7a, p. 448).

[illegible] eosinophil granules which occur in the cement cells [illegible] both the male and [illegible] pupa and in all but the most completely ripe [illegible]es are also probab[illegible]ules.

(5) *The ce[illegible] glands and ducts.*—The glands are two groups of cells [illegible]ced one on either side [illegible] midline in the posterior (in the adult—upper) part of the [illegible]eduncle. In the pupa of [illegible]ermaphrodite and male (pl. iv, figs. 4[1] and 6) and in [illegible]he adult male (pl. v, fig. [illegible] are more or less spherical cells with abundant protoplasm and a spherical nucle[illegible] A certain number contain in their protoplasm large granules of irregular shape, wh[illegible] staining reaction is identical with that of the yolk (pl. v, figs. 3, 4). (See Hoek, 8, p[illegible] fig. 5, and p. 28.) The abundance of the granules varies in a manner parallel to the abundance of the yolk (compare Hoek, 8, p. 7); th[illegible]e most numerous in the pupa of the male (pl. v, fig. 4), less in the pupa of the herm[illegible]e, only disappearing in the male when it has reached complete maturity (pl. v, fig. 3), but not found in the adult of the hermaphrodite even at an early stage (pl. v, fig. 5). That is to say, they are gradually absorbed or extruded with increasing age. They are probably yolk-granules which may or may not be in process of conversion to form cement. In unstained preparations or in preparations stained with carmine the cells containing these granules have a yellow colour (pl. iv, figs. 5 and 6, *c.g.*) and may be mistaken for the "cellules jaunes de la pedoncule" referred to above.

In the young adult of the hermaphrodite (specimens measuring about 2·5 mm. in length, pl. v, fig. 5) the cement cells resemble the non-granular cement cells of the pupa and of the male, but on account of their size it can now be seen that there are certain large granules in the centre of the nucleus which stain more intensely and rapidly with iron haematoxylin than do the ordinary chromatin bodies. In the larger hermaphrodites (16 mm. and upward) the cells (pl. v, fig. 6) are very large (·3 mm.), the protoplasm finely granular. The nucleus (·12 to ·2 mm.) is polymorphic and

[1] In pl. iv, fig. 4, the letters *c.g.* point by mistake to the spaces of the peduncle instead of to the cement glands. The latter structures can be seen as a group of small but sharp nuclei lying above the eye.

contains five or six of the large darkly-staining granules which are almost certainly cement-substance. The protoplasm is finely granular, and contains in many cases small rounded vesicular nuclei, each containing a single chromatin granule. These minute nuclei appear to be identical with the wandering nuclei of the ova, and are doubtless supplying nourishment to the cement cells.

The glands in the fully grown specimens (compare Hoek, 8, p. 30) consist of these large cells scattered separately throughout the upper half of the peduncle, often lying among the ovarian tubes, but never in any way connected with these. Each cell is enclosed in a capsule of fibrous tissue, which is perforated at one point by the ductule (*d.*). This ductule, still retaining its fine nucleated wall, enters the body of the cement cell, approaches the nucleus, and branches freely around this latter structure (*dl.*) After leaving the capsule of the cell, neighbouring ductules unite together, and the ducts so formed enter certain curious little spherical bodies composed of fibrous tissue. Here the ducts are thrown into convolutions, the convolutions being held together by the fibrous tissue of the nodules. On leaving the nodules the ducts have an internal lining of cuticle. They unite with each other until finally only two main ducts are left.

The nodules are the bodies which Darwin regarded as the cement glands.

It appears then that, in the younger stages, many of the cement cells contain a considerable quantity of yolk from which the cement may be manufactured, and that in the older forms the nucleus is the portion of the gland cell which produces this secretion.

(6) *Development of the ovaries.*[1]—The youngest specimens in which it is possible to recognize the ovaries are adults measuring 2·5 mm. in length (pl. vi, fig. 2). In these small aggregations of nuclei can be found embedded one on either side in the wall of the rostral duct in the uppermost portion of the peduncle (*ov.*).

The nuclei, of which not more than three appear in a section, lie in a thin cylindrical protoplasmic mass, measuring approximately ·3 mm. in length. This syncytium is surrounded by a delicate membrane continuous with the connective tissue of the wall of the rostral duct. The nuclei are minute (·005 mm. in diameter), generally oval, with a delicate nuclear membrane, very fine chromatin granules and a minute nucleolus. They cannot be distinguished from the ordinary connective tissue nuclei, except by their position and grouping together. There is no trace of a duct leading to the prosoma, and to attain the adult functional state the glands must grow both upward and downward.

In the pupa (pl. vi, fig. 1) at the corresponding points there are more nuclei than in other portions of the rostral duct. They are not, however, shut off, and, although some of them are doubtless the developing ovarian nuclei, it is not possible to say which are. They are generally about the same size as the ovarian nuclei in 2·5 mm. specimens. There is some likelihood from the appearances found in these sections that the two ovarian cylinders arise from the epithelium lining the rostral duct

[1] Compare Hoek, 8, p. 7, and pl. ii, figs. 1 and 2.

by the formation of two grooves, and their separation from the wall of the duct, in the same way as the notochord is formed from the gut of vertebrate embryos.

In an adult measuring 5 mm. the young ovaries resembled those of the 2·5 mm. specimens, but were larger and more clearly marked off. In specimens measuring 10 mm. they were still longer, but were still fine unbranched solid cylinders.

In a specimen measuring 12 mm. (pl. vi, fig. 3) the tubes are also still single. They run through the upper quarter of the peduncle, and in the lower portion of their course are no longer embedded in the wall of the rostral duct. The distinction between ovary and oviduct has also appeared. In the lower ovarian portion the cylinder is definitely solid, and the nuclei are central: in the upper oviducal portion there is a rudimentary lumen, and the nuclei are peripheral.

The tube measures ·035 mm. in diameter, the nuclei ·005—·01 mm.

In a 16 mm. specimen they have practically reached the adult form, an oviduct ...ng either side of the rostral duct, and ovarian tubes branching through the ...low the cement glands. At the fundus of an ovarian tube (pl. vi, fig. 4) ins... ...ter enveloping membrane (*gc.n.*) there is still the syncytium. The nucl... ... peripherally, almost identical in character with those of the 2·5 mm. ... but with larger nucleoli. Young ova (·04 mm. diam...er) with abundant proto..., large vesicular nuclei (·015 mm.) with a single large spherical chromatin mas... mm.), are found close to the fundi of the tubes (pl. vi, fig. 5).

In the ma... ...rmaphrodite the ova can be classed in two stages: (1) without yolk,—the proto... vacuolated, the nucleus as in the 16 mm. specimens, except that it often con... a second smaller chromatin mass; minute nuclei are found in the protoplasm of t... ll identical with those of the epithelium of the tubes;[1] (2) large ova crowded wit... olk (pl. vi, fig. 6).

It will be noticed that in the course of its development the rudimen... ry grows both upward toward the prosoma to form the oviduct and downw... and inward into the peduncle to form the branching ovarian tubes.

(6*a*) In consequence of Gruvel's statement that he had found a rudimentary ovary in the male of *Scalpellum peronii* I carefully examined several dwarf specimens (males) of *Scalpellum squamuliferum* in various stages of development to ascertain if any trace of a rudimentary ovary could be discovered in this species. The specimens were very well preserved, and the sections were extremely good and complete, but no trace of such an organ could be found. It might be expected that, if such an organ did occur in the male, it would resemble the ovary of the hermaphrodite in one of its earlier stages of development, and would occur in the same situation. For this reason particular attention was given to the walls of the rostral duct, but not even the slight accumulation of nuclei at the two sides of the duct which occurs in the pupa of the hermaphrodite could be found. Nor could I find any cells of the character described by Gruvel (7, p. 121) which did not clearly belong to the cement glands.

[1] Compare Gruvel (7a, p. 439). He regards these nuclei as belonging to unsuccessful ova, which are being consumed by the large successful ones.

(7) *The large coarsely granular cells of unknown function* occur in the peduncle in the young stages of the male. They are spherical, and are filled with large spherical granules or more properly vesicles. I have not been able to distinguish the nucleus. They have a degenerate appearance.

III. ABSENCE OF A RUDIMENTARY OVARY IN THE MALE OF *SCALPELLUM PERONII*, GRAY.

Through the kindness of Dr. Calman and of the authorities of the British Museum I was able to examine a specimen of the male of *S. peronii*. This specimen was most excellently preserved, and after examining it entire in cedar-wood oil I obtained a complete set of sections.

These sections were first of all examined for the cells which Gruvel regards as the rudimentary ovaries, but none were found. The only cells with large nuclei distinct nucleoli were the cells of the cement glands. I could not find differing from them in appearance in the situation defined by Gruvel—above the cement glands.

The rostral duct in *S. peronii* resembles very closely that of the male of *S. squamuliferum*. As in the latter species, the walls of this structure examined in vain for any trace of a rudimentary ovary.

Cement glands of the male of *S. peronii*.—Gruvel (7) states that the cement glands are entirely contained in the peduncle—"acineuses tri[illegible]es." His figure (pl. iii, fig. 4) represents them as occupying the upper half of the peduncle.

In my specimen they did not extend below the upper [illegible]th of the peduncle, but they extended well into the lower portion of the capitulum. In fact they formed a [illegible] hollow of which was the lowest portion of the pallial cavity. They were compact, and not lobate. The cells are entirely uniform, and are identical in appearance with the non-granular cement cells of *S. squamuliferum*. I was able to trace one cement duct into their substance.

IV. THE ANATOMY OF THE MALE OF *SCALPELLUM BENGALENSE*, ANNANDALE.

Plate vi, fig. 7, represents the general outline of the male of *S. bengalense*. There is no marked outward boundary between the peduncle and capitulum. The appendages, etc., have been described by Dr. Annandale (1).

The mouth cavity is small in comparison with the size of the capitulum; since the wall of the capitulum is relatively thick, the true body is also of course small.

The adductor scutorum muscle persists in its usual situation, although in the majority of specimens there are no scuta. It may be able to narrow the opening of the pallial cavity.

Alimentary system.—The alimentary canal has the usual V-shape. Both mouth and anus are open. The stomach is a fairly large sac, but it, as well as the other

portions of the canal, are empty. The two caeca arising from the anterior end of the canal are present.

Nervous system.—There is a pair of large cerebral ganglia and a massive ventral nerve cord. The hairs which cover the outer surface doubtless fulfil the usual sensory function—*vide infra*, p. 16.

Reproductive system.—The testes occupy the same position as in *Scalpellum squamuliferum*, that is, one on either side of the stomach. At the root of the prosoma there is a somewhat indefinite space, which may possibly be the equivalent of the rostral duct. There are no cells which it is possible to recognize as ovarian.

The cement glands are two groups of cells, identical with those of *S. squamuliferum*, which are to be found in the second quarter of the length of the peduncle counting from above. As in *S. squamuliferum* many of them contain the large irregular yolk-like granules which stain intensely with haematoxylin, while a smaller [illegible] are without these. Ducts were not found.

[illegible] also appears in the peduncle just as in *S. squamuliferum*. It, however, ten[illegible] more above than below the cement glands. In some cases the yolk mass[illegible] lying actually within cells,—vesicular cells with flattened nuclei,—the yo[illegible]g up the vesicle.

It is a no[illegible]thy fact that two species in which the hermaphrodite forms resemble each [illegible] closely as *S. squamuliferum* and *bengalense* should possess males which differ to [illegible] degree.

V.—POST-[illegible]RVAL DEVELOPMENT OF THE MALE OF *SCAL[illegible]LLUM GRUVELII*, ANNANDALE.

(1) THE CYPRID LARVA.

It closely resembles in its structure the cyprid of *S. regium* described by [illegible]K.[1]

Plate vi, fig. 8, represents a cyprid after attachment but before the first post-larval ecdysis. It measures 1 mm. in length, ·6 mm. in height. The prosoma bears six pairs of jointed legs. In comparing it with the slightly older stage of *S. squamuliferum* in which the ecdysis is in progress, various differences due to the increased degeneracy and specialisation of the male adult will be noticed. The alimentary canal is reduced to a closed oesophagus (pl. vii, fig. 2, *oes.*) and a small sac-like stomach (pl. vi, fig. 8, *st.*) with two blunt forward prolongations representing the caeca (pl. vii, fig. 2, *st.*). There is no hind gut or anus.

The nervous system is still well developed, but the segmentation of the ventral nerve cord (*v.n.c.*, pl. vi, fig. 8, and pl. vii, fig. 2), if present, is not perceptible. The nerve cord appears twice in the transverse section represented in pl. vii, fig. 2, owing to the curvature of the prosoma. I have not found larval eyes in the cyprid.

The testis (pl. vi, fig. 8, and pl. vii, figs. 1 and 2, *t.*) is relatively much greater. It occupies the space given up to the stomach and intestines in *S. squamuliferum*. It

[1] Compare Hoek, 8, p. 7.

is surrounded by a layer of mesodermal parenchyma cells (*m.p.*) continuous with the parenchyma which forms the mass of the prosoma behind the testis and nerve cord. The gonoduct, at this stage represented by a solid rod of cells passing from the anterior pole of the testis for a short distance upward and backward, can be seen to be developed from the parenchymatous covering, and not from the testis itself.

Hoek (8) does not describe a testis in the cyprid of *S. regium*. He refers, however, to a "dark-coloured mass consisting for the greater part of yolk fragments," which "makes up a great deal of the true body." From his figure it appears probable that this mass is the rudimentary testis.

The cement glands (pl. vi, fig. 8, *c.gl.*) occupy a different position from those of *S. squamuliferum* and *S. regium*, being confined to the capitular instead of the pedunc-ular half of the body. They also occur in this situation in *S. triangulare* among others. They are made up of large cells crowded with spherical granules, whose staining reactions are the same as those of the granules of the cement cells in *muliferum*. They are, however, smaller, and more regularly spherical.

I have not been able to distinguish any definite cement ducts in th

(2) The Pupa.

In the pupa after the first post-larval ecdysis considerable changes have taken place. The testis has greatly enlarged itself, growing forward and occupy the greater part of the peduncular half of the body and carrying the pallial cavity with it. The pallial cavity has become reduced in breadth, and associated with this change is the reduction and degradation of the prosoma.

Hairs have been developed on the surface under the thickened larval integuments.

The alimentary canal has rather advanced than retrograded, since the oesophagus is now open. The stomach is filled with a mass of granules and globules, apparently excretory, and doubtless the opening of the oesophagus is due to the necessity of discharging this mass of excrement.

The position of the cerebral ganglia and ventral nerve cord has been affected by the general torsion consequent on the growth of the testis and the reduction of the prosoma. They both now lie outside the prosoma. They have also undergone considerable reduction in size.

The cement glands are also somewhat reduced, and two cement ducts can be distinguished running from the glands to the antennae.

Plate vii, figs. 3 and 4, represent transverse sections through a pupa, fig. 3 passing through the stomach (*st.*), testis (*t.*), the anterior poles of the cement glands (*c.gl.*) and of the ventral nerve cord (*v.n.c.*), *ps.* indicating the prosoma lying surrounded by the pallial cavity; fig. 4 is somewhat further back, and shows the oesophagus between the cerebral ganglia and the ventral nerve cord. It also gives a good representation of the structure of the cement glands.

This animal in this stage appears to closely resemble in outer form the adult male of *S. velutinum*, Hoek (Gruvel, 7, pl. iv, fig. 11).

(3) THE ADULT MALE.

The adult of the male is a pear-shaped little body, the anterior half being thicker than the posterior. It measures 1 mm. in length, ·5 in maximum breadth.

Plate vii, fig. 5, represents a specimen slightly flattened out by mounting. The antennae are in the position characteristic of the larva, and not of the ordinary adult, since this form does not undergo the unfolding and straightening out which is characteristic of the development of the ordinary adult from the pupa.

The sensory hairs are to be seen in pl. vii, fig. 5. They are supplied with nerves in the same way as the hairs of *S. squamuliferum*. The muscle fibres running principally from the anterior to the posterior pole are clearly indicated.

The pallial cavity and prosoma are much reduced, as in the case of *S. regium*, described by Hoek, but I cannot agree with this author's statement that the pallial [illegible] lined by a layer of condensed connective tissue—this layer is clearly a fine [illegible] Neither the cavity (*p.c.*) nor the prosoma is clearly [illegible] in fig. 5, but the [illegible] through the posterior three-quarters of the body.

[illegible] tract is represented by a small hollow ball of cells (*st.*) containing some cuti[illegible] excretory matter.

The nervous system is also much reduced. The cerebral ganglion (*d.n.g.*) in fig. 5 has been somew[illegible] lifted from its proper place, which is on the opposite side of the stomach from th[illegible] ced ventral nerve cord.

The testis (*t*[illegible] art-shaped; the seminal vesicles being empty were not visible in the incompletely [illegible] ture specimen from which fig. 5 was taken. The ejaculatory mechanism appare[illegible] cts in the following manner. On the receipt of some stimulus —very probably co[illegible] ed by the sensory hairs and passed through the reduced central nervous system [illegible] the longitudinal muscles contract, the prosoma [illegible] e ejaculatory duct is thrust through the opening of the pallial cavity, and at the same time the tension in the little body is so raised that the seminal vesicles evacuate themselves.

The cement glands (*c.gl.*) consist of two or three small spherical masses of cells lying posterior to the testis. Some of the cells contain the same granules as in the cyprid. Two long fine ducts lead to the antennae.

VI.—*IBLA CUMINGII*, DARWIN.

A.—ANATOMY OF THE MALE (pl. iv, fig. 7).[1]

The body is vermiform. The prosoma is only partly marked off from the peduncle. The mantle takes the form of a hollow cup, from the base and dorsal side of which the prosoma arises.

Black pigment is distributed around the mouth and on the legs. It is noteworthy that in the prosoma of the female pigment is also confined to these two regions.

[1] Compare Darwin, 5, p. 189.

The external anatomy will be fully dealt with by Dr. Annandale in a later publication.

The oesophagus is thick and muscular, the stomach rounded and filled with small yellow globules. The anus is open and lies between the last pair of appendages. The alimentary tract has all the appearance of being actively functional.

Nervous system.—The nervous system consists of two closely approximated oval cerebral ganglia, bearing the large eye at their junction, and of a large ventral ganglion representing the ventral nerve cord. These two are connected by the usual commissures.

There is no cerebral ganglion close to the mouth as represented by Gruvel in the case of *Ibla quadrivalvis*. In this place it is true there is a small cellular body which might be mistaken for a ganglion, but it is in reality a small salivary gland and is not connected with the nervous system.

The eye consists of an almost closed retinal vesicle of nerve cells. The [illegible] contains pigment granules arranged in symmetrical masses like the segments of an orange inside the peel. At the pole of the eye nearest to the surface the [illegible] layer is absent and the pigment comes to the surface of the eye.

The reproductive system consists of two many-lobed testicles, muscular vasa, two seminal vesicles and a terminal ductus. There is no penis.

The cement glands are two masses of cells lying below the testicle. They are entirely free from the granules which occur in *Scalpellum squamuliferum*, *bengalense* and *gruvelii*.

There are none of the yolk masses such as occur in *Scalpellum*, but the tissue spaces of the peduncle are filled with minute fine granules, which are doubtless of the same nature.

B.—ABSENCE OF RUDIMENTARY TESTES IN THE FEMALE OF *IBLA CUMINGII*.

The entire prosoma of a specimen was cut into serial sections and carefully examined for the rudiments of a testis, the developing testis of the hermaphrodite of *Scalpellum squamuliferum* (*vide supra*) being examined for comparison. No vestige of such an organ was found.

Hoek (8 p. 19) made the same examination of the large form of *Scalpellum regium*, H., and did not find any trace of a testis.

VII. SENSORY HAIRS IN *SCALPELLUM SQUAMULIFERUM*, *BENGALENSE* AND *GRUVELII*, AND IN *IBLA CUMINGII*.

(Pl. vi, figs. 9 and 10.)

The entire surface of both capitulum and peduncle in the above three species of *Scalpellum* is covered with minute hairs both in the dwarf and large forms. The

peduncle of *Ibla cumingii* is also covered with hairs, but they are of a different nature from those of *Scalpellum*, while the male is bare.

Genus *Scalpellum*.—The distribution of the hairs is bilateral; they are parted in the carinal and rostral midlines, all the hairs of each side being directed towards the rostral line. They are fairly uniformly distributed, but in the male of *S. bengalense* there is a broad band of larger hairs on either side of the carinal midline.

The hairs appear to be specialised outgrowths of the outermost layer of the cuticle. They consist of an outer cortical portion which (in contrast with the cuticle) stains intensely with iron haematoxylin and a core which does not stain.

In the hermaphrodite of *S. squamuliferum* and *bengalense* the hairs are large, spike-like and compound. The main shaft arises from a bell-like base, which rests on a papilla of cuticle. Small simple branches arise from this base from the lower [illegible] of the shaft. The base of the hairs is broader in *S. bengalense* than in *S.* [illegible]*rum*, and the branches approximate more nearly in size to the main shaft. [illegible] male of *S. squamuliferum* the hairs are perfectly simple, but in that of *S.* [illegible] larger hairs have a bifid tip. In both forms of *S. grui[illegible]i* the hairs are simple [illegible] so rigid as in the other two species.

The hairs [illegible] three species are supplied with nerves (fig. 9). Fine tortuous fibrils can be seen traversing the cuticle or the valves from the epiderm to the bases of the hairs. These fibrils consist of a strongly staining cortex and an unstained medulla. Arriving at the base of a hair the cortex becomes somewhat thickened and ceases, while the medulla enters that of the hair.

In the male of *bengalense* I found a small ganglion in the outer wall of the pallial cavity in the carinal midline (fig. 10). It consists of a single row of cells, which are continuous with the epidermis, but rise slightly above the general level. A thin layer of intensely staining nervous matter spreads out from the nuclei on either side under the bands of larger hairs, to which I referred above. On entering the bases of the ganglion cells this nervous matter forms a series of thickened rings around the nuclei. It is not clear whether the nervous matter consists of a series of fibrils or of a continuous membrane-like expansion.

The cuticle is either entirely absent or very much thinned over the ganglion.

In the hermaphrodite of *S. squamuliferum* the cuticle is invaginated inward between the contiguous valves at the base of the capitulum, narrow finger-like canals being formed, which are open at their outer and upper ends, and pass downwards and inward through the substance of the cuticle to come in contact with the epiderm. They are thickly lined with hairs and presumably are especially sensitive to vibration of the water.

Genus *Ibla*.—In *Ibla* the hairs are stouter and more hollow. The outer layer of the hair arises from the innermost layer of the cuticle, while the cortex of the hair, although not cellular, is continuous with the epidermis. The entire hair thus passes through the thickness of the cuticle.

As regards the question of theory referred to on p. 34, our results (*vide supra*, pp. 43, 44 and 48) are negative. There are no traces of female organs in the males of

Scalpellum squamuliferum or *peronii* or of male organs in the female of *Ibla cumingii*. There is therefore no proof that, in the change from the hermaphrodite to the unisexual condition, the loss of one set of sexual organs has been a gradual change due either to disuse atrophy, or to the semiparasitic habit of the male (*vide supra*, p. 35).

It appears justifiable to emphasize one point, although it has been known to science since the time of Darwin, namely, that the only distinction between the species *Ibla quadrivalvis* and *cumingii* lies in the fact that the large form is hermaphrodite in the former and female in the latter. Experimental work on Mendelian lines has suggested that the distinction between the two sexes of one species is of the same nature as that between the varieties of one species. The distinction between the two Iblas appears closely to resemble that between a "negative variety" of De Vries and the parent species. The negative variety differs from the parent species in having lost one character, generally that of colour, and in *Ibla cumingii* the large form has lost the single character of possessing male sexual organs.

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1. Annandale, N. "The Indian barnacles of the subgenus *Arcoscalpellum* with remarks on the classification of the genus *Scalpellum*," *Rec. Ind. Mus.*, vol. v, p. 145 (19[illegible]).
2. Aurivillius, C. W. "Studien über Cirripedien," *Kongl. Svenska Vetenkap. Acad. Handl.*, Bd. 26 (1894).
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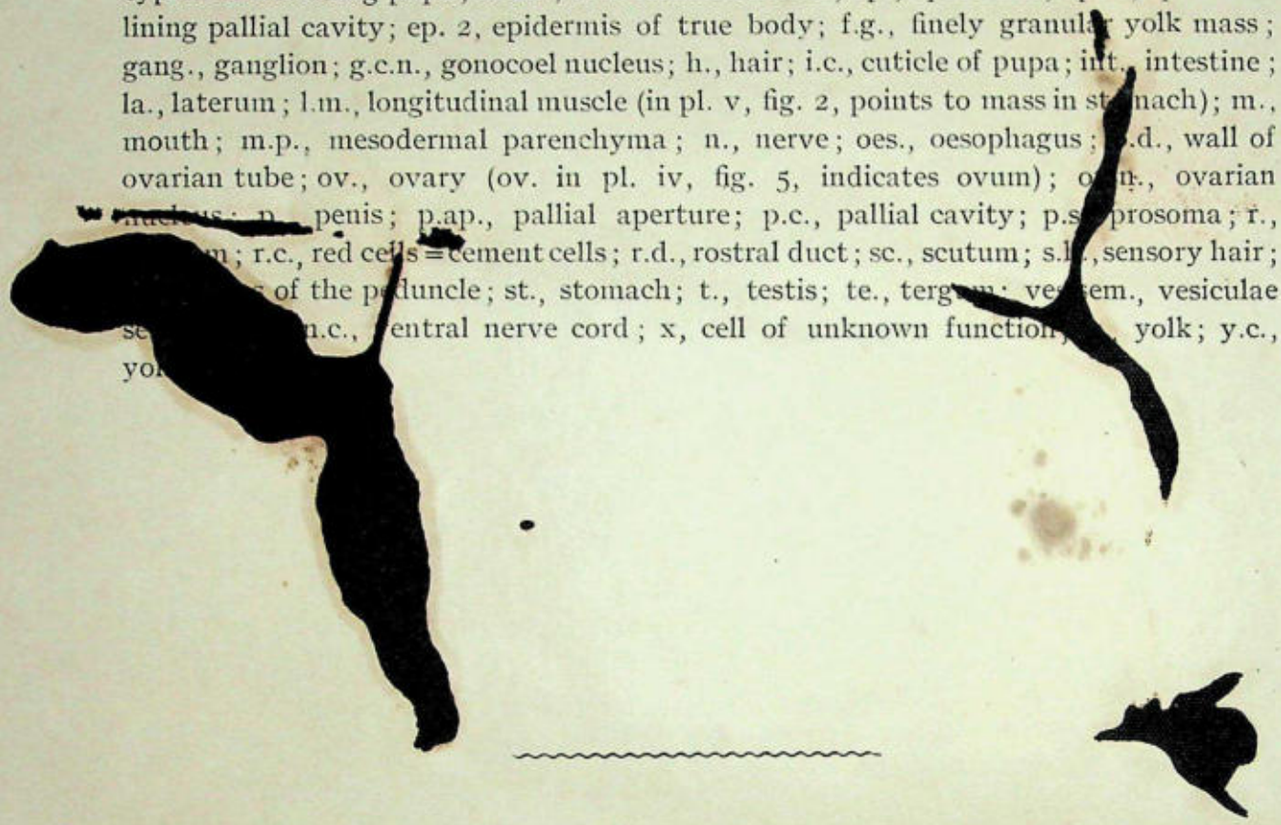
4. Claus. *Untersuch. zur Erforschung der Genealogie Grundlage Crust.-Syst.*, 1876, Vienna. (Quoted by Hoek.)
5. Darwin, C. *A monograph of the Cirripedia*, 1851—1854.
6. Gruvel, A. "Étude du mâle complémentaire du *Scalpellum vulgare*," *Arch. de Biologie Belges*, t. 16 (1899).
7. ,, *Expeditions du "Travailleur" et du "Talisman,"* Cirrhipèdes, 1902, Paris.

7a. ,, *Monographie des Cirrhipèdes*, 1905, Paris.

8. Hoek, P. P. C. Report on the Cirripedes collected by H.M.S. "Challenger," vol. x.
9. ,, "The Cirripedia of the Siboga-Expedition," *Siboga-Expeditie*, Monograph xxxia.
10. Krohn, A. "Beobachtungen über den Cementapparat und die weiblichen Zeugungsorgane der Cirripedien," *Arch. Naturg.*, Jrg. xxv, Bd. i.
11. Smith, Geoffrey. "Rhizocephala," Monograph xxix, *Fauna & Flora des Golfes von Neapel*, 1906, Leipzig.
12. De Vries, H. *Species and varieties, their origin by mutation*, 1905, London.

EXPLANATION OF LETTERS USED IN PLATES.

ad.m., adductor scutorum muscle; al.c., alimentary canal; ant., antennae; a.p.c., aperture of pallial cavity; b.sh., bivalve shell; ca., carina; caec., caecum; ce.g. and cer.g., cerebral ganglion; c.g. and c.gl., cement gland cell; cu. and cut., cuticle; d.c.g., dorsal cerebral ganglion; d.e., ductus ejaculatorius; e., eye; e.c., cuticle of cyprid surrounding pupa; ect.n., ectodermal nucleus; ep., epidermis; ep. 1, epidermis lining pallial cavity; ep. 2, epidermis of true body; f.g., finely granular yolk mass; gang., ganglion; g.c.n., gonocoel nucleus; h., hair; i.c., cuticle of pupa; int., intestine; la., laterum; l.m., longitudinal muscle (in pl. v, fig. 2, points to mass in stomach); m., mouth; m.p., mesodermal parenchyma; n., nerve; oes., oesophagus; o.d., wall of ovarian tube; ov., ovary (ov. in pl. iv, fig. 5, indicates ovum); o.n., ovarian nucleus; p., penis; p.ap., pallial aperture; p.c., pallial cavity; p.s., prosoma; r., rostrum; r.c., red cells = cement cells; r.d., rostral duct; sc., scutum; s.h., sensory hair; st., stalk of the peduncle; st., stomach; t., testis; te., tergum; ves.sem., vesiculae seminales; v.n.c., ventral nerve cord; x, cell of unknown function; y., yolk; y.c., yolk



INDIAN TRYPANEIDS (FRUIT-FLIES) IN THE COLLECTION OF THE INDIAN MUSEUM, CALCUTTA.

By PROF. M. BEZZI, *Turin, Italy.*

(Plates viii–x).

INTRODUCTION.

Through the k[illegible]dness of Dr. Annandale of the Indian Museum, I have received [illegible] of Indian acalyptrate Muscids with variegated wings, [illegible]rypaneids, but a few belong to other families. In the present [illegible]th the Trypaneids, and I will reserve the rest [illegible]nother paper, wh[illegible] the Heleomyzids, Lauxaniids, Ortalids, Ephydrids and Drosophilids.

I wi[illegible] present paper the more extensive inasmuch as the Oriental and Australian Try[illegible]s are little known and in most cases are as yet in great confusion. This is [illegible] due to the fact that the great monographer of the Trypaneids, Prof. Loew, wa[illegible]little acquainted with Oriental forms; though a great portion of Palaearctic, N[illegible], Neotropical and even Ethiopian species were named and described by him[1], [illegible]e Oriental or Australian fauna he has not described even a single species! Mo[illegible] the species are due to Mr. Walker, who, with his well-known inaccuracy, has mixe[illegible] the matter in a very disagreeable manner.

The family of th[illegible] Trypaneids, however, is of very great economic imp[illegible]e, because it contains a great many harmful insects which are generally kn[illegible]n as "Fruit-flies."

2. DISTINCTIONS OF THE FAMILY AND GENERAL CHARACTERS.

Among the so-called acalyptrate Muscids, the family of the Trypaneids is a natural one and not difficult to recognize; as however in the Oriental fauna there are many related forms with a very similar wing-pattern, which may easily be confounded with them, I think it better to give here the essential characters of the family. These are:—

1. The frons bears a row of bristles in the anterior part of its lateral borders, the so-called lower fronto-orbital bristles. Post-vertical bristles parallel or divergent, never crossed. There are no distinct vibrissae.
2. The thorax with a characteristic chaetotaxy on both dorsal and lateral surfaces, consisting of strong bristles which only in a few cases are

[1] Prof. Loew has named 32% of the Palaearctic, 28% of the Ethiopian, and 21% of the Nearctic species.

reduced. This is called "complete chaetotaxy" and consists of two pairs of scapular, a pair of dorso-central, a pair of prae-scutellar, one humeral, two noto-pleural, one prae-sutural, three supra-alar, one or two mesopleural, one pteropleural and one sternopleural. Very characteristic are the four bristles (scapular) in front of the thorax.

3. The legs without praeapical bristle on the tibiae and with spurs only at the end of middle tibiae.

4. The abdomen with four segments in the male and with five in the female, the first segment being very long and composed of two segments soldered together. Abdomen of the female terminating in a corneous, three-jointed and pointed ovipositor, often very long and usually flattened.

5. The wings have a characteristic neuration and are usually marked with a distinct pattern, consisting chiefly of bands [illegible] auxiliary vein becomes indistinct towards the end, [illegible] the [illegible] callosity; the first longitudinal vein is [illegible] setules, the third also in many cases; the basal cells [illegible] anal cell likewise large, with its lower angle mostly [illegible] to a point which in some cases is very long.

If attention is given to the assemblage of these characters it is impossible to confound a Trypaneid with another acalyptrate Muscid with similarly patterned wings.

There are two closely related families[1], in both of which the females possess a similar corneous ovipositor, the Ortalidae and the Lonchaeidae; the first have also, as a rule, variegated wings and are therefore very often mistaken for Trypaneids. But the Ortalids have no lower fronto-orbital bristles, and the auxiliary vein is distinct as far as its end in the costal vein. Both these characters are also to be found in the Lonchaeids, which have also the basal cells of much smaller size. There are in addition some Agromyzids with a corneous ovipositor (*Liriomyza*), but these flies are sharply distinguished by the simple first vein, by the presence of vibrissae, and by the wings not being blunt.

The Oriental fauna is rich in Lauxaniids which show a wing-pattern very like that of *Tephritis* (*Sapromyza trypetoptera*, *pulchripennis*, etc., *Amphicyphus reticulatus*); but these forms are easily distinguished by the crossed post-vertical bristles, the very small basal cells and the want of the corneous ovipositor.

The Heleomyzidae, some of which have been mixed up by Walker, are readily distinguished by the spinose costa and by the strong bristles (*vibrissae*) at the edges of the mouth; the Heteroneuridae are distinguished in the same way and also, moreover, by the very approximate cross veins. The Sciomyzidae and Dryomyzidae are distinguished by the presence of a praeapical bristle on the tibiae. Finally the Ephydridae and Drosophilidae have no distinct auxiliary vein, and the second basal cell is usually fused with the discoidal.

[1] Not speaking of the *Tachiniscidae*, which so far as is known are exclusively Neotropical.

For the distinction of the numerous genera and species of the Trypaneids, the following are the principal characters employed :—

Head.—The general form is important, as the head can be broad or narrow, widened below or not, with the face retreating inferiorly or not. The eyes can be rounded or narrowed; the epistome prominent or not; the cheeks broad or narrow; the occiput swollen inferiorly or not. The antennae are important chiefly on account of their form and of the length of the third joint; the arista can be bare, pubescent, pilose or plumose on both sides or only on the upper side.

The proboscis is short, but in some forms is elongated, with the flaps very much prolonged and directed hindwards, and therefore the proboscis appears to be geniculate.

Very important are the bristles, on account of their position, number and

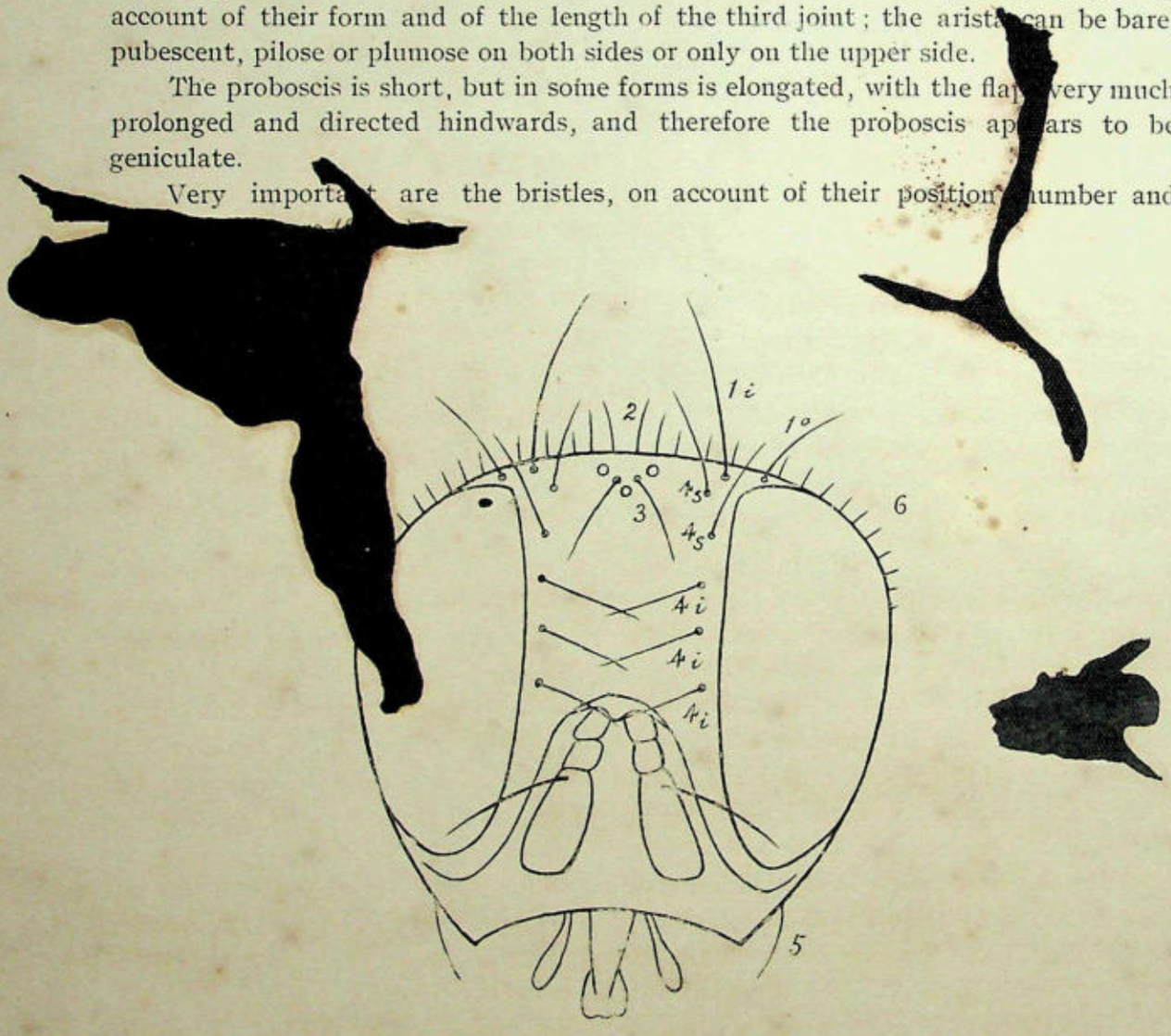


Fig. 1.—Front view of the head of a Trypaneid, showing typical chaetotaxy. For explanation of the numbers see text.

1. *Vertical bristles* (vt.): on the vertex, two pairs, the inner very long, the outer shorter.

2. *Postvertical bristles* (pvt.): on the vertex behind the ocellar spot, only a pair, short and weak, parallel or diverging, rarely wanting.

3. *Ocellar bristles* (oc.): a pair on the ocellar dot, strong, weak or absent.

4. *Fronto-orbital bristles* (or.): a row on each side of the front, variable in number and form. They are divided into superior (1 or 2 pairs bent backwards) and inferior or lower (1 to 4 pairs bent forwards or outwards).

5. *Genal bristle*: on the cheeks, more or less developed.

6. *Occipital row*: along the posterior orbits from vertex to chin, rarely wanting. It is formed either by black, thin, pointed bristles, or by whitish, thick, truncated bristles, and has great systematic value.

Thorax.—Very important is the number and position of the thoracic dorsal and pleural bristles. These are (fig. 2) :—

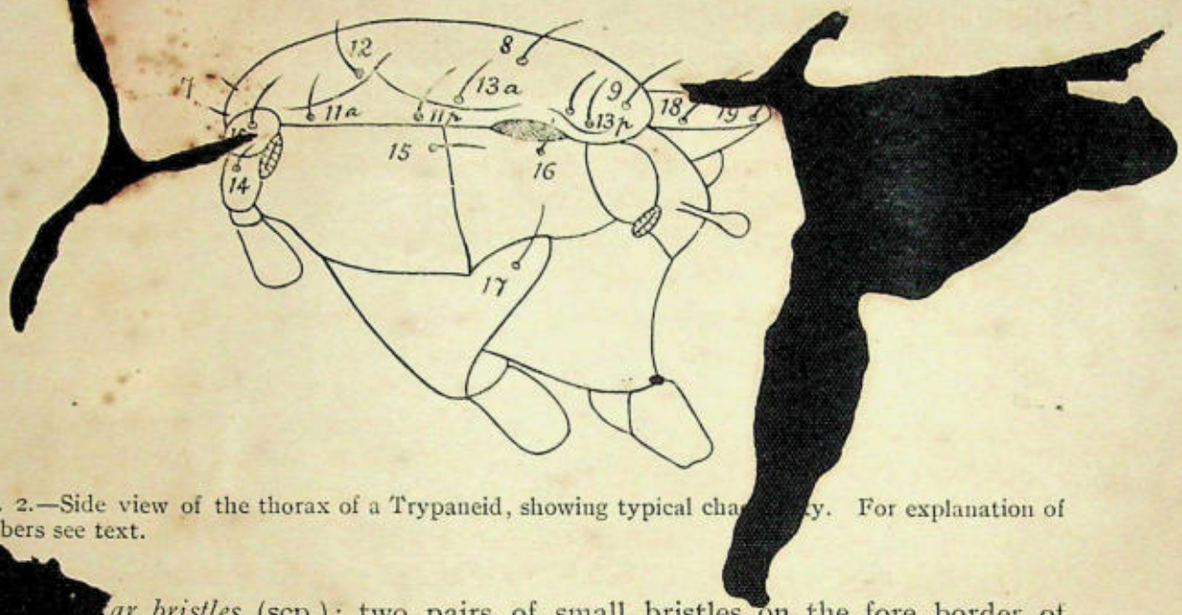


FIG. 2.—Side view of the thorax of a Trypaneid, showing typical cha[illegible]y. For explanation of the numbers see text.

...ar bristles (scp.): two pairs of small bristles on the fore border of tho[illegible], sometimes less distinct but never wanting; a pair is median or acrostichal, and the other lateral or dorso-central.

8. *Dorso-central bristles* (dc.): a pair, or very rarely two pairs, in the dorso-central region between the transverse suture and the scutellum, sometimes wanting.

9. *Praescutellar bristles* (prsc.): a pair on the hind border in front of the scutellum, more or less approximate, very rarely wanting.

10. *Humeral bristle* (hm.): on the humeral callus, very rarely wanting.

11. *Notopleural bristles* (npl.) or *post-humeral* of Osten Sacken: two bristles inserted above the dorso-pleural suture in the notopleural depression; that behind the humeral callus is called anterior and that before the suture[1] is called posterior; they are always present.

12. *Praesutural bristle* (prst.): before the suture and above the praesutural depression, sometimes wanting.

[1] In my paper of 1909 (*Boll. d. Labor. d. Zool. gen. e agaria d. Portici*, III, p. 275, fig. 1) I have called this bristle *praesutural* (calling *posthumeral* the *praesutural*); but at present I think it better to follow the usual nomenclature.

4. *Fronto-orbital bristles* (or.): a row on each side of the front, variable in number and form. They are divided into superior (1 or 2 pairs bent backwards) and inferior or lower (1 to 4 pairs bent forwards or outwards).

5. *Genal bristle*: on the cheeks, more or less developed.

6. *Occipital row*: along the posterior orbits from vertex to chin, rarely wanting. It is formed either by black, thin, pointed bristles, or by whitish, thick, truncated bristles, and has great systematic value.

Thorax.—Very important is the number and position of the thoracic dorsal and pleural bristles. These are (fig. 2) :—

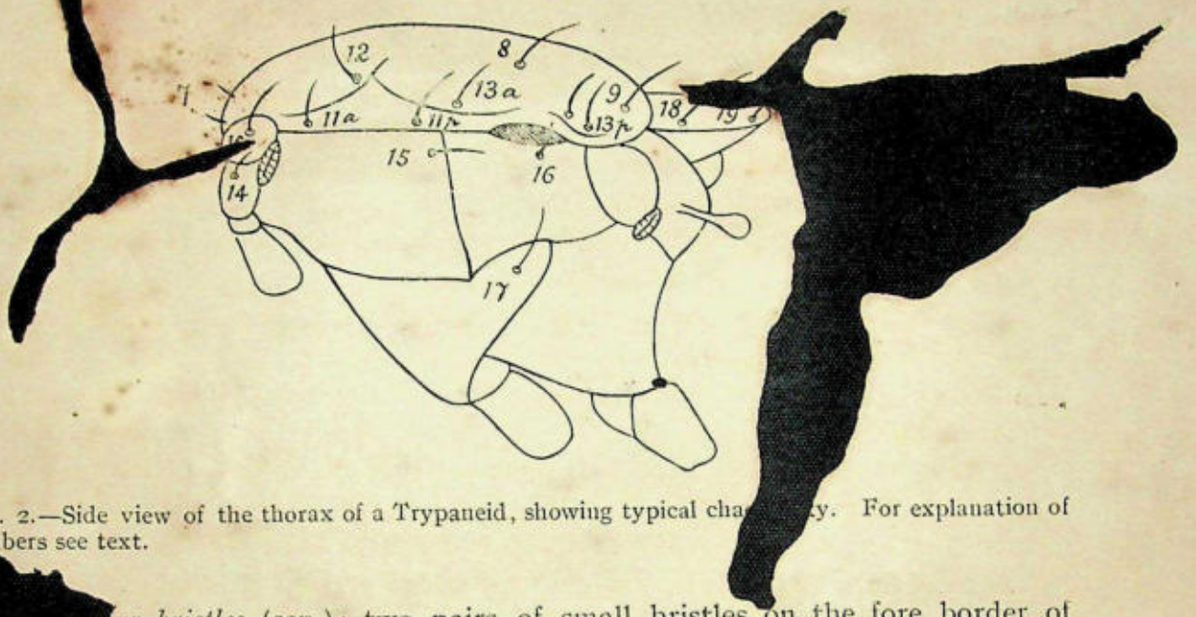


Fig. 2.—Side view of the thorax of a Trypaneid, showing typical cha[illegible]y. For explanation of the numbers see text.

7. *Scapular bristles* (scp.): two pairs of small bristles on the fore border of thorax, sometimes less distinct but never wanting; a pair is median or acrostichal, and the other lateral or dorso-central.

8. *Dorso-central bristles* (dc.): a pair, or very rarely two pairs, in the dorso-central region between the transverse suture and the scutellum, sometimes wanting.

9. *Praescutellar bristles* (prsc.): a pair on the hind border in front of the scutellum, more or less approximate, very rarely wanting.

10. *Humeral bristle* (hm.): on the humeral callus, very rarely wanting.

11. *Notopleural bristles* (npl.) or *post-humeral* of Osten Sacken: two bristles inserted above the dorso-pleural suture in the notopleural depression; that behind the humeral callus is called anterior and that before the suture[1] is called posterior; they are always present.

12. *Praesutural bristle* (prst.): before the suture and above the praesutural depression, sometimes wanting.

[1] In my paper of 1909 (*Boll. d. Labor. d. Zool. gen. e agaria d. Portici*, III, p. 275, fig. 1) I have called this bristle *praesutural* (calling *posthumeral* the *praesutural*); but at present I think it better to follow the usual nomenclature.

13. *Supra-alar bristles* (sa.): three; the anterior, just behind the suture, is very rarely wanting, the posteriors, one above the root of the wing and one on the postalar callus are always present; these last are also called postalar bristles.

14. *Propleural bristle* (pp.) or prothoracic: near the prothoracic stigma, usually wanting.

15. *Mesopleural bristles* (mpl.): one or two on the posterior border of the mesopleura, sometimes accompanied with some bristly hairs.

16. *Pteropleural bristle* (pt.): one on the pteropleura, under the root of the wing, usually strong, but sometimes weak.

17. *Sternopleural bristle* (st.): on the sternopleura, below the sternopleural suture, very rarely wanting.

The pubescence of the thorax is moreover of some importance, being more or less [illegible] and sometimes very strongly developed.

[illegible] form is important, its surface being [illegible] of convex, in general shape it is triangular, semicircular or trilobate. It usually [illegible] hairs of bristles.

[illegible]*les*: a pair, usually stronger than the apical pair, divergent, very rarely wanting.

19. *Apical bristles*: a pair, usually weaker than the basal, parallel, converging or even crossed, rarely wanting.

There is also rarely, an intermediate pair of bristles, between basal and apical.

Abdomen.—[illegible] and elongate, or broad and short; narrowed at the base or even pedunculate; the first two segments fused together or distinct; with or without lateral and [illegible]al bristles. Male genitalia usually not prominent. Ovipositor with the basal joint flattened or tubular; short, long or very long.

Legs.—Short and robust, or long and slender; fore femora rarely [illegible]d, with a row of bristles below, which is very rarely wanting; middle tibiae with one or two spurs; hind tibiae with or without a row of bristly hairs or even pectinate; some African species have pinnate legs.

Wings.—Narrow, broad or very dilated. Costal bristle wanting, more or less developed or even double. Stigma short, long or very long.

Very important characters are taken from the length, direction, form and position of the longitudinal and cross-veins, and from the form and length of the cells.

The longitudinal veins are distinguished as follows (fig. 3):—

1. *Costal vein* (Costa, C.): ending at the fourth vein, more or less thickened, ciliated over its whole length.

2. *Auxiliary vein* (Subcosta, Sc.) or mediastinal vein of Schiner: thin and more or less short, quite distinct, or very near the front vein and indistinct.

3. *First longitudinal vein* (Radius 1, R_1) or subcostal vein: usually bristly over its whole length, not reaching the small cross-vein, or reaching it or passing beyond it.

4. *Second longitudinal vein* (Radius 2+3, R_{2+3}) or radial vein: straight, bent

in the middle, or wavy, more or less distant from the first, rarely bearing a stump of vein.

5. *Third longitudinal vein* (Radius 4+5, R_{4+5}) or cubital vein: bare or bristly over its whole length, at base alone, or to the small cross-vein; straight or bent; parallel or diverging from the fourth, rarely converging with this; more or less approximate to the second.

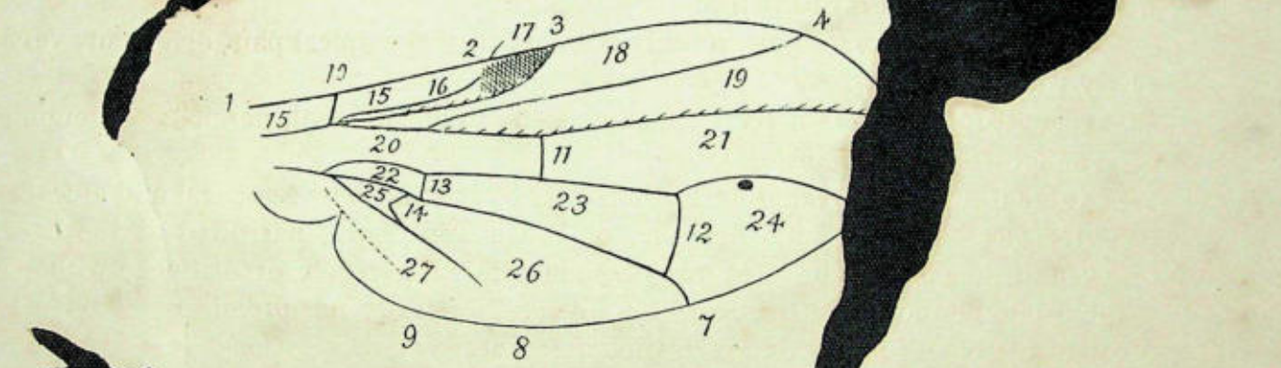
6. *Fourth longitudinal vein* (Media, M.) or discoidal vein: straight or curved after the [illegible] cross-vein or very rarely curved forward at its tip.

7. *[illegible]th longitudinal vein* (Cubitus, Cu.) or postical vein: bare or very rarely bristly ove[illegible]ts whole length, more or less diverging from the fourth.

8. *Sixth longitudinal vein* (Analis, An.) or anal vein: more or less long, reaching or not reaching the hind margin.

9 *Axillary vein* (Axillaris, Ax.): very indistinct.

10. *Humeral cross-vein*, or basal cross-vein: on fore border [illegible] costa and aux[illegible], less important.



[illegible]ing of a Trypaneid, showing typical neuration. For expl[illegible]ion of the numbers see text.

11. *Small cross-vein*, or anterior, or median cross-vein: towards the middle, between third and fourth longitudinal veins, very important; placed before, on, or after the middle of the discal cell; long or short, oblique or perpendicular.

12. *Hind cross-vein*, or posterior cross-vein: on the posterior portion near the hind margin between fourth and fifth veins; long or short, oblique or perpendicular, parallel or not with the small cross-vein. Very important is the distance between the small and the hind cross-vein, in relation to the position of the small cross-vein; this distance can be measured by reference to the length of the hind cross-vein; or, following Rondani, by the relative length of the various portions into which the fourth vein is divided. These portions are: the first or basal, between the basal and the small cross-vein; the second or median, between the small and the hind cross-vein; the third or apical, between the hind cross-vein and the end.

13. *Basal cross-vein*, or anterior basal, or discoidal cross-vein: in the middle of the base, between fourth and fifth veins, less important.

14. *Anal cross-vein*, or posterior basal cross-vein: at the base below the preceding, between fifth and sixth veins, very important; straight, convex or con-

cave, or with a very characteristic deep median bend (*Ceratitis*-like); sometimes with the lower portion very prolonged.

15. *Costal cell*: at the base of fore border between costa and auxiliary vein, broad or narrow, short or long; in reality this cell is divided into two cells by the humeral cross-vein; these cells are called the first and the second costal cell; but is here always considered only the second.

16. *Subcostal cell*, or mediastinal cell: at fore border below the preceding between auxiliary and first longitudinal vein; less important, often very small and sometimes indistinct.

17. *Stigma* or pterostigma: the callosity at the end of the subcostal cell, where it is dilated; important in its form and colouration; short or long, often very much prolonged. At the base, where the auxiliary vein ends, it bears the so-called *costal*

cell, or subcostal cell of Schiner: in the distal portion of the first and second longitudinal veins, narrow or broad, more or less apical portion.

cubital cell, or cubital cell: below the preceding and between the second and gitudinal veins, from the base to the tip of the wing; narrow or broad, more or idened at the end.

20. *First cell*: in the middle, between the third and fourth longitudinal veins, from the the wing to the small cross-vein; more or less long; widened or not at the end.

21. *First posterior cell*: in continuation of the preceding, between the same veins, from the small cross-vein to the hind margin of the wing; with parallel sides or widened outwards, very rarely narrowed at the end.

22. *Second basal cell*: below the base of the first basal cell, between the fourth and fifth longitudinal veins from the bifurcation of these veins to the basal cross-vein; more or less broad, more or less widened at end, sometimes very much dilated.

23. *Discoidal cell*, or discal cell: in continuation of the preceding and between the same veins, from the basal to the hind cross-vein; more or less long and more or less widened at the end, very rarely narrowed at the end.

24. *Second posterior cell*: in continuation of the preceding and between the same veins, from the hind cross-vein to the hind margin of the wing; more or less widened.

25. *Anal cell*, or third basal cell: below the second basal cell, between the fifth and sixth longitudinal veins, from their bifurcation to the anal cross-vein; rarely obtuse at the end, usually with the inferior angle drawn out in a point which is narrow or broad. This cell is shorter than the second basal cell, or of equal length, or longer, and is sometimes very elongate, reaching almost to the hind margin of the wing.

26 *Third posterior cell*: in continuation of the preceding and between the same veins, from the anal cross-vein to the hind margin of the wing.

27. *Axillary cell*: at the base of the hind margin, between sixth vein and hind margin of the wing; this cell is partly fused with the preceding and with the axillary lobe.

The pattern of the wings is also important for the distinction of the species and even of the genera; but in this last case some caution is necessary. The colouring is usually due to a diffused tint in the wing-membrane itself, but in some cases, as in the genera *Schistopterum* and *Rhabdochaeta*, it is due to microscopic peculiarly-shaped and coloured hairs of the wing surface. The patterns may be reduced to two principal types, the banded type and the reticulate type; rarely these two types are to be found on the same wing, as in *Acrotaenia*.

The banded type is well-developed in the so-called "rivulets" of many species; an exaggeration of this type is shown by the species which have black wings, with hyaline indentations and spots, or with complete apical [illegible] have entirely black wings, with scattered, rather distant, h[illegible] spots show passage to the following type.

The reticulated type is due to the presence of numerous [illegible]line spots, which break up the black colouring of the wing into a [illegible]; on account of the form and size of these spots the net can be mo[illegible]osed, and sometimes quite broken up into brown isolated streaks. Spe[illegible]ses of this type are the so-called "star-shaped pattern" and the "radiating [illegible]."

The colouring of the pattern varies from yellow or b[illegible] black; in rare instances red spots are to be observed, as in *Schistopterum*.

3. METAMORPHOSIS AND BIONOM[illegible]

Very little is known of the early stages and bionomi[illegible] Indian Trypaneids; b[illegible] it useful to give here a summarized account o[illegible]hose of the family in g[illegible].

The Trypaneids are flies which live only on vegetable substances, the adults running on leaves or feeding on flowers, the larvae living in various parts of vegetables. The metamorphoses of many species are well enough known, chiefly because some species are very serious pests, while some others can be easily obtained by rearing.

The adult flies are to be found on plants, chiefly on those in which they have been living in the first stages; most of the true Trypaneininae are to be seen on plants of the family Compositae. Other species visit flowers; and many of the Dacinae and of the Ceratitinae seek the sweet secretions and exudations of plants or of certain insects such as the Coccidae.

The flies are remarkable for their handsome aspect and specially for the patterned wings, which they hold spread and trembling A great many species prefer shady and cool places, and are to be found on the under surface of broad leaves. Many species, which are easily observed in the larval stages, are extremely rare as adult flies, and these can be obtained only by breeding.

The females, with their corneous ovipositors, place the eggs in suitable parts of the vegetables and the very variable form and length of the ovipositor denotes that

the adaptations in this way are very numerous and different. The eggs are elongate, cylindrical, rounded at the two ends, whitish, and with a smooth and thin shell; in microscopical observation the micropyle at the cephalic end appears as a prominent tubercle.

The larvae in the last stage are whitish maggots, with a round and conical body, pointed in front and abruptly truncated behind. They are divided into a number of segments, which are not always easily distinguished, but are usually [illegible] in number, those of the cephalic end being very small. The body is smooth above, the under surface bears transverse rows of small black spines, directed backwards; the sides are usually adorned with little prominent ring-like keels. The anal end is somewhat impressed, contoured by a variable number of fleshy points or tubercles, some of which bear also chitinous spines.

[illegible] study of Trypaneid maggots, with the object of [illegible] genera and species, has been made, but the larvae offer a [illegible]ral variations, which can be very well employed for this distinction, which will also throw some light on the systematic affinities and classification of the genera of the family.

The most important features of the larvae are to be found in the antennae and palpi, in the mouth parts and in the spiracles.

The antennae are short, two-jointed prominences, usually placed in the middle of the anterior [illegible] of the first segment; the form and length of the two joints are variable in the different species. The palpi are placed just below the antennae and in front of the mouth hooklets and are also variable in shape.

The mouth parts are very important and form the so-called "pharyngeal skeleton," which on account of its black colour and of the transparency of the teguments is easily seen. In the larva of the last stage the pharyngeal [illegible] is formed by the two thick and strong hooks, prominent and retractile, which represent the mandibles; the internal portion is constituted by the two pharyngeal plates, the upper and the lower, on which are inserted the muscles for their movements. The hooks vary in shape and curvature, in length and thickness; and below the pointed end they bear sometimes a projecting tooth-like point (present for example in *Rhagoletis*, wanting in *Zonosema*). The plates are also very variable in form.

The larva in the last stage is amphipneustic, *viz.*, presents only anterior and posterior spiracles. The anterior spiracles are placed on the sides of the third segment; they are of very small size and crown-shaped; in microscopical examination they appear to terminate in a variable number of finger-shaped processes. The posterior spiracles are of greater size and are placed on the last segment over the anal opening, near the dorsal surface. They appear as two small yellowish or brownish approximated tubercles, more or less prominent, each of which bears at the end a plate with three respiratory areas.

The larvae of some species are provided with the faculty of jumping.

The larvae of the Trypaneids are rather various in their habits, and attack

different parts of vegetables; lists of the host plants are given by Frauenfeld, 1856, and by Schiner, 1858. These habits can be reduced to four types:—

1. The Dacinae and most of the Ceratitininae live in the fruits of very different species of plants; they prefer fleshy fruits and are known as fruit-maggots; they dig into the pulp, going to the inner parts of the fruit and usually cause its fall.

2. Most of the Trypaneininae and Urophorinae live in the flower-heads of the Compositae usually without producing galls.

3. Some species live in various parts of plants, such as stems, flower-stems, buds, etc., and those which mine in the leaves of various Compositae and Umbelliferae, such as certain species of *Acidia*, *Spilographa* and *Euleia*, are very remarkable.

4. Finally some species make galls on various parts of the plants: on flowers, stems and roots. Not less than 48 gall-making species of [illegible] genera are known in Europe, *viz.* about 17% of all the species of the region.

The pupation of the larvae living in fruits takes place usually in the ground; those living in leaves, in flowers or in galls pupate on those parts.

The puparia are of the usual barrel-shaped form; they show the characters of the mature larva on the spiracles and are various in colouring and appearance. I have before me a certain number of puparia of Trypaneinae and the different features of these specimens show the great variety of characters which the first stages of these flies present. I will record here as an example the differences which are to be seen on summary and superficial examination. *Dacus oleae* has a whitish puparium, thin, smooth and almost opaque, with segmentation not prominent and with the posterior spiracles yellow and rather approximate. *Bactrocera tryoniformis* has a pale ferruginous puparium, with more approximated posterior spiracles, which are placed in the middle of a pale yellow area. The segments are more distinct and bear a row of very small spinules. The species *B. cucurbitae* has on the contrary a puparium very like that of *D. oleae* in colouring and appearance. *Anastrepha fraterculus* has a thin, pale yellow puparium, with more distinct segmentation; the surface is smooth and with silky sheen, the posterior spiracles are brown and somewhat approximate. This and the preceding genus have a broad, transverse, wrinkled anal cicatrice, which in *Dacus oleae* is less developed and smaller. *Ceratitis capitata* has a thin and smooth yellow puparium which does not present a shining appearance. The posterior spiracles are dark yellow and approximate and the anal cicatrice is small and smooth. *Acidia lucida* and *Euleia heraclei* have, according to Mik, a dull yellow puparium, with very hard and thick skin and with well-marked segmentation. *Zonosema alternata* has a hard and thick, opaque, pale yellow puparium; the surface is smooth but with well-marked segmentation; the posterior spiracles are yellow and somewhat distant and the anal cicatrice is small. Another species of this genus (*Z. meigenii*) has, according to Mik, a dark ferruginous and thin puparium. *Rhagoletis cerasi* has a puparium very like that of *Zonosema alternata*. *Gonyglossum wiedemanni* has, according to Mik, a

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dark ferruginous puparium, without prominent segmentation. *Carpomyia vesuviana* and *incompleta* have a hard and thick, opaque, pale yellow puparium; the segmentation is well marked, and the surface shows transverse wrinkles; the posterior spiracles are rather distant and the anal cicatrice is small and smooth. *Urophora cardui*, according to Mik, has a dark ferruginous, flat segmented puparium with little silky splendour. *Myiopites blotii* has a thin, smooth, yellow puparium without a shining surface and with less distinct segmentation; the posterior spiracles are very small and rather distant. *Euribia onotrophes*, according to Mik, has a thin, whitish, shining puparium, with marked ferruginous cross-wrinkles. *Carphotricha pupillata*, described by the same author, has a black violet-coloured puparium, with prominent segmentation and the surface strongly wrinkled, almost reticulate. *Enaresta sonchi* has a very shining, thin, transparent, white puparium, with less distinct segmentation, with distant yellow posterior spiracles. *Sphenella marginata* has an extremely shining, brownish black puparium, which is very convex on the dorsal segmentation is indistinct, and concave on the ventral surface which is strongly and finely denticulate. The posterior spiracles are black and very close together. The species of the genus *Oxyna* show, according to Mik, thin, smooth, [illegible]ted, pale ferruginous puparia, and those of *Tephritis* thick, wrinkled, more strongly segmented puparia.

I will finally record that hymenopterous parasites of Trypaneids are known, belonging to the Braconidae and to the Chalcididae and some of these can be used as a natural method of dealing with the flies. Among parasites of the genus *Dacus* (*s. l.*) are known some Opiinids of the genus *Opias* and many Chalcidids of the genera *Eupelmus*, *Eurytoma*, *Pteromyrus*, *Dinarmus* and *Eulophus*; among those of the genus *Ceratitis*, a species of *Entomosphyrum*, found in India, and among parasites of the genus *Anastrepha* some species of the Braconid genus *Bioteres*, etc.

4. GEOGRAPHICAL DISTRIBUTION.

The family Trypaneidae is a large one; it includes about 875 known species and this number goes on increasing from year to year. Schiner in 1858 stated that the known species were only 296.

The family has a wide distribution over all the globe, from the Arctic to Tropical regions; the number of the species naturally increasing from the north to the south. From Lapponia 10 species are known, from England 64, from Austria about 100, and from Italy about 130.

From the Palaearctic region 290 species are known. From Africa and the adjacent islands 160 species are known, 60 of which belong to the Mediterranean fauna and also to the Palaearctic region. The truly Ethiopian species are about 100. From the Oriental region the species known are 140, and 50 from the Australian. The North American fauna includes 210 species and from South America about 70 species have been recorded. There are also about 15 species whose habitat is unknown.

The Indian fauna is as yet little known. In the present paper 69 species are described; with the addition of those recorded by other authors as Indian and no

existing in the collection studied, the total number does not reach 100, which must, I think, be much less than one half of the species living in the country. As far as is known, the Trypetid fauna of the Himalayas is of special character, of more Palaearctic appearance. In Europe the Trypaneids go very high up on the mountains, following their nutritive plants, chiefly the Compositae ; 13 species are even recorded from the so-called "nival fauna."

The true Dacinae are exclusively proper to tropical or subtropical countries, *Dacus oleae* being the only example of a species going a little more towards the north. They are almost exclusively confined to the old world. The Ceratitininae have their head-quarters mostly in warm countries, but are also well enough represented in temperate regions. Urophorinae and Trypaneininae, which contain most of the species living on the Compositae, are, like these plants, more proper to temperate regions and mountainous districts ; the Urophorinae, so far as known, exclusively inhabit the old world.

Most of the well defined genera show a restricted area of habitation, but as the various faunae become better known there is a tendency to make the areas more restricted. The species of Trypaneidae with a wide area of distribution are very few and in most cases this distribution is not a natural one, but due to man. So the dangerous *Ceratitis capitata* is known from the warmer countries of Europe, Africa, Australia and North and South America. Some species of *Dacus* (*s. l.*) also show a wide distribution, as *D. oleae* from the Mediterranean subregion and from South Africa, *D. cucurbitae* from India, Australia and the Pacific Islands. Other examples are *Carpomyia vesuviana* from South Europe and India ; *Euribia florescentiae* from Europe and North America ; *Oxyna bullans* from Europe and South America ; *Tephritis angustipennis* from Europe and North America and *Trypanea stellata* from Europe and Australia. Characteristic genera of the Palaearctic region seem to be *Platyparea*, *Euphranta*, *Chaetostoma*, *Gonyglossum*, *Hemilea*, *Anomoea*, *Zonosema*, *Rhacochlaena*, *Myiopites*, *Urophora* and *Hypenidium*.

True North American genera are *Straussia*, *Oedicarena*, *Epochra*, *Stenopa*, *Neaspilota*, *Peronyma*, *Icterica*, *Eurosta*. Characteristic of the Neotropical fauna are *Hexachaeta*, *Polionota*, *Cecidochares*, *Anastrepha*, *Toxotrypana*, *Blepharoneura*, *Eutreta*, *Strobelia*, *Rhachiptera*, *Acrotaenia*, *Plagiotoma*.

The Ethiopian Trypetids are not yet divided into smaller genera, but there are many characteristic forms which will serve in future for the erection of new genera. *Dacus* (*s. str.*) and *Leptoxys*, *Schistopterum*, *Rhochmopterum* and *Carpophthoromyia* are the only examples which can be given at present.

The Australian species are very little known ; but this fauna also seems to have a number of forms which are related to the Oriental ones along with some others which are endemic; for the latter no special genera have been as yet erected. As special genera can only be recorded *Lenophila*, *Cardiocera* and *Phaeogramma*. It is remarkable that no species of Trypaneids are known from New Zealand, with the exception of those recently described by Brown, which are probably imported.

The Oriental Trypaneids are very numerous and include a great many handsome

and characteristic forms; no subdivision into smaller genera has yet been proposed, but in the following pages I have made an attempt to do this for the Indian species. The Dacinae are represented by very special forms, different from the African ones and I propose to separate them under the generic name of *Bactrocera*. Peculiar genera of the region are also *Meracanthomyia*, *Rioxa*, *Ptilona*, *Vidalia*, *Themara*, *Acanthoneura*, *Henicoptera*, *Rhabdochaeta* and *Myiopardalis*.

The peculiar character of the Oriental (and also of the Indian) fauna seems to be the great variety and richness of Ceratitininae and the very numerous species with a plumose arista. This last character is also shown by many Ethiopian and Australian forms, while in Europe we have, on the contrary, only *Euphranta* with a short plumose arista. In North and South America there are no such forms, the arista being only pubescent or very shortly pilose.

A comparison between Oriental and Australian or Ethiopian faunas, like that established between European and American faunas, is not at

REVIEW OF THE ORIENTAL AND AUSTRALIAN TRYPANEIDS HITHERTO DESCRIBED.

There are two catalogues of the Oriental Trypaneids, one by Bigot, the other by Van der Wulp. The first, published in the *Journal of the Asiatic Society of Bengal*, ii, 1892, p. 220, is very incomplete and confused; Bigot had no idea of the natural limits of the family or of the genera, as is shown by the MS. names in the Indian Museum collection.

Van der Wulp's catalogue (the Hague, 1896, pp. 186—195) is very diligent and complete, but not critical, as he refers to the species of Walker and Doleschall as these were described, without any attempt to place them in correct genera. These species are the misfortune of the Oriental fauna, and it seems that the types are in some cases lost; but fortunately Walker has described only a few species from India. Van der Wulp also was little acquainted with Trypaneids, as he described an *Oxyna* as a *Leptomyza*, an *Acidia* as an *Euxesta*, and even the common North American Ortalid *Chaetopsis aenea* as an *Aciura*!

In the following review I have included the few known Australian species, because they have relation with the Oriental forms and no catalogue of them exists. The species marked with an asterisk (*) are Indian (including Ceylon), and those with two (**) are Australian.

1. *absolutus* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., vi, 22, 13), from Ceram. Seems to be a *Bactrocera* allied to *ferruginea*. Type in London, British Museum.
2. ***acroleuca* (*Tephritis*), Schiner, 1868 (Diptera Novara Reise, 268, 112), from Sydney. Seems to be a *Tephritis*, with obtuse anal cell; but if the observation on p. 269 is exact, this species may belong to the new genus *Tephrella*. Type in Vienna, Imperial Museum.
3. *acroleucus* (*Dacus*), Wiedemann, 1830 (Auss. Zweifl., ii, 520, 11), habitat unknown. Is not a Dacine; the plumose arista clearly indicates one of the Ceratitininae from the Oriental region; but it is doubtful if this form is a Trypaneid or not. Type in Vienna, Imperial

Museum. Prof. Hendel (Wien. Entom. Zeit., xxxi, 1912, p. 13) has stated that this species is an African one, belonging to the new genus *Conradtina*, Enderlein.

4. **acrostacta*, Wiedemann, 1824 (Anal. Entom., 54, 119, and Auss. Zweifl., 1830, ii. 501, 39), both as *Trypeta*, from East India. A very characteristic species, belonging to the new genus *Tephrostola*. Type in the Museum at Copenhagen.

5. *addens* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 149, 177) from Macassar. Is not a Trypaneid, as I have stated in Boll. Lab. Portici, iii, 301, (1909), but an Ortalid, and belongs with great probability to the genus *Stenopterina* as stated by Walker himself. Type in London, British Museum. Prof. Hendel places it in the new genus *Conicipithea*.

6. ***a*... (*Tephritis*), Macquart, 1847 (Mem. Soc. Lille, 109, [93], pl. vi, f. 8), from New Holland. Seems to be an Ortalid. Type in Verrall's (Bigot's) collection at Newmarket.

7. *aenea* (*Dacus*), Wiedemann, 1819 (Zool. Mag., iii, 29, 44, and Auss. Zweifl., ii, 513, 2), from Java. Is the well-known Ortalid *Stenopterina aenea*.

8. ***aequalis* (*Dacus*), Coquillett, 1909 (Proc. Linn. Soc. N. S. W., xxxiii, 94) from N. S. Wales. The description appeared in March, 1909; Froggatt... the wing and gives a description; both authors say nothing ab... the species is probably a *Bactrocera*. Type in Washington, U. S. N...

9. ***albida* (*Trypeta*), Walker, 1853 (Ins. Saunders., iv, 384) from Sou... states that it is an *Acinia*, R. D. (=*Tephritis*); from the description ... of the group Trypaneininae but of impossible generic loca... London, ... Museum.

10. *albog*... (*Themara*), Doleschall, 1858-59 (Nat. Tijdschr. N. In... i, 124, 82) from Amboina. Seems to be a *Rioxa*. Type in Vienna, Imperial Mus...

11. *alboscutellata* (*Anomoea*), Van der Wulp, 1898 (Tijdschr. ... Entom... 7, 4, pl. x, f. 15) from Sumatra. The pattern of the wings comes near that of *A*... but the position of the posterior cross-vein is very different; I place the spe... *Acidia*. Type at Amsterdam? Prof. Meijere, Tijdschr. v. Entom., liv, p. 385, ha... cribed the puparium.

12. *alcestis* (*Trypeta*), Osten-Sacken, 1882 (Berlin. Entom. Zeitschr., ..., 229, f. 10) from the Philippine Islands. Is a *Themara* or *Acanthoneura*, as stated ... the author himself; the ...elling *alkestis* is incorrect. Type in Heidelberg? Accord... to Enderlein, Zool. Jahrb. Syst. Abt., 1911, p. 420, belongs to *Acanthoneura*.

13. ***alvea* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Museum, iv, 1027) from Australia. Is referred by Walker to the gen. *Noecta*, R. D., =*Carphotricha*, Loew, and seems to be a true Trypaneinine; but on account of its dilated wings, perhaps allied to the group of *stellata* etc., forming a genus related to *Eutreta*. Type in London, British Museum.

14. *amoyensis* (*Dacus*), Bigot MS., Froggatt, 1909 (Report, 99) from Amoy. Is only a MS. name in Bigot's, now Verrall's collection at Newmarket.

15. *ampla* (*Themara*), Doleschall, 1858-59 (Nat. Tijdschr. N. Indie, xvii, 154, 81) from Amboina. Doleschall has only quoted the name of this species, without description, referring to Walker's species of this name; but Osten-Sacken, who since Doleschall's death has come into possession of his original unpublished drawings, has stated (Ann. Mus. Civ. Genova, 1882, 19) that this species was a synonym of *Rioxa quadrifera*, Walker, and was therefore not the same as the following.

16. *ampla* (*Themara*), Walker, 1856 (Proc. Linn. Soc., i, 33, 110, pl. i, f. 5) from Singapore. As Walker, *l. c.*, p. 134, says, the present species is the female of *Achias maculipennis*, Westwood, 1848, which, as stated by Osten-Sacken in Ann. Mus. Civ. Genova, 1881, p. 461, is a Trypaneid allied to *Acanthoneura*, Macq.; on account of the widened head of the male, the gen. *Themara* can perhaps be retained as distinct. Type in London, British Museum.

17. *amplipennis* (*Trypeta*), Walker, 1860 (Proc. Linn. Soc., iv, 159, 199) from Macassar and

Philippine Islands. Van der Wulp places this species (Catal., p. 194) in the genus *Acinia*, Macq., which is the same as *Tephritis*; but Osten-Sacken (Berlin. Entom. Zeitschr., xxvi, p. 228) considers that it belongs to the group related to *Euresta*. Type in London, British Museum.

18. *amplissima*, Walker, was a mispelling for the preceding name, as pointed out by Osten-Sacken, Berlin. Entom. Zeitschr., xxvi, p. 228.

19. *amurensis* (*Ptilona*), Portschinsky (Hor. Soc. Entom. Ross., xxvi, 214, [illegible] i, f. 1[illegible] and 12a) from Vladivostok. Seems to be a *Rioxa*. I have recorded here this [illegible]arctic species, because it shows that the genus *Rioxa* comes also into the limits of the [illegible]arctic fauna. Becker in the Kat. Pal. Dipt., iv, p. 95, has erroneously placed this speci[illegible] the Ortalid genus *Ptilonota*, Loew.

20. *antica* (*Xiria*), Walker, 1856 (Proc. Linn. Soc., i, 36, 111, pl. ii, f. 2) [illegible]m Mt. Ophir. Accor[illegible] to Westwood's figure, it appears to be a true Trypaneid; but O[illegible]ten-Sacken and Van der [illegible]lp state that it is an Ortalid. It seems however different fr[illegible] my new genus [illegible]ondon, British Museum.

[illegible]*la*), Walker, 1853 (Ins. Saunders., iv, 378) from East India. Is said to be an [illegible]d probably belongs to that genus or to *Trypanea*. [illegible]e in London?

[illegible] (*Trypeta*), Walker, 1860 (Proc. Linn. Soc., iv, 160, 20[illegible]om Macassar. A [illegible] *Acidia* or *Aciura* which shows the shining black thorax and characteristic [illegible] the wings. Type in London, British Museum.

23. *d*[illegible] *coptera*), Walker, 1860 (Proc. Linn. Soc., iv, 156, 191) from Macassar. It seems to b[illegible]laced in this genus. Type in London, British Museum.

24. *areolati*[illegible]), Walker, 1861 (Proc. Linn. Soc., v, 295, 89) from Batjan. It is a true *Dac*[illegible]haracterized by the four black spots on the face; the ovipositor is said to be cylin[illegible]which perhaps shows relation with the African genus *Leptoxys*. Type in Londo[illegible]ish Museum.

25. *argentea* (*T*[illegible]*is*), Fabricius, 1805 (Syst. Antl., 323, 32) from Amboina. Wiedemann (Auss. Zw[illegible]ii, 596, 5) has since stated that this species belongs to the gen. *Chlorops*, but Prof. Mik i[illegible]7 (Verh. Zool. Bot. Ges. Wien, xxxvii, 180) has expressed the opi[illegible] that it is a *Lobio*[illegible]*a*; Prof. Giglio-Tos in 1895 (Ann. Soc. Ent. France, lxiv, 2[illegible]ded the gen. *Milichiella* for it, and this genus is accepted by Becker, in his mo[illegible]n of 1907, Ann. Mus. Nat. Hung., v, 536. Type in Museum at Kiel.

26. *asiatica* (*Ceratitis*), Becker, 1907 (Ann. Mus Zool. Acc. Imp. Sci. St. Petersb., xii, 291, [illegible] pl. i, f. 10) from N. E. Tibet. This Palaearctic species is recorded here because it is a true *Ceratitis s. str.*, which will perhaps be found in the Himalayas. Type in St. Petersburg, Museum of the Acad. of Science.

27. **asteria* (*Tephritis*), Schiner, 1868 (Dipt. Novara Reise, 270, 118) from Madras. A true *Trypanea* (*Urellia*). Prof. Meijere (Tijdschr. v. Entom., 1908, pl. iv, f. 6) recording the species from Java, has given a figure of the wing.

28. *atilia* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Museum, iv, 1021) from China. Walker placed the species in the group *Urophora*; it is a widely-spread species belonging to the genus *Spheniscomyia* (*Sphenisc*[illegible], Becker, preoccupied), which was placed in *Acidia* by Osten-Sacken. I think that the species is spread over all Africa; it has been described under different names by Macquart, Bigot and myself; see the special part. Type in London, British Museum.

29. ***basalis* (*Dacus*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1072) from Port Essington, N. Australia. As stated by the author himself, this is an Ortalid of the gen. *Stenopterina*. Type in London, British Museum. According to Prof. Hendel is a *Scotinosoma*.

30. *basalis* (*Trypeta*) Walker, 1859 (Proc. Linn. Soc., iii, 120, 144) from Aroe. Impossible to locate from description. Type in London.

31. *basifascia* (*Trypeta*), Walker, 1860 (Proc. Linn. Soc., iv, 158. 195) from Macassar. Is without doubt a *Rioxa*. Type in London.

32. *basilaris* (*Trypeta*) Wiedemann, 1830 (Auss. Zweifl., ii, 510, 55) from Sumatra. Is an Ortalid of the genus *Rivellia* as stated by Loew (Monogr., iii, 44, 1873). Meijere, 1908 (Tijdschr. v. Entom., 123, 3) records it from Java and Coquillett, 1898 (Proc. U. S. Nat. Museum, xxi, 328) from Japan. Type at Kiel.

33. ***basili*[illegible] Froggatt, 1909 (Report, p. 93) is a misprint for *basalis*, Walker, no. 29.

34. [illegible]*us* (*Dacus*), Walker, 1863 (Proc. Linn. Soc., viii, 122, 54) from New Guinea. Seems to [illegible] *Dacus s. l.*, characterized by the pattern of the wing; is perhaps allied with *Callistoia pavonina* or *C. icarus*, but has elongated antennae and bare arista. Type in London.

35. ***l*[illegible]*lor* (*Urophora*), Macquart, 1855 (Mem. Soc. Sci. Lille, 144 [124] 17, pl. 7, f. 7) from [illegible]delaide. A *Rioxa* showing the characteristic pattern of the wing of this genus. Froggatt ([illegible]nstr. Ins., 1908, p. 308, and Report 1909, p. 114) records it as *Tr*[illegible]*a*. Type in Verrall's [illegible]ection at Newmarket.

36. *bicolor* (*Dacus*), Walker, 1849 (List Dipt. British Mus.[illegible] be a *Stenopterina*; it may be an Ortalid from Oriental source. Ty[illegible] to H[illegible]del i[illegible] same as no. 52.

37. *bilineat*[illegible] (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 150, 178) [illegible] a *Dacus* at all, probably an Ortalid, showing a very characteristic pa[illegible]pe in London.

38. *bimaculata* (*Rioxa*), Walker, 1860 (Proc. Linn. Soc., i, 164, 65) fro[illegible] Walker has placed the species in this genus with a query; from the descripti[illegible]ems to be correctly placed. Type in London.

39. *bipars* (*Sophira*), Walker, 1861 (Proc. Linn. Soc., vi, 23, 14) [illegible]am. Probably an Ortalid. Type in London.

40. *bischofi* (*Ptilona*), Kertesz, 1901 (Termesz. Füzet., xxiv, 427, 25[illegible] New Guinea. Prof. Meijere (Bijdr. Djerk., 1904, 111) states that it is a true *Ptilon*[illegible]t the presence of a pair of *dc.* bristles is a character which makes this location im[illegible]le. Type in Budapest, Hungar. Nation. Museum

[illegible] (*Sophira*), Walker, 1860 (Proc. Linn. Soc., iv, 160, 2[illegible] from Celebes. In the same condition as no. 39.

42. **brahma* (*Tephritis*), Schiner, 1868 (Dipt. Novara Reise, 272, 121) from Madras. A true *Tephritis*. Type at Vienna, Imp. Museum.

43. *brevicornis* (*Ptilona*), Van der Wulp, 1880 (Tijdschr. v. Entom., xxiii, 185, 44, pl. 11, f. 7) from Java. Osten-Sacken, 1882, p. 226, records it also from the Philippine Islands. Is the type of the gen. *Ptilona* as restricted by Osten-Sacken and Meijere; eyes and head as in the new genus *Diarrhegma*, but no *prst.* bristle. Type at Amsterdam. Enderlein (Zool. Jahrbüch, xxxi, 420) places this species in *Acanthoneura*.

44. *brevivitta* (*Trypeta*), Walker, 1863 (Proc. Linn. Soc., viii, 124, 60) from New Guinea. A Trypetid with plumose arista. Type in London.

45. *brevivittata* (*Trypeta*), Van der Wulp, 1896 (Catal., p. 193); is a misprint or a correction for the preceding.

46. ***caerulea* (*Tephritis*), Macquart, 1843 (Mem. Soc. Lille, 340 [212] 10, pl. 18, f. 15) from Sydney Island, Polynesia. Seems to be an Ortalid, congeneric with *T. aenea*, Macq. and *rufitarsis*, Macq. Type in Verrall's collection at Newmarket.

47. **capitata* (*Trypeta*), Wiedemann, 1824 (Anal. Entom., 55, 124). Described originally from East India, but supposed to be from an African source; distributed over the world. Is the type of the gen. *Ceratitis s. str.* Type at Copenhagen.

48. *cassandra* (*Trypeta*), Osten-Sacken, 1882 (Berlin. Entom. Zeitsch., xxvi, 228, fig. 9) from the Philippine Islands. Seems to belong to my new genus *Anoplomus*. Type at Heidelberg?

49. **caudatus* (*Dacus*), Fabricius, 1805 (Syst. Antl., 276, 16), from Java. Types at Copenhagen and Kiel. A typical *Bactrocera*. *Dasyneura caudata* of Walker's List, 1073, from N. Bengal, appears to be surely this species.

50. *caudatus* (*Dacus*), Froggatt, 1909 (Report, p. 95), in Bigot's (Verrall's) collection is very different from the typical species, being smaller and differently coloured.

51. *caudatus* (*Dacus*), Wiedemann ♀ not ♂, 1830 (Auss. Zweifl., ii, 518, 8) from Java. As stated by Meijere (1908, p. 129), the female of Wiedemann's description is not of the typical species, but probably *maculipennis*, Dol. Type in Kiel.

52. *chlalybeiventris* (*Trypeta*), Wiedemann, 1830 (Auss. Zweifl., ii, 479, 5) from unknown locality. Appears to be an Ortalid. Type in Vienna. According to Prof. Hendel belongs to its new genus *Icteracantha*.

53. ***cluan*[illegible] (*Trypeta*), Walker, 1849 (List Dipt. Brit. Museum, iv, 1019) from New Holland. Placed by Walker in *Urophora*, appears to be an Ortalid; congeneric with No. 46, etc. Type in London.

[illegible] (Stett. Entom. Zeit., i, 157), from Europe. Schiner (Verh. Zool. Bot. Ges. Wien, viii, 1858, p. 643) records this species from Australia.

[illegible]*inna* (*Sophira*), Walker, 1856 (Proc. Linn. Soc., i, 132, 153) from Borneo. Seems to be [illegible] Ortalid; type in London.

[illegible]*neta*), Walker, 1862 (Proc. Linn. Soc., vii, 227, 28) from Waigiou. Placed in [illegible] Vulp, Cat. p. 188, has nothing to do with this genus, but may be a Trypetid [illegible] venation. Type in London.

57. *concisus* [illegible] Walker, 1861 (Proc. Linn. Soc., v, 252, 72) from N. Guinea. According to Oste[illegible] who has seen the type in the British Museum (Ann. Mus. Civ. Genova, xvi, p. 48[illegible] species of *Diplochorda*, family Micropezidae; of which *Elaphomyia brevicornis* ♀ Sa[illegible]861, and *Dacus turgidus*, Walker, 1861, are synonyms.

58. *confinis* (*R*[illegible] Walker, 1856 (Proc. Linn. Soc., i, 132, 152) from Borneo. A true *Rioxa*; type in L[illegible]n.

59. *conformis* (*Ba*[illegible]*a*), Doleschall, 1858-59 (Nat. Tijdschr. N. Indie, xvii, 122, 78) from Amboina. [illegible]p states (Cat., p. 186) that this is synonymous with *B. ferrugi*[illegible], F. *Dacus conformis* of Koningsberger, 1897, is also according to Meijere (1908, p. 137) a synonym of this same species. Type in Vienna, Imp. Museum.

60. *conformis* (*Strumeta*), Walker, 1857 (Proc. Linn. Soc., i, 34, 111, pl. 2, f. 4) from Singapore. Synonym of *Bactrocera umbrosa*, Fabr., as stated by Osten-Sacken, 1881, p. 72. Type in London.

61. *contingens* (*Oxyna*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii, 288, 58, pl. i, f. 5) from E. Tibet. A Palaearctic species, which may be found in the Himalayas. Type at St. Petersburg.

62. *contrahens* (*Dacus*). Walker, 1860 (Proc. Linn. Soc., iv, 151, 181) from Macassar. Seems to be an Ortalid allied to *Stenopterina* belonging to the genus *Pseudepicausta*, Hendel. Type in London.

63. **contraria* (*Trypeta*), Walker, 1853 (Ins. Saunders., iv, 385, pl viii, f. 7) from East India. Walker places it in *Acinia* (=*Tephritis*); it appears to belong to the group *Rioxa*, but Westwood's figure shows a bare arista. Type in London.

64. ***crassipes* (*Trypeta*), Thomson, 1858 (Eugenia Resa, 583, 260) from Honolulu. Is a *Tephritis*, as stated by Grimshaw, Fauna Hawaii., iii, 45, 1 (1901). Type at Stockholm.

65. ***cratericola* (*Tephritis*), Grimshaw, 1901 (Fauna Hawaii., iii, 46, 3, pl ii, f. 25) from Maui, Hawaii. Probably an *Oxyna*. Type ?

66. *cribrata* (*Urellia*), Becker, 1907 (Mem. Ac. Sci. St. Petersburg, xii, 287, 53, pl. i, f. 3) from Tibet. A true *Trypanea* of large size and peculiar wing pattern. Type at St. Petersburg.

67. **crux* (*Musca*), Fabricius, 1794 (Ent. Syst., iv, 358, 190) from East India. Placed in *Dacus*

49. **caudatus* (*Dacus*), Fabricius, 1805 (Syst. Antl., 276, 16), from Java. Types at Copenhagen and Kiel. A typical *Bactrocera*. *Dasyneura caudata* of Walker's List, 1073, from N. Bengal, appears to be surely this species.

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neta), Walker, 1862 (Proc. Linn. Soc., vii, 227, 28) from Waigiou. Placed in Vulp, Cat. p. 188, has nothing to do with this genus, but may be a Trypetid r venation. Type in London.

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62. *contrahens* (*Dacus*). Walker, 1860 (Proc. Linn. Soc., iv, 151, 181) from Macassar. Seems to be an Ortalid allied to *Stenopterina* belonging to the genus *Pseudepicausta*, Hendel. Type in London.

63. **contraria* (*Trypeta*), Walker, 1853 (Ins. Saunders., iv, 385, pl viii, f. 7) from East India. Walker places it in *Acinia* (=*Tephritis*); it appears to belong to the group *Rioxa*, but Westwood's figure shows a bare arista. Type in London.

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67. **crux* (*Musca*), Fabricius, 1794 (Ent. Syst., iv, 358, 190) from East India. Placed in *Dacus*

by Fabricius (Syst. Antl., 277, 23) and in *Trypeta* by Wiedemann (Auss. Zweifl., ii, 488, 19). A very interesting species, on which the new genus *Staurella* is founded. Type at Kiel.

68. ***cucumis* (*Dacus*), French, 1907 (Journ. of Agric. Victoria, May, and Bull. 26, Dept. Agric. Victoria) from Queensland and New South Wales Described as a variety of *tryoni*; Froggatt (Report, 1909, 80) thinks that it is a different species; and it is in fact a good species of *Bactrocera*, of which I have specimens in my collection.

69. **cucurbitae* (*Dacus*), Coquillett, 1899 (Ent. News, 129) from Hawaii. Recorded from India by Froggatt (Report, 1909, 81, pl. ii, f. 6-7). It is a true *Bactrocera*; type in Washington, U.S. National Museum.

70. *cucullifer* (*Dacus*), Walker, 1862 (Proc. Linn. Soc., vii, 229, 34) from Waigiou. Seems to be a *Bactrocera*. Type in London.

71. ***cucullipennis* (*Dacus*) Froggatt, 1909 (Report, 93, pl. iv, f. 15 and 16) from Fiji. A *Bactrocera*, with two scutellar bristles. Type in Sydney, Agric. Dept. collection.

72. **cylindrica* (*Trypeta*), Walker, 1853 (Ins. Saunders. [illegible]. Las.). Doubtful if a Trypaneid or an Ortalid, allied with *Adrana*. Type in London.

73. *cylindricus* (*Dacus*), van der Wulp, 1880 (Tijdschr. v. Entom., xxiii, 181, 43, pl. [illegible] Java). As stated by Osten-Sacken (1882, p. 211) this is synonymous with *Adrama determinata*, Walk.; this synonymy was subsequently accepted by [illegible] himself (Tijdschr. v. Entom., xxx, 176, 2, 1888).

74. *debeaufortii* (*Rioxa*), Meijere, 1906 (Dipt. Exped. N. Guinea, 94, [illegible] 17) from N. Guinea. On account of the very different pattern of the wings, [illegible] species can hardly be a true *Rioxa*, notwithstanding the presence of the *prst.* and of [illegible] scutellar bristles; it belongs perhaps to a new genus, but may be allied to *Xiria*, [illegible] *picoptera*. Type at Amsterdam?

75. ***dentipes* (*Lenophila*), Guérin-Méneville, 1843 (Rev. Zool., vi, [illegible] from Port Jackson (Sydney). Froggatt (Rep., 1909, p. 106) records that the type is in Bigot's (Verrall's) collection at Newmarket. A particular genus, described by the author as a subgenus of *Ceratitis*.

76. *determinatus* (*Dacus*), Walker, 1856 (Proc. Linn. Soc., i, 133, [illegible]) from Borneo. As stated by Osten-Sacken (1881, p. 279), this is an Ortalid of the genus *Adrama*. Type in London, seen by Osten-Sacken (1882, p. 210). But recently Prof. Hendel has stated (Wien. Entom. Zeit., xxxi, p. 12) that this genus belongs to the Trypaneids.

77. *detrudens* (*Dacus*), Walker, 1863 (Proc. Linn. Soc., viii, 135, 11) from Salwatty, N. Guinea. Seems to be an Ortalid, perhaps a *Pseudepicausta*, Hendel; type in London.

78. *devius* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v, 250, 67) from N. Guinea. Said to be allied to *divergens* and *addens*, and therefore perhaps an Ortalid, according to Hendel it is a *Antineura*. Type in London.

79. *diffusus* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 153, 185) from Macassar. Seems to be a *Bactrocera* with banded face. Type in London.

80. *diluta* (*Oxyna*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii, 289, 60, pl. i, f. 7) from Turkestan. A true *Oxyna*; type at St. Petersburg.

81. *discipennis* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v, 294, 87) from Batjan. Said to be allied to *emittens*, seems to be a *Bactrocera*; type in London.

82. ***dispar* (*Cardiocera*), Macquart, 1847 (Mem. Soc. Sci. Lille, 108 [92], pl. ii, f. 3), from Tasmania. Seems to be an interesting genus of Trypaneids.

83. *distorta* (*Sophira*), Walker, 1857 (Trans. Ent. Soc. (2) iv. 230) from Celebes. Osten-Sacken, who has seen the type in the British Museum (1881, p. 481), placed this species among the Ortalids.

84. *divergens* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 149, 176) from Macassar. Seems to be

by Fabricius (Syst. Antl., 277, 23) and in *Trypeta* by Wiedemann (Auss. Zweifl., ii, 488, 19). A very interesting species, on which the new genus *Staurella* is founded. Type at Kiel.

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69. *cucurbitae* (*Dacus*), Coquillett, 1899 (Ent. News, 129) from Hawaii. Recorded from India by Froggatt (Report, 1909, 81, pl. ii, f. 6-7). It is a true *Bactrocera*: type in Washington, U.S. National Museum.

70. *cu[illegible]er* (*Dacus*), Walker, 1862 (Proc. Linn. Soc., vii, 229, 34) from Waigiou. Seems to be a *Bactrocera*. Type in London.

71. ***cu[illegible]ipennis* (*Dacus*) Froggatt, 1909 (Report, 93, pl. iv, f. 15 and 16) from Fiji. A *Bactrocera*, with two scutellar bristles. Type in Sydney, Agric. Dept. collection.

72. **cylindrica* (*Trypeta*), Walker, 1853 (Ins. Saunders[illegible] Doubtful if a Trypaneid or an Ortalid, allied with *Adrana*. Type in London.

73. *cylindricus* (*Dacus*), van der Wulp, 1880 (Tijdschr. v. Entom., xxiii, 181, 43, pl. [illegible] Java. As stated by Osten-Sacken (1882, p. 211) this is synonymous [illegible] *determinata*, Walk.: this synonymy was subsequently accepted by [illegible]nself (Tijdschr. v. Entom., xxx, 176, 2, 1888).

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75. ***dentipes* (*Lenophila*), Guérin-Méneville, 1843 (Rev. Zool., vi, [illegible] from Port Jackson (Sydney). Froggatt (Rep., 1909, p. 106) records that the ty[illegible] in Bigot's (Verrall's) collection at Newmarket. A particular genus, described by [illegible] author as a subgenus of *Ceratitis*.

76. *[illegible]terminatus* (*Dacus*), Walker, 1856 (Proc. Linn. Soc., i, 133, [illegible]) from Borneo. As stated by Osten-Sacken (1881, p. 279), this is an Ortalid of the genus *Adrama*. Type in London, seen by Osten-Sacken (1882, p. 210). But recently Prof. Hendel has stated (Wien. Entom. Zeit., xxxi, p. 12) that this genus belongs to the Trypaneids.

77. *detrudens* (*Dacus*), Walker, 1863 (Proc. Linn. Soc., viii, 135, 11) from Salwatty, N. Guinea. Seems to be an Ortalid, perhaps a *Pseudepicausta*, Hendel; type in London.

78. *devius* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v, 250, 67) from N. Guinea. Said to be allied to *divergens* and *addens*, and therefore perhaps an Ortalid, according to Hendel it is a *Antineura*. Type in London.

79. *diffusus* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 153, 185) from Macassar. Seems to be a *Bactrocera* with banded face. Type in London.

80. *diluta* (*Oxyna*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii, 289, 60, pl. i, f. 7) from Turkestan. A true *Oxyna*; type at St. Petersburg.

81. *discipennis* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v, 294, 87) from Batjan. Said to be allied to *emittens*, seems to be a *Bactrocera*; type in London.

82. ***dispar* (*Cardiocera*), Macquart, 1847 (Mem. Soc. Sci. Lille, 108 [92], pl. ii, f. 3), from Tasmania. Seems to be an interesting genus of Trypaneids.

83. *distorta* (*Sophira*), Walker, 1857 (Trans. Ent. Soc. (2) iv. 230) from Celebes. Osten-Sacken, who has seen the type in the British Museum (1881, p. 481), placed this species among the Ortalids.

84. *divergens* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 149, 176) from Macassar. Seems to be

an Ortalid of the *Stenopterina* group, according to Hendel it is a *Philocompus*; type in London.

85. *diversata* (*Trypeta*), Walker, 1863 (Proc. Linn. Soc., viii, 124, 59) from N. Guinea. Perhaps not a Trypaneid at all; fore tibiae bristly. Type in London.

86. **diversus* (*Dacus*), Coquillett, 1904 (Proc. Ent. Soc. Washington, vi, 139) from Ceylon and India. A true *Bactrocera*; type in Washington.

87. ***doclea* (*Trypeta*), Walker, 1849 (List. Dipt. Brit. Mus., iv, 1035) from [illegible] Holland. Placed by its author in a group without name, between *Anomoia* and *Eni[illegible]*. Probably a Trypaneid; type in the British Museum.

88. *dorsigutta* (*Trypeta*), Walker, 1859 (Proc. Linn. Soc., iii, 119, 143) from th[illegible]ru Islands. Seems to be a Trypaneid near *Ceratitis*, with blackish streaks on the bas[illegible]f the wings. Type in London.

89. *dunlopi* (*[illegible]na*), Van der Wulp, 1880 (Tijdschr. v. Entom., xxiii, 186, 45, pl. xi, f. 8 and 9) from Pada[illegible] Prof. Meijere placed this species in *Rioxa* (Bijdr. Djerk., p. 110); but it is [illegible] the reduced chaetotaxy, comparable with that of *Euphranta*. Type at Amsterdam.

[illegible]*ia* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1033) fr[illegible] the Philippines. Placed by its author in *Anomoia*; Osten-Sacken has recognized it as a *Trypeta s. l.*, and Van der [illegible]898 placed it erroneously in *Anomoea*; it belongs to *Acidia*. Type in the [illegible]eum.

91. *en[illegible]*), Walker, 1860 (Proc. Linn. Soc., iv, 152, 184) from Celebes. Said to be allied [illegible]*ugineus* and *trivittatus*, seems to be a true *Bactrocera*. Type in London. Frog[illegible]ort, p. 96) has redescribed the species.

92. *crebus* (*R[illegible]*ndani, 1875 (Ann. Mus. Civ. Genova, vii, 436) from Borneo. Seems to be a true *R[illegible]*ype at Genova, Museo Civico.

93. ***escheri* ([illegible]), Bezzi, 1910 (Boll. Labor. Zool. Portici, v. 19, f. 9) from Sydney. Type in the aut[illegible] collection.

94. *evanescens* (*Ox[illegible]*, Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii, 189, 59, pl. i, f. 6) from N. E. [illegible] and Turkestan. Type at St. Petersburg, Museum of the Academy of Science.

95. *exigens* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 151, 180) from Celebes. Seems to be a *Stenopterina* belonging to the Ortalids in the genus *Pseudepicausta*, Hendel. Type in London.

96. *expandens* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 114, 129) from the Aru Islands. A true *Bactrocera*, probably the same as *ferruginea*. Type in London.

97. *expertus* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., vi, 14, 47) from Gilolo. Seems to be an Ortalid, perhaps a *Pseudepicausta*, Hendel; type in London.

98. ***facialis* (*Dacus*), Coquillett, 1910 (Entom. News, xxi, 12) from Tonga Island, Polynesia. Is said to be allied to *oleae*, but nothing is known about the chaetotaxy. Type at Washington, National Museum, N. 12737.

99. *faciestriata* (*Acinia*), Doleschall, 1857 (Nat. Tijdschr. Ned. Indie, xiv, 416, pl. x, f. 7) from Amboina. Is an Ortalid, synonymous with *Scholastes cinctus*, Guer., a widely distributed species extending from Sydney to the Philippines; the synonymy is established by Schiner; the type is at Vienna, Imp. Museum, seen by Osten-Sacken, 1881, p. 479.

100. *fasciata* (*Urophora*), Walker, 1856 (Proc. Linn. Soc., i, 134, 158) from Borneo. Has nothing to do with *Urophora*, but is a Ceratitinine near *Zonogastra* or *Anoplomus*. Type in London.

101. *fasciatipennis* (*Bactrocera*), Doleschall, 1856 (Nat. Tijdschr. N. Indie, x. 412, 35, pl. iii, f. 1) from Java. Is synonymous with *Bactrocera umbrosa*, Fabr., as stated by Osten-Sacken, who has seen the type in Vienna.

102. ***fasciestriata* (*Lamprogaster*), Schiner, 1868 (Dipt. Novara Reise, 264, 160) from Stuart Islands. Is a correction of the name of No. 99 and the same as *Scholastes cinctus*.

103. *fascipennis* (*Dacus*), Wiedemann, 1819 (Zool. Mag., iii, 28, 42, and Auss. Zweifl., ii. 519, 9) from Java. Is synonymous with *Bactrocera umbrosa*, Fabr. Type in Vienna.

104. **fasciventris* (*Tephritis*), Macquart, 1843 (Mem. Soc. Sci. Lille., 382 [225] 4, pl. 31, f. 2) from East [illegible]. Belongs to the new genus *Gastrozona*. Type in Paris, Jardin de Plantes.

105. *fasciv[illegible]* (*Tephritis*) (*bis*), Macquart, 1847 (Mem. Soc. Sci. Lille, 225 [65], pl. 7, f. 7) from [illegible]a. Is the type of the new genus *Anoplomus*; I have called it by Bigot's manuscript name *flexuosus*. Type in Paris? It is very curious that Macquart (*l. c.*, 1851, p. 290) describes another *Tephritis fasciventris* (*ter*) from Brazil, which is synonymous with *Plexachaeta eximia*, Wied., see Loew, Monogr., iii, 216.

106. *fe[illegible]stella* (*Oxyphora*), Coquillett, 1910 (Ent. News, xxi, 308) from Hongkong. Type in Washington, N. 12993, U. S. National Museum.

107. **ferruginea* (*Trypeta*), Walker, 1853 (Dipt. Saunders., 387) from [illegible]ast India. Unknown to me; type in London.

108. **ferrugineus* (*Musca*), Fabricius, 1794 (Ent. Syst., iv. 342, 127) transferred to *Dac[illegible]* Antl., 274 (1805) from India. Is the type of the genus *Bactrocera*. T[illegible] hagen.

109. *ferrugineus* (*Dacus*), Macquart, 1847 (Mem. Soc. Sci. Lille, 224 [64] [illegible]851, 257 (284) 2, pl. 26, f. 8) from Java. Is different from the sp[illegible]e name recorded by Fabricius and Wiedemann, and seems to be syn[illegible]n *Bactrocera caudata*, Fabr. on account of the infuscated hind cross-vein. [illegible]f the description of 1867 in Paris (?), and of that of 1851 in Bigot's (Verrall's) c[illegible]at Newmarket, as stated by Froggatt, Report, 1909, p. 81.

110. *figuratus* (*Dacus*), Walker, 1856 (Proc. Linn. Soc., i, 133, 155) [illegible]rneo. In my paper of 1909 I have considered this species as a *Dacus s. l.*, but [illegible] think that this was incorrect. Type in London.

111. *flava* (*Henicoptera*), Macquart, 1847 (Mem. Soc. Sci. Lille, 223 [illegible]1, pl. 7, f. 9) from Java. Is the type of the genus *Henicoptera*, one of the Ceratitina[illegible]t is without sternopleural bristle (as pointed out by Osten-Sacken) and therefore perhaps a Dacine. Type in Paris.

112. *formosipennis* (*Rioxa*), Walker, 1861 (Proc. Linn. Soc., v. 252, 73) from N. Guinea. Prof. Meijere has figured it in Dipt. N. Guinea, 93, 1 pl. i, f. 16. A true *Rioxa*, type of the genus. Type in British Museum.

113. **fossata* (*Tephritis*), Fabricius, 1805 (Syst. Antl., 320, 20) and Wiedemann, Auss. Zweifl., ii, 503, 41 (*Trypeta*), from Tranquebar. Placed by Van der Wulp in *Anomoea*, perhaps because Walker placed his *elimia* in this genus, but, notwithstanding the resemblance of the wing pattern, does not belong to it. Type at Copenhagen.

114. ***frauenfeldi* (*Dacus*), Schiner (Dipt. Novara Reise, 269, 95) from Stuart Islands. Froggatt, Report 1909, p. 96; type at Vienna. Probably a *Bactrocera*.

115. ***frenchi* (*Dacus*), Froggatt, 1909 (Report, 92, pl. i, f. 4) from N. Caledonia. French, Journ. of Agricult. Victoria, May 1907, fig. without name. In all probability a *Bactrocera* with banded wings of the *umbrosa* group.

116. **fulvidus* (*Dacus*), Froggatt, 1909 (Report, 99) from India. Is a MS. name in Bigot's collection.

117. *fulvitarsis* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 153, 186) from Macassar. Not a *Dacus*, and perhaps not a Trypaneid at all. Type in London.

118. *fulviventris* (*Dacus*), Froggatt, 1909 (Report, 99) from N. Guinea. A MS. name in Bigot's collection.

119. *furcifer* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., vi. 14, 46) from Gilolo. Osten-Sacken,

1881, p. 461, says that it is a Trypaneid, but not a *Dacus*; on account of the plumose arista is perhaps a *Taeniostola* and according to Hendel a *Lagarosia*. Type in London.

120. ***fuscata* (*Acinia*), Macquart, 1851 (Mem. Soc. Sci. Lille, 266 [137] 10, t. 27, f. 8) from Tasmania; perhaps a Trypaneid of the *stellata* group. Type in Paris.

121. **fuscipennis* (*Acanthoneura*), Macquart, 1847 (Mem. Soc. Sci. Lille, 378 [221], pl. 30, f. 2) from Bengal. Type of the genus *Acanthoneura*; type in Paris.

122. **gamma* (*Meracanthomyia*), Hendel, 1910 (Wien. Entom. Zeit., xxix, 1, N. pl. i, f. 3) from Ceylon. Type in Vienna, Imp. Museum.

123. **[illegible]* (*Trypeta*), Thomson, 1858 (Dipt. Engen. Resa, 584, 256) from Sy[illegible] A typical *Trypanea* (*Terellia*), with two scutellar bristles. Type in Stockholm.

124. **[illegible]ultata* (*Ensina*), Macquart, 1843 (Mem. Soc. Sci. Lille 387 [230] 1, pl. [illegible] f. 10) from Co[illegible]manuel. Is without any doubt synonymous with *Tephrostola acrostacta* Wied. Why Macqu[illegible] placed it in *Ensina* I cannot comprehend. Enderlein, Zool. Jahrbüch., xxxi, [illegible]453, says that it [illegible] perhaps to the genus *Platensina*. Type in Paris.

125. [illegible] (Mem. Soc. Sci. Lille, 267 [193], 1, pl. 27, f. 9) from Tasmania. [illegible] Monogr., iii, 23) thinks that it is a genus of Trypaneids, but Hendel in Genera Ins. [illegible] states that it is a Pyrgotid, perhaps synonymous with [illegible]*ura*. Type in Par[illegible]

[illegible]*oides* (*Strumeta*), Walker, 1867 (Proc. Linn. Soc., vii. 220, 84) from Mysol. Meijere (Nat. N. Guinea, 96) after a comparison with the type in London made by Austen, says that it is a *Rioxa*; but I think that it should be placed in a special genus with No. 74.

127. ***heterura* (*Trypeta*), Thomson, 1858 (Diptera Engenia Resa, 584, 262) from Sydney. Said to be allied to *marginalis*, Wied. from the Cape; but this is perhaps a *lapsus* for *marginata*, Fall., the species being evidently a *Sphenella*. Type in Stockholm.

128. *hirtipes* (*Themara*), Rondani, 1875 (Ann. Mus. Civ. Genova. vii. 435) from Borneo. An *Acanthoneura*, which Rondani compares with *lata*, viz. *ampla*. Type in Genova, Museo Civico.

129. **histrionicus* (*Musca*), Fabricius, 1794 (Ent. Syst., iv. 343, 128; placed in *Dacus* in 1805, Syst. Antl., 274, 5) from East India. Wiedemann, Auss. Zweifl., ii. 530, 1, states that it is a species of *Chyliza*. Type in Copenhagen.

130. *h[illegible]ldi* (*Achias*), Westwood, 1850 (Trans. Ent. Soc. London, v, 235, pl. 23, f. 9) from Java. Collection of W. W. Saunders. As stated by Osten-Sacken in litt. this is the same as *Themara maculipennis*, Westw.

131. *icarus* (*Dacus*), Osten-Sacken, 1882 (Berlin. Entom. Zeitschr., xxvi, 224, f. 8) from the Philippine Islands. Seems to belong to my new genus *Callistomyia*. Type in Heidelberg?

132. *imitans* (*Dacus*), Walker, 1860 (Proc Linn. Soc., iv, 150, 179) from Macassar. Is not a *Dacus*, and not a Trypaneid at all; according to Prof. Hendel it is a *Plagiostenopterina*. Type in London.

133. ***immaculata* (*Terellia*), Macquart, 1855 (Mem. Soc. Sci. Lille, 125, [145] 2) from the Marquise Islands. A Trypaneid with hyaline wings; type in Verrall's collection at Newmarket.

134. *impleta* (*Trypeta*), Walker, 1859 (Proc. Linn. Soc., iii, 120, 145) from the Aru Islands. A Trypaneid with plumose arista and reticulate wings. Type in London.

135. *inaptus* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., iv, 151, 182) from Macassar. Seems to be an Ortalid, allied to *Stenopterina*, according also to Prof. Hendel. Type in London.

136. **incisa* (*Trypeta*), Wiedemann, 1824 (Anal. entom., 53, 117, and Auss. Zweifl., ii, 500, 37) from Bengal. Seems to be identical with *Rioxa modesta*, Fabr. Type in Vienna.

137. **incisus* (*Dacus*), Walker, 1860 (Trans. Ent. Soc. London, v, 323) from Burma. A *Bactrocera*, near *ferruginea*. Type in London.

138. **indica* (*Sphenella*), Schiner, 1868 (Dipt. Novara Reise, 267, 110) from Madras. A true *Spenella*; type in Vienna.

139. *inscriptus* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., v, 162, 61) from Ambonia. Said to be allied to *bilineatus*; seems to be an Ortalid. Type in London.

140. *instabilis* (*Dacus*), Walker, 1861 (Proc. Linn Soc., v, 250, 68) from N. Guinea. Said to be closely allied to *divergens* and *addens*, and therefore perhaps a *Stenopterina*. Type in London.

141. **klugii* (*Dacus*), Wiedemann, 1824 (Anal. entom., 56, 125, and Auss. Zweifl., ii, 523, 15) from East India. Probably a *Bactrocera* with banded wings or a *Callistomyia*. Type at Copenhagen.

142. [illegible]*lata* (*Rioxa*), Walker, 1856 (Proc. Linn. Soc., i, 35, 114, pl. ii, f. 3) from Singapore. The typical species of the genus *Rioxa*, figured also by Van der Wulp, Tijdschr. v. entom., [illegible]li, 218, 5, pl. x, f, 6. Type in London. See also Meijere, Tijdschr., liv, 38[illegible], 1911, and [illegible]nderlein, Zool. Jahrbuch., xxxi, 447.

143. *lat*[illegible]*alis* (*Ptiiona*), Kertesz, 1901 (Termesz. Füzet., xxiv, 428, 26[illegible] xx, f. 17) from N. Guinea. Meijere places it in *Rioxa*; type at Budapest.

144. *lateralis* (*Dacus*), Walker, 1863 (Proc. Linn. Soc. [illegible] inea. [illegible] *Dacus*, and perhaps not a Trypaneid. Type in London.

145. *lateralis* (*Tryp*[illegible]), Wiedemann, 1830 (Auss. Zweifl., ii, 479, 6) from unknow[illegible] Trypaneid with *Acidia*-like pattern of wings. Type at Vienna.

146. *latifascia* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 114, 131) fro[illegible] An Ortalid belonging to *Xiria*, according to Prof. Hendel. Type in London.

147. *latiuscula* (*Noeeta*), Walker, 1856 (Proc. Linn. Soc., i, 133, 156) from Borneo. Seems to be a true *Carphotricha*. Type in London.

148. *lativentris* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 115, 134) from Aru Islands. Seems to be an Ortalid; type in London

149. *lativentris* (*Trypeta*), Walker, 1860 (Proc. Linn Soc., iv, 158, 197) from Macassar. A Trypaneid with dilated wings, perhaps of the group of *stellata*, etc. Type in London.

150. ***leontodontis*, Degeer; Macquart, 1847 (Mem. Soc. Sci. Lille, 225) records this European species from Australia.

151. *leucotelus* (*Xarnuta*), Walker, 1856 (Proc. Linn. Soc., i. 28, 95, pl. i, f. 4) from Singapore. Placed erroneously in the Helomyzids, was later recognized as a Tryp[illegible]eid by Walker him[illegible] widely spread species. Westwood's figure shows no bristles on the frons. Type in London.

152. *limbipennis* (*Dacus*), Macquart, 1843 (Mem. Soc. Sci. Lille, 374 [217], pl. 29, f. 9) from Java. Seems to be a *Bactrocera* allied to *ferruginea*, if not the same. Type in Paris.

153. ***limpidapex* (*Tephritis*), Grimshaw, 1901 (Fauna Hawaii., 46, 2, pl. ii, f. 24) from Hawaii. A true *Tephritis*.

154. *lituratus* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v 251, 70) from Waigoe. Seems to be an Ortalid which, according to Hendel, is the same as *Cleitamia liturata*, O.-S.; type in London.

155. ***longicornis* (*Bactrocera*), Guerin-Méneville, (1832) 1838 (Voyage de la 'Coquille,' 301) from Sydney. The species was named by Macquart, and is reported in Suites à Buffon, ii, 1835, 453, 1, pl. xix, f. 13. Is the typical species of *Bactrocera*, probably the same as *umbrosa*, F. Type at Paris?

156. *longicornis* (*Dacus*), Wiedemann, 1830 (Auss. Zweifl., ii, 524, 16) from Java. A species of *Dacus s. l.*, of the special group which resembles *Conops* in the shape of the abdomen (Froggatt, Report 1909, p. 86). Type at Vienna. Redescribed by Prof. Meijere, Tijdschr. liv, 380, 1911.

157. ***longirostris* (*Trypeta*), Thomson, 1858 (Dipt. Eugenia Resa, 586, 266) from Foua. An *Oxyna* allied to *sororcula*, with two scutellar bristles. Type at Stockholm.

158. *longivitta* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 115, 133) from Amboina. Perhaps

an Ortalid of the *Stenopterina* group, belonging to *Plagiostenopterina*, Hendel. Type in London.

150. ***lugubris* (*Tephritis*), Macquart, 1847 (Mem. Soc. Sci. Lille, 109 (93), pl. vi, f. 7) from N. Holland. Seems to be a *Rioxa*; type in Bigot's (Verrall's) collection at Newmarket.

160. *macilentus* (*Dacus*), Wiedemann, 1830 (Auss. Zweifl., ii, 525, 18) fro[m] unknown locality. Not a *Dacus*, and perhaps an Ortalid; referred as *maculentus* by Frog[gatt], Repo[rt] 1909, p. 99. Type in Vienna. Belongs to *Rivellia* according to Prof. Hendel.

161. *maculiger* (*Bactrocera*), Doleschall, 1858-59 (Nat. Tijdschr. N. Indie, xvi[i], [1]23-[1]79) from Amboina. A *Bactrocera*, synonymous with *zonata*, Saunders. Froggatt, [R]epo[rt] 1909, p. 94, says that the type in the Imperial Museum, Vienna, bears a label by L[oew] on which is written: *zonatus* = *maculiger*.

162. *macul[ipennis]* (*Bactrocera*), Doleschall, 1856 (Nat. Tijdschr. N. Indie, x. 412, 36, pl. ii, f. 1) from [Ja]va. Placed by Van der Wulp in synonymy with *ferruginea*, Fabr., has been recently recognized as a good species by Meijere. Type in Vienna.

163. **m[acu]l[ipennis]* (*Dacus*), Macquart, 1851 (Mem. Soc. Sci. Lille, 258 [285] 1, pl. 26, f. 9) from India. Loew and Osten-Sacken considered it as an Ortalid; but Hendel (Wien. E[nt]. Ze[it]., xxix, 1910, p. 109) has stated that it is the type-species of the Trypaneid genus *Zacerata*, the generic name of Macquart being preoccupied in Coleoptera. Type in Verrall's collection.

164. *maculipennis* (*Dacus*), Westwood, 1848 (Cab. Orient. Entom., 38, pl. 18, f. 4) from Java. Is a *Themara*, as stated by Osten-Sacken, 1881, p. 461. The species is widely spread in the Oriental region. Type at Oxford. See also Meijere, Tijdschr., liv, p. 382, and Enderlein, Zool. Jahrbüch., xxxi, 415.

165. **malaica* (*Oxyphora*), Schiner, 1868 (Dipt. Novara Reise, 274, 125) from Ceylon. Is said to be synonymous with *Xarnuta leucotelus*, Walk., as was suspected by Schiner himself. Type at Vienna.

166. **mangiferae* (*Dacus*), [Ma]xwell-Lefroy, 1893 (Ind. Mus. Notes, iii, 17) from In[dia] [Ja]es has been figured by Maxwell-Lefroy. Van der Wulp has considered it synonymous with *Bactrocera ferruginea*, Fabr. I have seen the type in the Indian Museum, and think that it is a variety of *ferruginea*, but suspect that the differences may be due merely to immaturity, being seen only in bred specimens.

167. *manto* (*Trypeta*), Osten-Sacken, 1882 (Berlin. Entom. Zeitschr. [1]881) from the Philippine Islands. A Ceratitinine with plumose arista. Ty[pe] according to Enderlein (Zool. Jahrbüch., xxxi, 420) belongs perhaps

168. *marginemaculata* (*Acinia*), Macquart, 1851 (Mem. Soc. Sci. [Lille], 27, f. 6) from Asia. Seems to be a Trypaneinine of the *stellata* grou[p] [Ma]caris.

169. *melaleuca* (*Trypeta*), Walker, 1862 (Proc. Linn. Soc., vii, 2[1]) from Ceram. Osten-Sacken, 1881, p. 259, says that this species is identical with *atilia* of the same author; but this last name has priority, and therefore is used by Van der Wulp in his Catalogue. A widely distributed species, which belongs to *Spheniscomyia*. Type in London.

170. *melanotus* (*Dacus*), Coquillett, 1910 (Ent. News, xxi, 13) from Cook Island, Polynesia. Probably a species of *Bactrocera*, bred from oranges. Type at Washington, U. S. National Museum, no. 12739.

171. *meritoria* (*Helomyza*), Walker, 1862 (Proc. Linn. Soc., vii, 218, 79) from Mysol. Czerny, who has seen the type in the British Museum, says that this species is not a Helomyzid, but a Trypaneid; from the wing-pattern it seems to be related to *Rioxa*.

172. **mixta* (*Trypeta*), Walker, 1853 (Dipt. Saunders., iv, 385) from East India. Seems to be a *Tephritis*. Type in London.

173. **modestus* (*Dacus*), Fabricius, 1805 (Syst. Antl., 278, 29) from Bengal; Wiedemann, Auss. Zweifl., ii, p. 493. 26. Van der Wulp in 1898 placed the species in *Ptilona*, but Meijere

thinks that it is probably a *Rioxa*, as already suspected by Osten-Sacken. But the shape of the head is very different from that of *Rioxa*, and I think it better to make the species the type of a new genus, called *Diarrhegma*. Type at Copenhagen.

174. *multistriga* (*Trypeta*), Walker, 1859 (Proc. Linn. Soc., iii, 110, 142) from Aru Islands. Seems to be a form with plumose arista, allied to *Rioxa*. Type in London.

175. ***musc*[illegible] (*Trypeta*), Froggatt, 1899 (Agric. Gazette N. S. Wales, 501, pl. ii, f. 1-2, and Report 190[illegible], p. 123, p. vii, f. 1-3) from Australia. Is a *Rioxa*. Type in Sydney, Dept. of Agriculture.

176. [illegible]*loides* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 115, 132) from Aru Islands. Osten-Sacken, who has seen the type in London, says (1881, p. 461) that the present species is not a *Dacus* and not a Trypaneid at all; according to Hendel it belongs to *Pseudepicausta*.

177. **mutyca* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1036) from East India. Placed in *Euleja* by Walker; it appears to be a *Rioxa* allied to *vaga*, Wied. Type in London.

178. *nebulosa* (*Urellia*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii. 286, 51, pl. i, f. [illegible]) from E. Tibet. A true *Trypanea*; type at St. [illegible]

179. *nebulosa* (*Dasyneura*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1076) from unknown [illegible]. Seems to be a true Oriental *Bactrocera*; type in London.

180. *nigra* (*Rioxa*), Meijere, 1906 (Dipt. N. Guinea Exped., 95, 3, pl. i, f. 18) [illegible] Guinea. Seems to be congeneric with *debeaufortii* and *helomyzoides*. Type at Amsterdam?

181. *nigricans* (*Trypeta*), Wiedemann, 1830 (Auss Zweifl., ii, 509, 53) from unknown locality. Seems to be an *Acidia* or an *Aciura*. Type at Vienna.

182. *nigrifascia* (*Trypeta*), Walker, 1860 (Proc. Linn. Soc., iv, 158. 196) from Macassar. A Ceratitinine with plumose arista and peculiar pattern of the thorax. Type in London.

183. *nigrilinea* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v, 251, 71) from N. Guinea. Not a *Dacus*, and probably not a Trypaneid at all. Type in London.

184. **[illegible] (*Urophora*), Macquart, 1851 (Mem. Soc. Sci. [illegible], 260 (131), 11, pl. 26, f. 13) [illegible]mania?. An Ortalid, congeneric with *testacea*. Type at Paris.

[illegible]*gropunctulata* (*Themara*), Doleschall, 1858-59 (Nat. Tijdschr. N. Indie, xvii, 124, 83) from Amboina. Is a Sapromyzine, perhaps synonymous with *Sapromyza trypeloptera*, *picta* or *punctipennis*. Type at Vienna.

186[illegible] [illegible]*myza*), Walker, 1861 (Proc. Linn. Soc., [illegible]246, 57) from N. Guinea. Czerny [illegible]xamination of the type in the British Museum, has stated that this is not [illegible] a Trypaneid, and I think that it is probably a *Rioxa*.

187[illegible] [illegible] der Wulp, 1880 (Tijdschr. v. Entom. xxiii, 187, 46, pl. xi, f. 9-11) [illegible]aps a *Rioxa*, according to Enderlein. Type at Amsterdam.

188. *nox* (*R*[illegible]n, 1875 (Ann. Mus. Civ. Genova, vii, 437) from Borneo. A true *Rioxa*. Type in [illegible]

189. *obliqua* (*Xiria*), Osten-Sacken, 1881 (Ann. Mus. Civ. Genova, xvi, 463, fig.) from Sumatra. This species has no lower fronto-orbital bristles, and therefore is perhaps allied to the new genus *Chaetellipsis*, but the shape of the face and pattern of the wings are very different. Westwood's figure of the type species shows lower fronto-orbital bristles. Type at Genova.

190. *obsoleta* (*Trypeta*), Wiedemann, 1824 (Anal. Entom, 53, 118, and Auss. Zweifl., ii, 499, 36) from Java. Seems a Trypaneid, with a peculiar wing-pattern, which however seems to be like that of the Lauxanid genus *Amphicyphus*. Type at Vienna.

191. *obtrudens* (*Dacus*), Walker, 1859 (Proc Linn. Soc., iii, 116, 135) from Aroe. Osten-Sacken, who has seen the type in London, places it among the Ortalids of the *Stenopterina* group, and Prof. Hendel says that it belongs to *Pseudepicausta chalybea*, Dol.

192. *optatura* (*Helomyza*), Walker, 1863 (Proc. Linn Soc., viii, 116, 40) from N. Guinea. Osten-Sacken in 1881 says that it is a Trypaneid allied to *quadrifera*, Walk., and Czerny

in 1904, after examining the type in London, says that it is the female of *Rioxa quadrifera*, Walker.

193. *orientalis* (*Tephritis*), Meijere, 1908 (Tijdschr. v. Entom., 41, 130, [illegible] 4, f. 5) from Semarang, Java. Type at Amsterdam ?

194. **ornatipes* (*Dacus*), Froggatt, 1909 (Report, 99) from India. Is a M[illegible] name of Bigot's in Bigot's (Verrall's) collection.

195. ***ornatissimus* (*Dacus*), Froggatt, 1909 (Report, 93, pl. iv, f. 13-14) fro[illegible] New C[illegible]edonia, bred from mandarins at Sydney. A true *Bactrocera* allied to *ferruginea*. [illegible]ype [illegible] Sydney.

196. *ortalioides* (*Helomyza*), Walker, 1863 (Proc. Linn. Soc., viii, 116, 41) from N[illegible]nea. Said by the author to connect *Helomyza* with *Poticara*. Czerny, after examini[illegible]he type in London, states that it is a Trypaneid.

197. **pardalina* (*Carpomyia*), Bigot, 1891 (Ind. Museum Notes, i, 51, pl. 5, f. 1) from India. In my pap[illegible] of 1910 I have founded upon this species the new genus *Myiopardalis*. Type in the Indian [illegible]useum, Calcutta.

198. *parilis* (*Tephritis*) [illegible] 876 (Nat. Tijdschr. N. Indie, x, 412, 38, pl. 1, f. 2) from Amboina. Osten-Sacken states that it is synonymous with *Diarrhegma modestum*, Fabr. Type at Vienna. See also Enderlein, Zool. Jahrbüch., xxxi, 449.

199. **parvula* (*Euxesta*), Van der Wulp, 1897 (Termesz. Füzet., xx, 141, 20, pl. iii, f. 2) from Ceylon. Meijere in 1908 places this species in the Trypaneidae, and Hendel in 1909, after examining the type at Budapest, states that it is an *Acidia*. I think that it is synonymous with *Spheniscomyia quadrincisa*, Wied.

200. *pectoralis* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 114, 130) from Aroe, etc. Seems to be a *Bactrocera* allied to *ferruginea*. Type in London.

201. ***pelia* (*Tephriti[illegible]* Schine[illegible], 1868 (Dipt. Novara Reise, 271, 120) from Sydney. A true *Tephritis*. Ty[illegible] Vienna.

202. *perplexus* (*Dacus*[illegible]er, 1861 (Proc. Linn. Soc., vi, 14, 48) [illegible]. Perhaps a Pyrgotine Orta[illegible]e in London.

203. **persicae* (*Rivellia*), Bigo[illegible] (Indian Mus. Notes, i, [illegible] *acus* by me and by Frogga[illegible]eems to be the same as [illegible] tunders. [illegible] in the Indian Museum.

204. *pictipennis* (*Hemicop*[illegible]), Walker, 1860 (Proc. I[illegible] Celebes. Osten-Sacken, who has seen the type in London[illegible] talid *Sophira distorta*, Walk.

205. **pictus* (*Dacus*), Froggatt, 1909 (Report, 9[illegible] Bigot's collection.

206. *plagifera* (*Henicoptera*?), Walker, 1860 (Proc. Linn. Soc., iv, 156, 192) from Macassar. It is very doubtful whether the species is rightly referred to this genus, as already pointed out by Osten-Sacken, 1882, p. 233. Type in London.

207. *platypalpus* (*Atopognathus*), Bigot, 1881 (Ann. Soc. ent. France, [6] i, 24) from Ternate. Is a Micropezid, near *Phytalmia*. Type at Newmarket.

208. ***poenia* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1025) from N. Holland. Placed in *Acinia* by the author, and recorded also by Froggatt (Austral. Ins., 308). Seems to be allied to *Tephritis*. Type in London.

209. *polyxena* (*Acanthoneura*), Osten-Sacken, 1882 (Ann. Mus. Civ. Genova, xvi, 462, fig.) from Java. Van der Wulp in Tijdschr. v. entom., xii, 221, 7, pl. x, f. 18 (1898), has redescribed and figured this species. Type in Genova.

210. *pompilioides* (*Dacus*), Walker, 1859 (Proc. Linn. Soc., iii, 116, 136) from Aroe. Seems to be an Ortalid, which according to Prof. Hendel belongs to *Pseudepicausta*; type in London.

211. ***pornia* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1039) from N. Holland, Port

Stephenso[illegible] Placed in *Euleja*, but has a plumose arista, perhaps a *Rioxa*. Type in London.

212. *proditrix* (*H[illegible]coptera*), Osten-Sacken, 1882 (Berlin. entom. Zeitschr., 233), from the Philippines. Said to be very like *H. flava*. Type at Heidelberg? Enderlein (Zool. Jahrbüch., xxxi, [illegible]4) records the species from Sumatra.

21[illegible] ***psidii* (*Tephritis, Dacus*), Froggatt, 1899 (Agric. Gazette, N. S. W., 501, pl. ii, f. 1-3, and Re[illegible]t 1909, 86, pl. vii, f. 1-3), from New Caledonia and Fiji. A *Bactrocera* with two [illegible]tellar bristles. Type at Sydney.

214. [illegible]*ta* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v. 294, 86) from Mysol. Said to be allied [illegible] *divergens* and *addens*, and therefore perhaps an Ortalid allied to *Stenopterina*; according to Hendel belongs to *Antineura*. Type in London.

215. *pulchella* (*Rhabdochaeta*), Meijere, 1904 (Bijdr. Dierk., xvii, 109, pl. viii [illegible]22-23) from Java. Said to be allied to *Schistopterum*, Becker; type at Amsterdam.

216. *pulla* (*Trypeta*), Wiedemann, 1830 (Auss. Zweifl., ii, 506, 47) from [illegible]known locality. Allie[illegible] to *Tephritis*. Type at Vienna.

217. *punctifera* (*Sophira*) Wal[illegible] 1861 (Proc. Linn. Soc., vi, 15, 49) from Gilolo. Osten-Sack[illegible] in 1881 placed this species among the synonyms of *Trypeta stellipennis*, Walk. Type in London.

218. *punctum* (*Urellia*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii, 285, 50, pl. i, f. 1) from Turkestan. A true *Trypanea*; type at St. Petersburg.

219. *quadrifera* (*Helomyza*), Walker, 1861 (Proc. Linn. Soc., v. 246, 58) from N. Guinea. Osten-Sacken, 1881, 459, has stated that this is a Trypaneid; Czerny in 1904, after examination of the type in London, placed it in *Ptilona*?, as had already been done by Kertesz, who has redescribed and figured the species. I think that t[illegible]ecies is better placed in *Rioxa* [illegible]as already been done by Meijere.

220. *[illegible]*ypeta*), Wiedemann, 1824 (Anal. entom[illegible] and Auss. Zweifl., ii, 508, [illegible]. A widely spread species, w[illegible] synonyms, usually placed in *[illegible]heniscomyia*. Type at C[illegible]agen.

221[illegible] [illegible]t, 1910 (Entom. Nev[illegible]xxi, 308) from Hongkong. Type at [illegible]um, No. 12992.

22[illegible] [illegible] 1858-59 (Nat. Tijdsch[illegible]. Indie, xvii, 119, 75) from [illegible], p. 227, places the species among the synonyms of *Trypeta* [illegible]. Type at Vienna.

22[illegible] [illegible]24 (Anal. Entom., 54, 121, and Auss. Zweifl., ii, 507, 48) [illegible] East I[illegible] (A species [illegible] new genus *Tephrostola*. Type at Copenhagen.

224. *repleta* (*Strumeta*), Walker, 1861 (Proc. Linn. Soc., v. 296, 94) from Batjan. Placed in *Dacus* by Van der Wulp, has a plumose arista and seems to be a *Rioxa*. Type in London.

225. *reticulata* (*Ensina*), Doleschall, 1856 (Nat. Tijdschr. N. Indie, x, 412, 37, pl. xii, f. 2) from Java. A Lauxaniid, upon which Meijere has erected the new genus *Amphicyphus* (Tijdschr. v. entom., 1908, 148, pl. 4, f. 9-10). Type in Vienna. The species is also an Indian one.

226. *retorta* (*Trypeta*), Walker, 1861 (Proc. Linn. Soc., vi, 16, 33) from Gilolo. A Ceratitinine with plumose arista. Type in London.

227. *ritsemae* (*Dacus*), Weyenberg, 1869 (Arch. neerl., iv, 360, pl. vi, f. 1-5) from Java. A true *Bactrocera*; type at Amsterdam?

228. *roborowskii* (*Hemilea*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii, 290, 61, pl. i, f. 6) from Turkestan. Type at St. Petersburg.

229. *roripennis* (*Trypeta*), Walker, 1859 (Proc. Linn. Soc., iii, 131. 15) from Key Island. A Trypaneid with plumose arista. Type in London.

230. *rudis* (*Trypeta*), Walker, 1856 (Proc. Linn. Soc., i, 133, 157) fr[illegible]orneo. A Ceratitinine. Type in London.

231. ***ruficeps* (*Urophora*), Macquart, 1851 (Mem. Soc. Sci. Lille, 461, [487] 12, pl. 26, f. 14) from Tasmania. Seems to be a *Sphenella*; type at Paris.

232. *rufipetia* (*Dacus*), Froggatt, 1909 (Report, 99) from unknown locality. A mere MS. name in Bigot's collection.

233. ***rufitarsis* (*Tephritis*), Macquart, 1847 (Mem. Soc. Sci. Lille, 110, [94], pl. vi, f. c) from N. Holland. Seems to be an Ortalid of the *aenea* group No. 6. Type in B[illegible] Verrall's) collection.

234. *rufiventris* (*Henicoptera*), Walker, 1860 (Proc. Linn. Soc., v, 163. 64) from Am[illegible]na. Osten-Sacken has stated, 1881, p. 479, that this is a synonym of *Adrama sel[illegible]a*. Type in Lond[illegible]

235. *sepedonoides* (*Dacus*), Walker, 1862 (Proc. Linn. Soc., vii, 228. 33) from Waigoe. In my paper of 1909 I have accepted this species as a *Dacus*, but at present its position seems to me to be very obsc[illegible] according to Prof. Hendel it is allied to *longicornis*, Weid. Type in London.

236 *sepsoides* (*Dacus*), Walker, 1860 (Proc. Linn. Soc., v, 163. 62) from Amboina. Probably an Ortalid of the genus *Stenopterina*; according to Hendel belongs to *Elassogaster*. Type in London.

237. *sexincisa* (*Trypeta*), Thomson, 1858 (Dipt. Eugenia Resa, 579. 252) from China. The same as *Sphenisconyia atilia*, Walk. Type at Stockholm. Thomson's spelling 6-*incisa* is incorrect.

238. *sexmaculata* (*Ptilona*), Van der Wulp, 1880 (Tijdschr. v. entom., xxiii, 185, and Dipt. Sumatra, 51, pl. iii, f. 7-11) from Sumatra. In 1898 the species was correctly placed in *Rioxa*. Type at Am[illegible] Enderlein (Zool. Jahrbüch., xxxi, 447) has erected upon this the new genus *Pt[illegible]*

239. *signatipes* (*Dacus*[illegible] 1860 (Proc. Linn. Soc., v. 163. 63) f[illegible] An Ortalid of the grou[illegible] according to Hendel belongs [illegible]

240. [illegible]860 (Proc. Linn. Soc., [illegible]e in London, st[illegible] pl[illegible]ry like that of s[illegible]

241. *sinensis* (*Sphenella*), S[illegible]8 (Diptera Nov[illegible] *Sphenella*. Type at Vienna.

242. *sinensis* (*Trypeta*), Thomson, 1858 (Dipt. Eug[illegible] evi-dently a *Sphenella* allied to the preceding

243. *sinica* (*Trypeta*), Walker, 1857 (Tr[illegible] China. Seems to be allied to *Rioxa*. Type in Lo[illegible]

244. *sordidus* (*Dacus*), Walker[illegible]51. 69) from Mysol. Not a *Dacus* at all, but probably an Ort[illegible]*pterina* group. Type in London.

245. *soror* (*Acidia*), Schiner, 1868 (Dipt. N[illegible] Reise, 264. 100) from Java. With plumose arista, seems to belong to the group *R[illegible]a*, and perhaps a *Taeniostola*. Type in Vienna.

246. *speculifer* (*Dacus*), Walker, 1863 (Proc. Linn. Soc., viii, 122. 53) from N. Guinea. The pattern of the wings is like that of *Callistomyia*. Type in London.

247. **squalidus* (*Dacus*), Walker, 1860 (Trans. Ent. Soc. London, v, 323) from Hindustan. Probably a *Bactrocera*. Type in London.

248. **stella* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1030) from Bengal. Placed in the group *Noeeta*, but seems to be more like a *Tephritis* than a *Carphotricha*. Type in London.

249. *stellata* (*Acinia*), Macquart, 1851 (Mem. Soc. Sci. Lille, 266 [293] 9, pl. 17, f. 7) from Manila. Osten-Sacken has seen the type in Bigot's (now Verrall's) collection, and says that it is a Trypaneid of the group related to *Eutreta*. Enderlein (Zool. Jahrbüch., xxxi, 433, f. 4) records the species from Sumatra, giving a figure of the wing and a complete synonymy.

250. *stellipennis* (*...eta*), Walker, 1860 (Proc. Linn. Soc., iv. 159. 198) from Macassar. Osten-Sacken s... that this is allied to the preceding. Type in London.

251. **striata* (*Ce...itis*), Froggatt, 1909 (Report, 111, pl. v, f. 17) from Ceylon. Belongs to the new genus *...ctaspis*. Type at Peradeniya ?

2... *strigifer* (*...acus*), Walker, 1861 (Proc. Linn. Soc., vi, 13. 46) from Gilolo. An Ortalid, perh...s of the group *Stenopterina*; according to Prof. Hendel it belongs to the genus *A...neura*. Type in London.

253. *...inis* (*Dacus*), Walker, 1861 (Proc. Linn. Soc., v, 295. 90) from Batjan. In my paper of 1909 I have considered this species as a *Dacus*, but at present this seems to me very doubtful. Type in London.

254. ***...strigipennis* (*Tephritis*), Macquart, 1851 (Mem. Soc. Sci. Lille, 263 [280]... 16, pl. 27, f. 2) from N. Holland. Seems to be a *Ceratitis*. Type in Paris.

255. *subocellifera* (*Trypeta*), Walker, 1859 (Proc. Linn. Soc., iii, 120. 146) ...om Aroe. Seems to be a Lauxaniid of the group of *Sapromyza trypetoptera*, on account of the colouring of the thorax. Type in London.

256. *succinatus* (*Dacus*) ...emann, 1830 (Auss. Zweifl., ii, 526. 20) from unknown locality. An Ortalid of the genus *Rivellia*, as stated by Loew (Monogr., iii, 12 and 44) who erroneously called the species *succinctus*. Type at Vienna.

257. *succinctus* (*Dacus*), Loew, 1873 (Monogr. N. Amer. Dipt., iii, 12) is a misprint for *succinatus*.

258. *tacia*, Van der Wulp, 1896 (Cat. Orient. Dipt., 192); is a misspelling for *tucia*, No. 269.

259. *taeniata* (*Urophora*), Macquart, 1843 (Mem. Soc. Sci. Lille, 379, [222] 3, pl. 30, f. 6) from Java. An Ortalid of the group Platystominae. Type in Paris.

260. *tau* (*Dasyneura*), Walker, 1849 (List Dipt. Brit. Mus., iv. ... in China. A true *Bactro-*... in London.

... Becker, 1907 (Mem. Acad. Sci. St. P... xii. 287. 54) from Turkestan. Type at St. Petersburg.

... A *Bactro-*... 1860 (Proc. Linn. S... Type in Lon... 1851 (Mem. So... 31] 16, pl. 26, f. 12) from ...gotine. Type a...

...860 (Proc. Linn. Soc., iv. 155. 190) from Macassar. Osten-...losely related to *flava*. Type in London.

... n. Soc., v. 164. 66) from Amboina. Seems to be a Trypaneid...

266. *trivittatus* (*Dacus*), Walker, ...us., iv. 1072) from the Philippine Islands. Seems to be a *Stenopterina*, ...logue has the species twice over, once as *Stenopterina* and once ... ...on.

267. ***tryoni* (*Tephritis*, *Dacus*), Frogg... ...897 (Agric. Gazette N. S. W., 410, pl. 8, f. 1 and Report, 1909, 79, pl. i, f. 1, and pl. vi) from Australia. A true *Bactrocera*, with two scutellar bristles, the same as *ferruginea*. Type in Sydney.

268. *tubifera* (*Trypeta*), Walker, 1857 (Trans. Ent. Soc. London, iv, 230) from China. Seems to be a Ceratitinine. Type in London.

269. **tucia* (*Trypeta*), Walker, 1849 (List Dipt. Brit. Mus., iv, 1021) from Bengal. Placed by its author in *Urophora* but is really a *Spheniscomyia* synonymous with *quadrincisa*, Wied. Type in London.

270. *turgidus* (*Dacus*), Walker, 1863 (Proc. Linn. Soc., viii, 134. 10) from N. Guinea. Is a Micropezid of the genus *Diplochorda*, as stated by Osten-Sacken, who has seen the type in London.

271. *umbrosus* (*Dacus*), Fabricius, 1805 (Syst. Antl., 274. 7, and Wiedemann, Auss. Zweifl., ii, 517.

7) from Sumatra. A widely spread species, the type of the *B[illegible]rae* with banded wings. Type at Copenhagen.

272. ***undecimguttata* (*Trypeta* 11-*guttata*), Thomson, 1858 (Dipt. Euge[illegible] Resa, 581. 255) from Sydney. Seems to be a *Tephritis*. Type at Stockholm.

273. **vaga* (*Trypeta*), Wiedemann, 1830 (Auss. Zweifl., ii. 490. 21) from B[illegible]gal. A tru[illegible] *Rioxa*. Type at Vienna.

274. *variabilis* (*Ptilona*?), Kertesz, 1901 (Termesz. Füzet., xxiv. 426, 24, pl. [illegible]o, f. 1[illegible] from N. Guinea. Meijere also refers this species to *Ptilona*, but the presence of a[illegible]es makes this impossible. Type at Budapest.

275. *varialis* (*Dacus*), Walker, 1863 (Proc. Linn. Soc., viii, 123. 56) from N. Gui[illegible]. Probably Ortalid, which belongs to *Elassogaster* according to Hendel. Type in London.

276. *variata* (*Urellia*), Becker, 1907 (Mem. Acad. Sci. St. Petersburg, xii. 286, 51, pl. i. f. 4) from Turkestan. A typical *Trypanea*. Type at St. Petersburg.

277. **varipennis* (*Leptomyza*), Van der Wulp, 1897 (Termesz. Füzet., xx. 143, 28, pl. iii, f. 3–4) from Ceylon. As [illegible] by Czer[illegible] who has seen the type at Budapest, the present species is an *Oxyna*, and I think it is the same as [illegible] Wied.

278. *venusta* (*Sophira*), Walker, 1856 (Proc. Linn. Soc., i. 35, 113, pl. ii, f. 1) from Singapore. Is an Ortalid. Type in London.

279. *vespoides* (*Bactrocera*?), Doleschall, 1858-59 (Nat. Tijdschr. N. Indie, xvii, 123. 80) from Amboina. In my paper of 1909, p. 292, I have placed this species in synonymy with *longicornis*, Wied. No. 156. Type at Vienna.

280. *violacea* (*Tephritis*), Gray, 1832 (Griffith, Anim. Kingd., ii. pl. 128, f. 1) from S. Asia. Is the handsome well-known Ortalid *Loxoneura decora*, Fabricius.

281. *violacea* (*Tryp[illegible]*[illegible]emann, 1830 (Auss. Zweifl., ii. 476, 1) from Java. Osten-Sacken (Ann. Mus. ci[illegible]ra, xvi, 464) places this species in the gen[illegible] which is placed among the Or[illegible] Westwood's figure of the type of *Xi[illegible]* [illegible]onto-orbital bristles. Type [illegible]n Museum.

282. ***virgatus* (*Dacus*), Coq[illegible]910 (Entom. News, x[illegible] bred from guavas. No[illegible]is said abo[illegible] [illegible]. No. 12[illegible]

283. [illegible] (Mem. Soc. S[illegible] [illegible]. Type in Paris.

284. ***vittipennis* (*Trypanogramma*?) Grimshaw, 190[illegible] Hawaii. A very peculiar [illegible]

285. **vittithorax* (*Urophora*), M[illegible] [illegible]26, f. 11) said to be from [illegible]een [illegible]eously given, because, as stated by L[illegible]t species is synonymous with the Neotropical *Anasi[illegible]* Bigot's (Verrall's) collection at Newmarket.

286. ***xanthodes* (*Tephritis*, *Dacus*[illegible], Bro.,1894 (Trans. N. Zeal. Instit., xxxvii, 327) from N. Zealand and Fiji. See als[illegible]o Froggatt, port, 1909, 91, pl. i, f. 3. A *Bactrocera*, closely allied to *ferruginea*, Fab[illegible]

287. *ypsilon* (*Themara*), Ronda[illegible]n. Mus. civ. Genova, vii, 435) from Borneo. As the second vein is straight, this [illegible]annot belong here; it is perhaps a Ceratitinine. Type at Genova, Museo Civico. A[illegible]ding to Enderlein (Zool. Jahrbüch., xxxi, 422), who records the species from Sumat[illegible], it belongs to *Acanthoneura*.

288. **zonata* (*Dasyneura*), W. W. Saunders, 1841 (Trans. Entom Soc. London, iii, 61, pl. 5, f. 3) from Bengal; Walker, List Dipt. Brit. Mus., iv, 1075. The type of the genus *Dasyneura*, which is synonymous with *Bactrocera*. Type in London. See also Enderlein, Zool. Jahrbüch., xxxi, 408.

The present li[illegible]s already written, when I received a paper by Mr. Froggatt (*Notes on Fruit-Fli[illegible]rypetidae) with descriptions of new species*, 1911) and another by Dr. Enderlein (*Trypetiden-Studien*, 1911). I give below a list of the new species and genera of the Oriental and Australian regions described in these papers; minor citati[illegible]s will b[illegible]nserted at convenient places in the text.

289. *appen[illegible]culata* (*Sophira*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 434, fig. M) from Sumatra. A very interesting species. Type in Museum at Stettin, like the following.

290. [illegible] (*Acanthoneura*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 417, fig. B) from Sumatra. A good species near *fuscipennis*, Macq.

291. *bisetosa* (*Ensina*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 455, figs. Y and Z) from Formosa. Seems to be *Oxyna sororcula*, Wied., a widely spread species.

292. *formosana* (*Acanthoneura*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 41[illegible], fig. C) from Formosa. Seems to be a typical *Rioxa* in my opinion.

293. *formosana* (*Trypeta*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 427, fig. H) from Formosa. Is the widely spread [illegible]*scomyia sexmaculata*, Macq.

294. *gigantea* (*Henicoptera*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 413) from Sumatra. A very interesting species.

295. ***hirki* (*Dacus*), Froggatt, 1911 (Proc. Linn. Soc. N. S. Wales, xxxv, 871) from ? New Zealand. A true *Bactrocera*.

296. *latilimbata* (*Euphranta*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 438, fig. P) from Sumatra. Very doubtful; the author says nothing about the *de* , which in the genus *Euphranta* are wanting. Probably a *Rioxa*, as stated by Prof. Hendel, Wien. Entom. Zeit., xxxi, 15.

297. *lemniscata* (*Trypeta*), Enderlein, 1911 (Zool. Jahrbüch., xx[illegible]ig. G) from Formosa. Is no[illegible]*Trypeta*.

298. *li[illegible]* Enderlein, 1911 (Zool. Jahrbüch., x[illegible]fig. N) from Sumatra. A [illegible]ies.

[illegible]gatt, 19[illegible] (Proc. Linn[illegible]. S. Wales, xxxv, 863) from W. [illegible]pecies, which [illegible]ps belongs to *Carpophthoromyia*.

[illegible]in, 1911 (Zool.[illegible]üch., xxxi[illegible] Java. Seems to [illegible]*us*.

[illegible] (Zool. Jahrbüch., xxxi, 439, fig. Q) from Sumatra. A [illegible]ably not of this genus. Prof. Hendel says that it is a

[illegible]hrbüch., xxxi, 420, fig. D) from Sumatra. S[illegible]to be [illegible]

303. *ortalina* (*Dimeringophrys*), H[illegible] 452, fig. W) from Sumatra. This new genus seems t[illegible]account of the reduced chaeto-taxy of the head.

304. ***passiflorae* (*Dacus*), Froggatt, 19[illegible] (Proc[illegible]. N. S. Wales, xxxv, 870) from Fiji and New Zealand. Seems to be a true *Bactr*[illegible]unspotted wings.

305. ***pepisalae* (*Dacus*), Froggatt, 1911 (Proc[illegible]. N. S. Wales, xxxv, 869) from the Solomon Islands. There is some doubt [illegible]pecies really belongs to the Dacinae.

306. *pulchralis* (*Colobostroter*), Enderlein, 1911 (Z[illegible]rbüch., xxxi, 445, fig. T) from Sumatra. The position of this new genus among Trypa[illegible]s seems to be very doubtful.

307. *quadrifasciata* (*Spilographa*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 436, fig. O) from Sumatra. The pattern of the wings is like that of the new genus *Taeniostola*, but the arista is only pubescent.

308. ***rarotongae* (*Dacus*), Froggatt, 1911 (Proc. Linn. Soc. N. S. Wales, xxxv, 872) from Cook Island. Seems to be the same as *D. melanotus*, Coq., No. 170 from the same locality.

309. *sauteri* (*Tephritis*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 456, f[illegible] from Formosa. A true *Tephritis*.

310. *sumatrana* (*Rioxa*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 449, [illegible]U) from Sumatra. A true *Rioxa*, perhaps the same as my *quinquemaculata*.

311. *sumbana* (*Platensina*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 454, [illegible]X) from [illegible]mba. Seems to be a species allied to *acrostacta*, Wied. It consequently [illegible]ows that [illegible]y new genus *Tephrostola* is the same as *Platensina*, the latter having pri[illegible]ity. T[illegible]e genus however has nothing to do with *Ensina*.

312. *superfluctа* (*Trypeta*), Enderlein, 1911 (Zool. Jahrbüch., xxxi, 428, fig. Z) [illegible] Formosa. Seems not to be a true *Trypeta*.

313. [illegible]*ugensis* (*Dacus*), Froggatt, 1911 (Proc. Linn. Soc. N. S. Wales, xxxv, 876) from Tonga Islan[illegible] and New Zealand. Seems to be a *Bactrocera* with hyaline wings, different from the species described by Coquillett from the same locality.

314. ***zonatus* (*Dacus*), Froggatt, 1911 (Proc. Linn. Soc. N. S. Wales, xxxv, 868) from the Solomon Islands. Is [illegible]ly different from the Indian *zonatus*, Saund., being moreover twice as large; perhaps a *Bactrocera*.

In the meantime three other papers have appeared dealing with Trypaneids, one by Prof. J. C. H. de Meijere (*Studien über Südostasiatische Dipteren* vi, 1911), and two by Prof. Fr. Hendel (*Neue Muscidae Acalypteratae*, 1912 and *Genus Dacus* from *H. Sauter's Formosa-Ausbeute*, 1912). I have inserted in the text some citations, chiefly concerning Prof. Hendel's last paper, which has, as usual, a very great importance, and I will complete the above list in the following lines.

315. *albistrigatu*[illegible], 1911 (Tijdschr. v. Entom., liv, 377, 4, pl. 20, f. 33) from Java. A *B*[illegible]d wings. Type in Amsterdam.

316. *abi*[illegible]II (Tijdschr. v. Entom., liv, 376[illegible]*cera*, [illegible]sterdam.

[illegible](Wien. Ento[illegible]cit., [illegible]pe in

318. *chr*[illegible]*sotoxus* (.[illegible]nds. A tru[illegible] *Bactrocer*[illegible]

319. *cilifer* (*Dacus*), Hen[illegible] [illegible]us *Bactrocera*. Type in [illegible]

320 *conopsoides* (*Dacus*), Meije[illegible] A *Dacus* s. l., with stalked abdor[illegible]gico[illegible]d.). Type in Amsterdam.

321. *cruciata* (*Psila*), [illegible]i, 126, 03) from New Guinea. As recognized by ([illegible]to *Adrama selecta* no. 332. Type in London.

322 *dorsalis* (*Dacus*), Hendel, 19[illegible] pl. i, f. 3) from Formosa. A true *Bactrocera* allied to *ferruginea*. Type[illegible] Berlin, Deutsch[illegible] Entom. Museum.

323. *hageni* (*Dacus*), Meijere, 1911 (Tijdschr[illegible] Entom., liv, 375, 2) [illegible]rom Sumatra. A *Bactrocera*, near *ferruginea*. Type i[illegible]seum.

324. *imitans* (*Lagarosia*), Meijere, [illegible]r. v. Entom., liv, 383, 2) from Java. Type[illegible]m. sterdam.

325. *lacteata* (*Lagarosia*), Van der Wulp, 1891 (Tijdschr. v. Entom., xxxiv, 211, pl. 12, f. 13) from Java. The typical species of the genus *Lagarosia* which was considered by its author to belong to the Ortalids. Prof. Meijere, and subsequently Prof. Hendel have shown that it is a true Trypaneid, belonging to the Ceratitinae with plumose arista. Type in Amsterdam.

326. *maculifrons* (*Acanthipeza*), Rondani, 1875 (Ann. Mus. Civ. Genova, vii, 438), from Borneo. The type is the genus *Acanthipeza*, but according to Osten-Sacken (1881, p. 479) it is synonymous with *Adrama determinata*. Type at Genova, Museo Civico.

327. *nubilus* (*Dacus*), Hendel, 1912 (Suppl. Entom., i, 16, 2, pl. i, f. 2) from Formosa. A true *Bactrocera*, described as a variety of *caudata*. Type in Berlin, Entom. Museum.

328. *obscurata* (*Dacus*), Meijere, 1911 (Tijdschr. v. Entom., liv, 373, 1) from Java. A *Bactrocera*, described as a variety of *ferruginea*. Type in Amsterdam.

329. *[illegible]nctata* (*Rioxa*), Meijere, 1911 (Tijdschr. v. Entom., liv, 381) from Java. A true *Rioxa*, described as a variety of *sexmaculata*. Type in Amsterdam.

330. *[illegible]ulus* (*Dacus*), Hendel, 1912 (Suppl. Entom., i, 21, 5) from Formosa. A true *Bactrocera*, near *ferruginea*. Type in Berlin, Entom. Museum.

331. *scutellatus* (*Dacus*), Hendel, 1912 (Suppl. Entom., i, 20, 4, pl. i, f. 4), from Formosa. A true *Bactrocera*. Type in Berlin, Entom. Museum.

332. *selecta* (*Adrama*), Walker, 1859 (Proc. Linn. Soc., iii, 118, 139) from Aru Islands. The typical species of the genus *Adrama*, which is considered by Prof. Hendel to belong to the Trypaneids, near *Meracanthomyia*. Type in London.

333. *smieroides* (*Callantra*), Walker, 1860 (Proc. Linn. Soc., iv, 154, 187) from Macassar. Prof. Hendel (Suppl. Entom., i, 15) says that this species is very like a *Dacus s. l.*, with stalked abdomen; it is therefore perhaps a Trypaneid, while the following genus *Aragara* belongs to the Ortalids. Type in London. *Smieroides* is evidently a misprint for *smicroides*.

334. *striatella* (*Lagarosia*) Van der Wulp, 1891 (Tijdschr. v. Entom., xxxiv, 213, pl. 12, f. 14) from Java. According to Prof. Meijere, 1911, p. 383, is evidently the female of *lacteata*, no. 325. Type in Amsterdam.

[illegible] NOMENCLATURE AND CLAS[illegible]

I [illegible]50 (Boll. Labor. Zoolog. Port[illegible]ve already disc[illegible]nd the classification [illegible] here briefly [illegible] giv[illegible] characte[illegible]

For [illegible] by [illegible] Me[illegible] the genus *Trypeta*, ham[illegible]e,. 1804, the family [illegible]. Quite recently, however, a[illegible] the same as *Euribia*, Meigen, 1800, Czerny has pro[illegible]ver[illegible]p. 252) to call the family Euribiidae. I have already ([illegible]*ypanea* (*Trupanea*) of Schrank, 1795, must be employ[illegible]u-Desvoidy) Loew, and therefore the family name mus[illegible], and must be Trypaneidae, as used in the present pape[illegible] *Trypanea*, 1756, cannot be taken into consideration, being pri[illegible] to the year 175[illegible]

The subdivision [illegible]he family Trypa[illegible]y difficult, and up to the present has not been effected in a satisfactory [illegible] I have proposed to divide the family into two subfamilies, the Dacinae and the Trypaneinae, and the latter into three tribes.

1. *Subfamily Dacinae.*—Antennae elongate, as long as or longer than the face, usually bare, or very rarely shortly pilose. *Oc.* wanting; *pvt.* wanting or very small; occipital row wanting. *Hm.*, *prst.* and *dc.* wanting; anterior *sa.* and *prsc.* sometimes

wanting; *pt.* usually weak; *st.* wanting. Abdomen of the female with the last segment (5th or 6th) hidden. Front femora without bristles below, or very rarely bristly. Scutellum with two or four bristles; if the bristles are only two it is always the basal (not the apical) pair that is absent. Wings with the auxiliary vein very approximate to the first longitudinal vein, and often very little distinct; the first three longitudinal veins are usually very approximated, the others more distant, the small cross-vein is therefore very long and oblique. Second basal cell usually very much dilated, and short at the base; anal cell narrowed, its inferior angle usually drawn out into a very long point, much longer than the second basal cell. Pattern of the wings usually very simple and reduced to a fore border and some stripes; banded wings are very rare, and reticulated wings are never found.

The principal character of the subfamily is the reduced chaetotaxy of the head and of the thorax. The species are tropical or subtropical and live almost exclusively in the old world. The larvae live only in fruits of various kinds, and are never gall-makers.

Loew was not clear as to the limits of his group *Dacinae*, which is very different from the subfamily here defined; he has drawn the characters chiefly from the shape of the abdomen of the female. *Ceratitis* and allied forms have been often placed near *Dacus*, with which, however, they have nothing to do, as is shown by their very developed chaetotaxy.

The subfamily *Dacinae* is not at present rich in genera; besides the genus *Dacus s. l.*, it probably *actrocera* [illegible] the very distinct American genus *Toxotrypana*,[1] and certainly the *alis* (*Dacus*), *Meracanthomyia*, Hendel, with [illegible] *Henicoptera* and [illegible] near *ferruginea*. [illegible] perhaps to be placed here [illegible] the reduced [illegible] *austeni* (*Adrama*). Hendel [illegible] ae of the [illegible] Dacinae are distinguished by the pilose femora are bristly. Hendel, [illegible] the first [illegible] wings are not approximated, [illegible] second basal cell is not [illegible] angle of the anal cell is not drawn out [illegible] basal cell.

If we take the well-known *Dacus* [illegible] *Dacus*, we will find that the major [illegible] considered as congeneric with it. The [illegible] ted to the forms which have no anterior *sa.* and no *prs* [illegible] en with distinct segments and a flattened ovipositor. [illegible] *longistylus*, Wied., which have the same chaetotaxy as the species [illegible] ry elongate body, an abdomen with partly fused segments and a cylindrical unflattened ovipositor, belong to a distinct genus which will bear the name *Leptoxyda*, M[illegible] do not know if all the African species belong [illegible] two groups, or if [illegible] other genera; but as far as I know, the African species are very distinct from the Oriental and Australian species principally by reason of their more reduced chaetotaxy.

The Oriental (and Australian) species have always a pair of *prsc.* and one anterior *sa.* bristle, and the scutellum bears very often four bristles. All the known

[1] Chiefly on account of its very reduced chaetotaxy; it would be the only Dacine of the new world.

Indian species belo[illegible] to one single genus, which I have previously named *Chaetodacus*; but subsequ[illegible] I recognized that it is better to distinguish them under the name *Bactrocera*, C[illegible]in-Méneville. If the species with banded wings (type *umbrosus*) are considered ge[illegible]rically distinct from those with unbanded wings (type *ferrugineus*), for t[illegible] latter t[illegible] generic name *Dasyneura*, W. W. Saunders, must be used; but this name [illegible]eing pr[illegible]ccupied by Rondani in the Diptera, my name *Chaetodacus* will replace it. *St[illegible]meta* Walker, is synonymous with *Bactrocera*, or with the group of species with ban[illegible] wings.

2. *Subfamily Trypanеinae.*—Antennae usually shorter than the face, with a bare, pilose or plumose arista. *Oc.* mostly present, strong or small, as also the *pvt.*; occipital row more or less developed, but never wanting. *Hm.* always present, but in a single case wanting; *prst.* rarely wanting; anterior *sa.* present; *prsc.* and usually one or rarely two pairs of *dc.* present; *st.* almost always present; *pt.* usually strong. Scutellum usually with two pairs of bristles, but sometimes with three pairs; if only one pair is present it is always the basal (not the apical) pair, that is to say, the apical pair only can be wanting. Anterior femora usually bristly below (bare in *Euphranta*). Abdomen of the female with the last segment distinct and the others never fused together; the ovipositor usually flattened (cylindrical in some *Anastrepha*, *Carpophthoromyia* and *Urophora*). Auxiliary vein distinct; the first three longitudinal veins not approximated; second basal cell not dilated; anal cell not narrowed, with the inferior angle drawn out in a point or not [illegible] or longer than the second basal cell. Pattern of the wings varying from t[illegible]ION[illegible]ed to the reticulated type, rarel[illegible] The species are proper to tropi[illegible]p. 2perate and even cold cou[illegible] fruits, or in various p[illegible]amily [illegible]getables, and are very often [illegible] the su[illegible]

Th[illegible] [illegible]itidae[illegible]sed genera of Tr[illegible] No[illegible] attem[illegible]ivide it; an[illegible]think [illegible] Loew in his generic divi[illegible] the wings, chiefly for practical [illegible]ittle modification, and so have all subseq[illegible]en a more scientific arrangement, but he lays [illegible] [illegible]ngths of the various portions of the fourth longitudinal vein [illegible]

I think that the subdivisio[illegible] into other groups of subfamily rank is not at presen[illegible]n that three secondary groups or tribes can be disting[illegible] characters:—

1*st Tribe: Ceratitini*[illegible] Occipital r[illegible]ormed by thin black bristles, which at the most are [illegible]n the postver[illegible] or the row is almost wanting, being [illegible] the superior portion[illegible]en pilose or plumose. Thorax [illegible]othed on the back with black pubescence. Wings with the third longitudinal vein usually bristly over its whole length, or at least towards the base; anal cell usually with its lower angle drawn out into a point, and therefore as long as, or longer than, the second basal cell (obtuse in *Gonyglossum*). Wing-pattern of the banded type. The species of this tribe are most abundant in tropical or subtropical

countries, but are not rare in temperate regions. The larvae often live in fruits like those of the Dacinae; but some species mine into the [illegible]es of umbelliferous plants or of Compositae; a few species are gall-makers, but none live in the flower-heads of the Compositae.

2nd Tribe: Myiopitininae. This tribe has the same characters as the preceding; but the anal cell is always obtuse, its lower angle is never drawn out in a point; the ovipositor is long and cylindrical; the wings are banded. The species are found exclusively in temperate countries, being wanting in the tropics; the larvae live only on plants of the family Compositae, and often make galls.

3rd Tribe: Trypaneininae. Occipital row usually formed of strong yellow bristles, which are usually obtuse at the end. Thoracic pubescence yellowish. Wings with the third longitudinal vein usually bare; anal cell never longer than the second basal cell (obtuse in some forms). Wing-pattern usually of the reticulate type, rarely banded and sometimes hyaline. Ovipositor flattened. Arista usually bare. The species occur in temperate countries and also in cold regions; the larvae live usually in the flower-heads of the Compositae, and sometimes make galls, even on the roots of plants of this family.

The known genera of Trypaneids are arranged as follows in my classification:—

Subfam. DACINAE.

Toxotrypana (*M[illegible]*).
Dacus.
Leptoxyda (*Lept[illegible]*
Bactrocera (*Strume[illegible]neura*, *Chaetodacus*).

? Henicoptera.
? Cardiocera.
Meracanth[illegible]
Adram[illegible]

Subfam. TRYPANEIDAE.

Tribe CERATITINI.

Anastrepha (*Acrotoxa*, *Leptoxyda*).
Hexachaeta.
Blepharoneura.
Polymorphomyia.
Xarnuta.
Dimeringophrys.
(Xiria).
(Sophira).
Colobostroter.
Acanthoneura (*Themara*).
Rioxa (*Ptilonina*).
Ptilona.
Conradtina.
Euphranta (*Mosina*).
Lagarosia.

[illegible]a (*Epidesmia*, *Myioleja*).
[illegible]eros (*Hemilea*).
[illegible]enidium.
Rh[illegible]chlaena.
Chaet[illegible]
Stemono[illegible]
Vidalia.
Straussia (*Strauzia*).
Molynocoelia.
Spilographa (*Forellia*, *Phorellia*).
Zonosema.
Rhagoletis.

Euleja (*Philoph*[illegible])
Carpomyia.
Myiopardalis.
[illegible]onyglossum (*Orellia*).
[illegible]daspis.
P[illegible]ionota.
Ced[illegible]ochares.
Pero[illegible]ma.
Ceratitis (*Petalophora*, *Halterophora*).
Lenophila.
Carpophthoromyia.
Anomoea (*Phagocarpus*).
Epochra.
Spheniscomyia (*Spheniscus*).
Aciura.
Coelopacidia.

Tribe Myiopitininae.

Myiopites (*Stylia*).
Asimoneura.
Urophora.

Tribe Trypaneininae.

Schistopterum.
Rhochmopterum.
Rhabdochaeta.
Stenopa.
Euribia (*Trypeta*, *Orellia*, *Cerajocera*, *Sitarea*, *Terellia*).
Phaeogramma.
Plagiotoma.
Neoaspil[illegible]*philota*).
[illegible]
Eut[illegible]
[illegible]
Ca[illegible]
Hoplochaeta).
Eurosta.
Acidogona.
Elaphromyia.
Xenochaeta.
Oedicarena.
Oxyphora (*Xyphosia*).
Icterica (*Westermannia*, Lioy preocc).[1]
Sphene[illegible]*eura*, Lioy).
Ensi[illegible]
O[illegible]
[illegible]niophilus.
[illegible]piglossa.
[illegible]
Tephritis (*Ditricha*, *Spathulina*, *Acinia*).
[illegible]anea (*Urellia*, *Actinoptera*, *Tru-*

7. KEY FOR THE [illegible]E GENERA.

In the following key the g[illegible] the collection submitted for my study are distinguis[illegible]. The ab[illegible]viations used in naming the bristles of the head and th[illegible]hose propose[illegible] the second chapter and explained by the figu[illegible]

[illegible]: wanting; no *hm.*, *prst.* and *dc.*; a[illegible]in faintly distinct; second basal cell dilated.

2 (3). Anterior *sa.* and *prsc.* wanting; ovipositor cylindrical .. *Leptoxyda*, Macq.

3 (2). Anterior *sa.* and *prsc.* always present; ovipositor flattened .. *Bactrocera*, Guer.-Men.

[1] *Westermannia*, Lioy, 1863, has the same type species as *Icterica*, Loew, 1873, and has therefore priority, but is preoccupied.

a (*b*) Wings not banded .. .. .. *Chaetodacus*, n. gen.
b (*a*) Wings banded .. .. .. *Bactrocera*, G.-M.

4 (1). Sternopleural bristle always present;[1] *hm.*, *prst.* and *dc.* v… rarely wanting; auxiliary vein well distinct; second basa… cell of usual size.

5 (48). Occiput with the usual row of black bristles, or with bristles only on the upper side; if rarely the occipital bristles are yellow, they are thin and pointed; thorax usually with dark dorsal pubescence; arista mostly plumose or pubescent; proboscis not elongated; third longitudinal vein usually bristly throughout its whole length.

6 (37). Third longitudinal vein bristly throughout its whole length, or at least from the base to the small cross vein.

7 (8). No *hm.*; middle tibiae with 2 apical spurs; *dc.* and *prsc.* present; no *oc.*; *or.* 2. 2; oc… strongly swollen below; arista plumose; body black, marked with white; wings with brown rivulet-pattern .. .. *Anoplomus*, n. gen.

8 (7). *Hm.* always present.

9 (12). Frons flattened, thinly pilose, longer than the face; antennae inserted below the middle of the eyes; no *oc.*; arista plumose only on the upper side; wings without entire cross-bands.[2]

10 (11). No lower *or.*; colouring of body yellow; wings with yellowish markings toward the fore border .. .. .. *Chaetellipsis*, n. gen.

11 (10). Lower *or.* … colouring of body tawny and shining black; wings … n fore border .. .. .. *Poecillis*, n. gen.

12 (9). Frons not f… as long as, or longer than the face, not thi… pilose a… rds the middle; antennae insert… above the mi… eyes; arista usually plu… sides.

13 (16). …d longitudinal ve… .

14 (15). Second longi… l vei… ght at base and … very broad; body s… rown co… black with hyaline spots and indentati… 1st, 3rd and 5th veins bris… Macq.

15 (14). Second vein wavy at … bla… e yellow longi-… bare .. *Xanthorrhachis*, n. gen.

16 (13). …

17 (18). *Pr*… and *dc.* wanting … at the tip; … with four bris-tles; third antennal joint rou… body brown and dark yellow… gs with hyaline … plumose; and spots .. .. .. Wulp.

18 (17). *Prst.* and *dc.* always p…

19 (22). Scutellum flattened, with six strong bristles, rarely the middle

[1] Wanting in *Henicoptera*, according to Osten-Sacken, and therefore this genus belongs probably to the Dacinae.

[2] *Ceratitis s. str.* shows a similar shape of head, but the arista is only shortly pubescent on the upper side.

pair ... than the others; no *oc.* or very weak; arista plum... body dark yellow or brownish, with black bands on the ... men; wings with hyaline spots and indentations.

... (21). Eyes v... narrow; face convex .. .. .. *Diarrhegma*, n. gen.

... (20). Eyes ... usual size, rounded; face concave .. .. *Rioxa*, Walker.

... (19). Scu... um with four bristles only.

... (24). A ... istinct *pp.*; four posterior femora spinulose beneath; middle tibiae with two spurs; abdomen narrowed at the base, almost pedunculate; no *oc.*; arista shortly plumose; body tawny, with yellow and black markings; wings with cross bands and broad apical spot .. .. *Callistomyia*, n. gen.

24 (23). No distinct *pp.*; femora not spinulose beneath; abdomen not pedunculate; middle tibiae with a single spur.

25 (32). Arista long plumose.

26 (27). *Oc.* very little developed, weak and short; third antennal joint rounded at the tip; small cross vein placed after the middle of the discal cell; body brown or yellowish, with black markings; wings with brown or yellowish rivulet-pattern, without basal black streaks .. .. *Gastrozona*, n. gen.

27 (26). *Oc.* very strongly developed, strong and long.

28 (29). Third antennal joint rounded at the tip; body yellowish ferruginous, with black longitudinal stripes on thorax and black cross-bands on abdomen; wings with four brownish cross-bands, the externals fused together at fore borde... *Taeniostola*, n. gen.

29 (28). Third ...ennal joint pointed at end.

30 (31). ...vein placed on or before the middle of the ... l; ...llen, with shining black spots ... rn ...h basal black streaks; bod... low .. *Stictaspis*, n. gen.

3... ... scutellum ... len, yellow ...dy elongate, ... wings with ...tions, without ... black... e, ... in the ... entations of .. .. .. *Phacospila*, n. gen.

... discal cell;

33 (... hind c... ver... with peculiar brist... side; body black-sp... .. *Ceratitis*, Mac Leay. black streaks towar... cross-vein

34 (33). Small cross-vein mor... shortly pilose ... ubescent on both sides; not oblique; ar...sal black streaks ... wi... ...teriorly; frons of ... orn-like pro-

35 (36) ... or with very incrassated and ... s .. *Vidalia*, R. D.

... (35). Face not retreating; frons of the male without such bristles .. *Acidia*, R. D.

37 (6). Third longitudinal vein wholly bare, or with few bristles at the base only.

38 (39). Scutellum with two bristles only; *oc.* strong; arista pubescent; small cross-vein after the middle of the discal cell; body black; wings with hyaline spots and indentations .. *Aciura*, R. D.

39 (38). Scutellum with four bristles.

40 (41). *Prst.* wanting; *oc.* small; only a pair of superior *or.*; shortly plumose, body narrow, elongate; no distinct cos bristle; small cross-vein before or on the middle of the discal cell; colouring pale cinereous or black, wings banded .. *urella*, n. ge

41 (40). Thoracic chaetotaxy complete: two superior *or.*

42 (45). Small cross-vein before the middle of the discal cell; anal cell short; arista pubescent; body yellow, with shining black spots on thorax and scutellum; wings with yellowish cross-bands.

43 (44). A pair of strong *oc.*; second longitudinal vein with a stump; cheeks very broad .. .. *Myiopardalis*, Bezzi.

44 (43). *Oc.* entirely wanting; second vein without stump; cheeks rather narrow .. .. *Carpomyia*, A. Costa.

45 (42). Small cross-vein on or after the middle; body black or yellowish, not spotted; wings with blackish bands or spots.

46 (47). No costal bristle; body elongate, yellow; wings with cross-bands dissolved into spots .. .. *Zonosema*, Loew.

47 (46). Costal bristle present; body short, shining black; wings with black cross-bands, united together .. .. .. *Spheniscomyia*, n. nom.

48 (5). Occipital row formed by strong yellow bristles, which usually are obtuse at the end; thorax with pale pubescence; arista usually bare, or at most shortly pilose; proboscis often elongate and geniculate; third longitudinal vein usually bare.

49 (50). Third longi ein bent at end against the fourth, the fi posterior therefore narrowed at the end yellow, wit s on the thorax; wings w fore border .. n. gen.

Third longitudinal ve llel or diver

ior ce narrowed.

51 (54). Proboscis prolonged ate.

52 (53). Wings with a middle cross-band; scutell cross-veins conspicuously ap imat

53 (52). Wings reticulate; scut or the apical ve *Oxyna*, R. D.

54 (51). Proboscis abella are elong oboscis there-fore does

55 (56). Body slender, el with parallel sides; anal cell obtuse; wing- consisting ry numerous and small subhyaline dot .. .. *Paralleloptera*, n. gen.

56 (55). Body shorter and mo of usual shape; with the lower ang

57 (60). Wings with hyaline indentatio nd spots, as in *Aciura*.

58 (59). Scutellum with four bristles; costal bristle well developed, often double .. .. *Tephrostola*, n. gen.

59 (58). Scutellum with two bristles only; costal bristle less developed .. *Tephrella*, n. gen.

60 (57). Wings reticulate or with a star-shaped pattern at the distal extremity.

61 (62). Wing-pat[illegible] not radiating at the margin; scutellum usually with four [illegible] strong bristles. .. .. .. *Tephritis*, Latr.

62 (61). Wing-pa[illegible] radiating.

[illegible] (64). The wh[illegible] surface of the wings with a unicolorous reticulation; sc[illegible]llum with four bristles .. .. .. *Campiglossa*, Rond.

64 (63). Only [illegible]e distal extremity of the wings with a star-shaped pattern; scutellum usually with two bristles only .. .. *Trypanea*, Schrank.

8. DESCRIPTION OF THE SPECIES.

Family TRYPANEIDAE.

1. Subfamily DACINAE.

1. **Leptoxyda**, Macquart.

Macquart, Hist. Nat. des Ins. Dipt., ii, 452. 2, (1835) [illegible]

As stated above I incl[illegible] this genus the species of *Dacus s. l.* which have neither *prsc.* nor anterior *sa.* bristle; these differ from *Dacus s. str.* in having an elongated body and a cylindrical borer in the female. The type of the genus is *L. testacea*, Macquart, *l. c.*, which seems to be the same as *Dacus longistylus* of Wiedemann, 1830, or at least a closely allied species. Macquart in 1843 has emended his own name to *Leptoxys*, which is perhaps orthographically better; but at the same time he has employed it in a different sense, including some Neotropical species which are now placed in *Anastrepha*; and as I find in Scudder's "[illegible]ersal index", p. 173. that this na[illegible]ccupied by Rafinesque in the Mollu[illegible] prefer to use here the origi[illegible]us, as at present known [illegible]vely Ethiopian, some spec[illegible]nted in Egypt.

[illegible] near **longi**[illegible], Wiedemann

[illegible] fig. 1[illegible]

[illegible] females from Karachi (*Cumming*), 30-vii-89, [illegible] genus, and are very closely allied to *longistyl*[illegible]s distinct, and the ovipositor a little shorter. Un[illegible] description. This is probably an imported Af[illegible]

2. Ba[illegible]

Guérin-Méneville, Voyage de la [illegible]quille, Bot. [illegible]om., xxvii livr., pl. 6, Paris, 1832 (the description appeared only in [illegible]viii, 1838).

Dasyneura [illegible]rans. Entom. Soc[illegible]60 (1841), not of Rondani, 1840.

St[illegible]n. Proc. Linn. Soc. Lond[illegible].

[illegible]dopt this name for the Oriental (and Australian) species of *Dacus s. l.* which have a pair of *prsc.* and an anterior *sa.*; practically this genus will contain all the true species of *Dacus* as yet known from the Orient. As the type of the genus I take *Musca ferruginea* of Fabricius, 1794, and also *Dacus umbrosus*, Fabricius, 1805, with which *Bactrocera longicornis* of Guérin is perhaps synonymous. Some species of this

genus have four bristles on the scutellum, and some others ve complete cross-bands on the wings: these two characters are never present e Ethiopian or the Palaearctic species.

In the collection before me are no Indian species with compl e cross-band on the wings; there is however a male of *D. umbrosus*, Fabricius, fro Batavia, eter-mined by Prof. Meijere. This species will probably be found in futu in Ind , and is easily distinguished from any other by its banded wings.

I have already stated, that if the species with banded wings are cons ered as generically distinct from the others, the name *Bactrocera* (type *umbrosus*, F.) will remain theirs; and for the species with unbanded wings will be used my new name *Chaetodacus* (type *ferrugineus*, Fabr.).

The species of *Dacus* which have been hitherto recorded from India and Ceylon are the following:—*ferrugineus*, Fabricius, 1794 (as *Musca*); *klugii*, Wiedemann, 1830; *zonatus*, W. W. Saunders, 1841 (as *Dacus neura*); *incisus*, Walker, 1860; *squalidus*, Walker, 1860; *persicae*, Bigot, 1890 (as *Rivellia*); *mangiferae*, Cotes, 1893; *cucurbitae*, Coquillett, 1899, and *diversus*, Coquillett, 1904. Of these, *persicae* is the same as *zonatus*, and *squalidus* probably the same as *mangiferae*, both being therefore only a variety of *ferrugineus*; of the remaining seven species *klugii* and *incisus* are not represented in the collection, which however includes four more species, two of them new. *Klugii* is very different from the other species in the pattern of the wings, even from those of the group *umbrosus*; perhaps it may not be a Dacine at all, but a Trypaneine near the genus *Callistomyia*.

The Indian specie collection can be distinguished as

1 (10). Scutellum bear bristles, the basal pair being
2 (3). Face of the female ck cross ba that of marked; third abdo egment of de shows of bristle d margin.
3 (2). Face in both sexes ith two b minal segment of male ciliated.
4 (5). Hind cross-vein broadly margined with br
5 (4). Hind cross-vein not borde
6 (9). Wings with the brow size (5-
7 (8). Abdomen sh kings of the thorax w
8 (7). Abdomen narro .. .. *ferruginea*, Fabr.
x less distinct *ferruginea* var. *mangiferae*, Cotes.
9 (6). An isolated brown spot at the tip o
10 (1). Scutellum with four bristl ngs; size smalle m) *zonata*, Saund.
11 (12). Face in both sexes wit
12 (11). Face in both sexes marked band .. d.
13 (16). Body narrow and elonga black spots.
tellum and ed, of prevalent reddish colour; scu-
ovipositor entirely reddish.
14 (15). Thorax on the back with distinct black markings; all the femora entirely pale yellow; third abdominal segment of the male ciliated .. .. *caudata*, Fabr.

15 (14). Thorax [illegible]out black markings; all the femora beneath with a shi[illegible]ck stripe; third abdominal segment of male not cili[illegible] .. .. *garciniae*, n. sp.

16 (13). Body [illegible]ort and broad, of prevalent black colour; scutellum [illegible]n the distal half black, ovipositor black .. .. *scutellaris*, n. sp.

2. Bactrocera diversa, Coquillett.

(Pl. viii, figs. 2-3).

Coquillett, Proc. Ent. Soc. Washington, vi, 139 [*Dacus*] (1904); Bezzi, Boll. Labor. Zool. Portici, iii, 294 and 300 [*Dacus*] (1909); Froggatt, Report on parasitic and injurious Ins., 1907-1908, 83 [*Dacus*] (1909).

A small rounded species, with conspicuous bright yellow markings on the thorax, distinguished from any Indian species by its very different colouration in both sexes and by the third abdominal segment of the male not being ciliated.

To the good description of [illegible] Coquillett, quoted by Mr. Froggatt in his Report, I have nothing to add. The transverse black facial band of the female is double, while in *maculipennis*, Dol., it is simple; the male show sometimes a rudiment of this band just on the oral margin. Vertical bristles black. The yellow streak in the centre of the mesonotum is sometimes wanting in the female. The unique female in the collection has the abdomen quite black, with only the posterior margin of the first segment very narrowly yellow.

The description of *incisus*, Walker, appears to [illegible]me points not unlike this species.

[illegible]dhapur, Bengal, 13-x-09 ([illegible]); a male from Katihar, [illegible] 30-xii-09 ($\frac{6058}{16}$) (*P*[illegible]) 6 males and a female from [illegible] ($\frac{5926}{15}$, $\frac{5929}{15}$[illegible]) [illegible]lett.

[illegible]s from Col[illegible] [illegible]galore, Ind[illegible]

[illegible]umshaw-[illegible]

[illegible] zonata, W. W. Saunders.

W. W. Saunders, [illegible]om. [illegible]*ra*] (1841); Walker, List Dipt. British Mus., iv, 1075 [illegible] Zool. Portici, iii, 293 and 299 [*Dacus*] (1909); Enderl[illegible] [illegible]*Dacus*] (1911).—*maculigera*, Doleschall, Nat. Tijdschr. v. [illegible] [illegible]roggatt, Report on par. and injur. Ins., 1907-1908, 94 [*D*[illegible] [illegible]abor. Zool. Portici, iii, 294 and 300 [*Dacus*] (1909).—*persicae* [illegible]ce, Ind. Mu[illegible]otes, i, 192 [*Rivellia*] (1889); Cotes, *l. c.*, 195 [*Rivellia*] (188[illegible] Lefroy, Indian [illegible]sts, 170, f. 193 [*Rivellia*] (1906); Bezzi, Boll. Lab[illegible] [illegible]293 and 298 [*Daci*[illegible] [illegible]att Report on par. and injur. Ins., [illegible]. ii, f. 5 [*Dacus*] (1909).

A small species very like the preceding, bu[illegible]t lighter coloured, with the face [illegible]ings. spotted and with an isolated brown spot at the tip of the wi[illegible]

There is no yellow streak in the middle of the mesonotum. Le[illegible]gs wholly yellow in both sexes. The two facial black spots show a tendency, chiefly in the female, to get confused together in a transverse band as in the preceding. Vertical bris[illegible]

yellow. Third abdominal segment of the male with a row of bristles. Wings without anal stripe, but in the male a grey round spot at the tip of the anal cell.

The synonymy with *persicae* seems to me very certain; [illegible] with *maculig[illegible]a* appears to be proved by Loew's label in the Museum at Vienna, of which Mr. Froggatt speaks in his Report.

There are several specimens in the collection caught on board ship, ten miles off Masulipatam, Madras coast, 4—5th June 1908, by C. Paiva ($\frac{5.7.70}{15}$ – $\frac{5.7.72}{15}$). This is a very good example of the transport of fruit flies by shipment. Another specimen is from Paresnath, West Bengal, 4300 ft., 9-iv-1909 (*Annandale*) ($\frac{9.5.81}{15}$), and another from Pusa, June 1908 ($\frac{8.2.32}{15}$). The species is already recorded from several places in India, Doleschall has it from Amboina and Enderlein from Sumatra.

4. Bactrocera ferruginea, Fabricius.

(Pl. viii, fig. 5)

Fabricius, Ent. Syst., iv. 342. 127 [*Musca*] (1794) and Syst. Antliat., 274. 5 [*Dacus*] (1805); Wiedemann, Auss. Zweifl. Ins., ii, 515. 5 [*Dacus*] (1830); Wulp, Compt. rend. Soc. entom. Belg., 1884, 296. 14 [*Dacus*] (1884) and Cat. describ. Dipt. S. Asia, 186 [*Dacus*] (1896); Meijere, Tijdschr. v. Entom., li, 126 [*Dacus*] (1908); Bezzi, Boll. Labor. Zool. Portici, iii, 293 and 299 [*Dacus*] (1909); Froggatt, Report on par. and injur. Ins., 1907-1908, 81, pl. ii, fig. 8 [*Dacus*] (1909).—*conformis*, Doleschall, Nat. Tijdschr. v. Ned. Indie, xvii, 122. 78 (1858-59); Koningsberger, Med. uit s'Lands Planten., xx, 24 [*Dacus*] (1897).

A middle-sized sp[illegible]rying in colouring from ferruginous t[illegible]k brown with distinct yellow marking[illegible] thorax and with hyaline wings f[illegible]wn only on the fore border and [illegible]cell.

This species i[illegible]ize and co[illegible]ring [illegible]og-gatt. The [illegible]tles on th[illegible]d the anal stripe of the wing [illegible] tip. Fron[illegible]tles yellow; posterior bristles of th[illegible]rk specimens the yellow streaks of the thorax and t[illegible]g.

This is a widely spread species [illegible] Java and Amboina, but it is very d[illegible]ecognized. The *ferrugineus* of Ma[illegible]he *marginipennis* of Doleschall has been erroneously p[illegible]

In the collection ar[illegible], all caught in May, and one fed on rotten mangoes. Ot[illegible]ngalore, S. India; Mergui; Sikhim; Tenasserim, Lower [illegible]net; Shillon[illegible]urseong, 5,000 ft., E. Himalayas (*Annandale*); R[illegible]gal, 6-vii-09; [illegible]eah district, N. Bengal, 15-v-10; Peradeni[illegible]16-iv. There is a[illegible] from Batavia, determined by Prof. Meijere.

To judge from a specimen from Peradeniya, Ceylon, labelled by Mr. Froggatt himself, *Dacus tryoni* is synonymous with the present species; the specimens bred from fruits which I have received from Gospad district, N. S Wales, through the kindness of Mr. Froggatt, approach the following variety:—

Var. **mangiferae**, Cotes.

(Pl. viii, fig. 6).

...otes, Ind. Mus. ...otes, iii, 17, fig. [*Dacus*] (1893); Maxwell-Lefroy, Indian Ins. Pests, 170, figs. ...91-92 [*Dacus* ...1906) and Mem. Dept. Agric. India, i, 227. 129, fig. 71 [*Dacus*] (1907) both as ...*rrugineus*,

This variety very much resembles the lighter coloured specimens of *ferrugineus*, from which it is distinguished by the paler colouring and by the shape of the abdomen, which is pointed at the end and distinctly narrower than the thorax. The dark brown spots of the frons are often indistinct. Thorax always pale ferruginous, the yellow markings therefore less distinct; thoracic bristles yellow. Wings with an indistinct narrow greyish margin on the fore border, often quite hyaline with only a small grey spot at the tip of the third vein; anal stripe also less distinct, but the dark spot at the end of the anal cell in the male is present.

In my paper of 1909 I have ...ith Mr. Froggatt, not distinguished this variety. *D. xanthodes*, Brown, as described and figured by Froggatt, seems to be a closely allied form; it was bred in New Zealand from larvae infesting fruits brought from Fiji.

It is very probable that this variety is based only on bred specimens, its colouring and the peculiar shape of the abdomen depending only on immaturity. There are many specimens in the collection. Two males from Calcutta ($\frac{2500}{13}$, $\frac{2596}{13}$), bred from mangoes, are co-types of Cotes. One female from Calcutta ($\frac{2502}{13}$), determined by Bigot as *ferrugineus*, is said to have been com...th specimens of this species in the ...Museum. Other specimens come ...lughli, Bengal (*J. C. Chakrabut...*

...ctrocera cucurbita...

...viii, fig. 7...

Coqui... [*Dacus*] (189... ...Hawaii. Dipt., 45, 4 ...nd Agri... ...27 [*Dacus*] (1906); Maxwell-Lefroy, ...*Dacus*] (1907); Bezzi, Boll. Labor. Zool. Portici. iii, 291 ...t on paras. and injur. Ins., 1907-1908, 84, pl. ii, figs. ...

A proportionally ... spe... ...ized from all other known Indian species by the p... ...being widely bordered with brown.

Vertical, thoracic and scut... ...dominal segment of the male with a row of black b... ...at the tip, but less abruptly than in the preced...

This ... ...ally described f... ...but subsequently it has been f... ...ibuted over India and C... ...this is its original home. In the collection are many specimens from Calcutta, caught in April, May, June and September; others from Durjhana, Nepal Terai; Ranchi; Jhansi, N. W. India, 850 ft. (*Brunetti*); Katihar, Purneah district, N. Bengal; Kumdhik, Nepal Terai, in March; Bhogaon, Purneah district, N. Bengal, in October; Allahabad, United Provinces, in August; Nepalganj, Nepal Frontier, 22-xi-11; Siripur, Saran, N.

Bengal, 26-ix-10; Adra, Manbhum district, 12-x-09; Bo[illegible] gourds, 12-x-03; Peradeniya, Ceylon, 10-i.

6. **Bactrocera caudata**, Fabricius.

(Pl. viii, fig. 8.)

Fabricius, Syst. Antl., 276 16, [*Dacus*] (1805); Wiedemann p. p., Auss. Zweifl. [illegible]i, 518. 8 [*Dacus*] (1830); Walker, List Dipt. Brit. Mus., iv, 1073 [*Dasyneura*] (1849); Meijere, Tijdschr. v. Entom., li, 179. 5 [*Dacus*] (1908); Bezzi, Boll. Labor. Zool. Portici, iii, 294 and 300 [*Dacus*] (1909); Enderlein, Zoolog. Jahrbüch., xxxi, 409 [*Dacus*] (1911); Hendel, Suppl. Entom., i, 16, 2, pl. i, f. 2 [*Dacus*] (1912).

A large species very much like the preceding, but at once distinguished by the four bristles of the scutellum and by the posterior cross-vein being only a little darkened in the lower portion.

The black markings on the mesonotum are much more marked than in the preceding, but rather variable. Male characters as in the preceding.

The specimen from Bigot's (Verrall's) collection described by Mr. Froggatt in his Report, p. 95, seems to belong to another species. On the other hand the *ferrugineus* described by Macquart (Dipt. exot. Suppl. 3, 224, (64) pl. vii. f. 8 and Suppl. 4, 257 (284) 2, pl. xxvi. f. 8 [*Dacus*] 1847 and 1851) seems to belong here.

This species was originally described from Java, but Walker has recorded it from North Bengal, and Enderlein and Hendel have it from Formosa. In the collection are examples fro[illegible]g, Assam; Tenasserim, Lower Burma; Calcutta; Dehra Dun, United Provinc[illegible]urseong, 5000 ft., E. Himalayas; [illegible] Katmandu; Bhowali, Kumaon, 57[illegible]i-10 (*A. D. Imms*). A speci[illegible]m, bears a label in Bigot's h[illegible]g: *D. nigrolineatus* [illegible] has never been published. Anoth[illegible]imen fro[illegible] speci-[illegible]deniya, Ceylon, [illegible]1910.

7. Bactroc[illegible]

(Pl. viii, fig[illegible])

Very closely allied to th[illegible] ferrugi-nous thorax, a blac[illegible]elow [illegible] the third segment of the abdomen of the m[illegible].

Head entirely ye[illegible]e eyes; a brown spot on the frons above the antennae[illegible]ing black spots on the face, their inner lower corner reaching the [illegible], a [illegible]n subtriangular spot on the cheeks below the eye; a small black oc[illegible] dot; antenn[illegible] the third joint a little darkened at the end; a[illegible]t the base; pa[illegible] yellow; all the bristles black, the *or.* 1. 2[illegible] on less distinct brown dots.

Thorax ferruginous, opaque in the middle, without black lateral markings on the back, the post-sutural yellow lateral stripe not being striking, because its brown inner border is less distinct; humeri broadly yellow; a broad mesopleural shining yellow stripe, reaching the yellow upper border of the sternopleura; the mesopleura before this stripe and the sternopleura below are blackish; a large yellow double

ypopleural spot. [illegible]tellum like the thorax, with four bristles, the basal pair w[illegible]ker. All the bri[illegible]re black. Metanotum with two brown spots on the sides. Ha[illegible]eres pale yello[illegible]

bdomen na[illegible]w and elongated, clothed with white rather long pubescence; that o[illegible] the male [illegible]thout lateral bristles on the third segment. It is, like the thorax, entirel[illegible] ferrugin[illegible]us; the first segment is yellowish at the base and the second at the apex; third segment with a basal black cross band, broadly interrupted in the middle; a longitudinal black stripe runs from the middle of the third segment to the end of the abdomen. Belly yellow, with black quadrate spots in the middle of the segments. Ovipositor very short, reddish.

Legs entirely yellow, all the femora below with a shining broad black stripe, that of the hind femora being smaller and apical; hind tibiae darkened; first two segments of the tarsi whitish.

Wings as in *caudatus*, but the brow[illegible] costal border less widened at the end, and the anal stripe in the male not broadened at the tip.

Some specimens from Peradeniya, Ceylon (*Green*), obtained through the kindness of Prof. Petri of Rome, bred from *Garcinia* fruits, viii-09: types ♂ and ♀ in the Indian Museum.

8. Bactrocera scutellaris, n. sp. ♂, ♀.

(Pl. viii, fig. 10).

A medium-sized species, easily distinguished from a[illegible]r by its predominating black colou[illegible] by the scutellum being largely black[illegible] tip and bearing four bristle[illegible] ovipositor of the female. Le[illegible] mm.

[illegible]d the occiput shining; [illegible] opaque but shining on the v[illegible] the [illegible]its; facial [illegible] triangular, with the inner corners a[illegible] the middl[illegible]e face; a brow[illegible] the middl[illegible] lower cor[illegible] the [illegible]s; frons marked with a bro[illegible] [illegible] pairs of lateral brown dots; vertex with[illegible] [illegible]g the ocelli; occiput wholly black, with a narrow[illegible] [illegible]tennae yellow, the third joint darkened at the tip; [illegible] [illegible]low, quite bare, with some hairs on the underside only; [illegible] [illegible]own, with some pale hairs; frons with short hairs, c[illegible] occiput with rather longer hairs; all the bristles a[illegible] [illegible]rbital, 3 lower fronto-orbital, of which the 2 apical [illegible]ated together, and 2 vertical; a tuft of yellowish short bristl[illegible] the middle [illegible]occiput on the callus over the insertion of the neck.

[illegible]omen densely puncta[illegible] with a short pale pubescence. [illegible] quite black, both on the sides and below; the following markings yellow: three very small longitudinal streaks on the back behind the suture (a shorter one in the centre, the others on the sides above the wings), the humeral callosities, a fascia on the mesopleura extending from the transverse suture of the back to the upper part of the sternopleura, a large spot on each side of the metanotum includ-

ing the hypopleura. Scutellum yellow, punctate like the [illegible] with the apical h[illegible] black. Pleura bare, shining, with longer white hairs on the [illegible]pleura, pteropl[illegible]ra and lower portion of the sternopleura. All the bristles are [illegible]ack: 2 *scp.*, [illegible]*mpl.*, 3 *sa.*, 1 *prsc.*, 1 *mpl.*, 1 *pt.*; scutellum with four bristles, the basal [illegible]ir on the [illegible]llow, the apical on the black part. Halteres yellow; squamae very sma[illegible] pale ha[illegible]ed.

Abdomen oval, as broad as the thorax, black, with the hind border of the first segment[1] very narrowly and that of the second more broadly yellow; hind border of the 5th segment also narrowly yellow; the pale pubescence on the sides of the first two segments is longer; third segment of the male with a row of black bristles on the sides of the hind border; venter yellowish, with a longitudinal median black band. Male genitalia not prominent, dark yellow; the circular pregenital ventral plate shining black; ovipositor depressed, slightly longer than the fourth and fifth abdominal segments taken together, shining black, the apical segment yellow.

Legs brownish black, the basal half of an[illegible]femora and the first joint of all the tarsi light yellow; fore coxae, and four anterior tibiae somewhat yellowish, the middle tibiae in the male often wholly yellow (there are some pale hairs), those of the upper side of the femora a little longer.

Wings hyaline; costa narrowly bordered with brown from apex of the auxiliary vein to the tip of the wing, distinctly widened in the apical portion; anal cell filled with brown, in the male more broadly, the brown widened at the tip; the apical lower corner of the [illegible] cell is somewhat filled with greyish.

Of the describe[illegible]es, *D. incisus* of Walker seems [illegible] unlike this species, but differs in [illegible]ring of the legs, etc.

This new species see[illegible] to be rare in India; [illegible] four males and six females from S[illegible]g, Assam [illegible] engal, [illegible] July ([illegible]) [illegible] Kurseong [illegible]0 ft., E. H[illegible] Bhowali, Kumaon, 5700 ft., 15-vi-10 ([illegible]*nus*).

9. Bactrocera macul[illegible]

Doleschall, Nat. Ti[illegible] [illegible]ijere, Tijdschr. v. Entom., li, 127. 2 [*Dacus*] ([illegible] iii, 293 and 299 [*Dacus*] (1909).

A medium-sized [illegible] at once distinguished by its greater size and the four bl[illegible]

The facial band is simple. All t[illegible]ristles are [illegible]k. The first joint of all the tarsi is whitish. Third abdominal se[illegible] of the male [illegible]

The *caudatus* of Wiedem[illegible] partly here.

This species is known from J[illegible] In the collection is a female f[illegible] 5000 ft., E. Himalayas, 9-vii-08, ($\frac{5}{15}\frac{8}{8}\frac{8}{8}$), and another from Calcutta, August, 1909. A male from Java is determined by Prof. Meijere.

[1] In the numeration of the abdominal segments I have not followed Loew, since the segment that he numbered the first is here always considered as formed by two, the first and the second; our third segment is the second of Loew, etc.

2. Subfamily Trypaneinae.

1. Section *Ceratitininae.*

3. **Anoplomus**, n. gen.

Easily distinguished from any other genus of the subfamily by the absence of the humeral bristle and by the swollen occiput.

Head higher than broad; face in the middle swollen but flattened, with narrow antennal furrows reaching the epistome; occiput with very strongly developed lateral swellings; cheeks rather broad; eyes very narrow; antennae not reaching the epistome, inserted over the middle of the eyes, the third joint a little pointed at the tip; arista plumose, the rays being longer at the upper than at the under side; *or.* 2. 2[1]; *pvt.* weak; *vt.* 2, inner pair very long, the outer weak; no *oc.*; no occipital row of bristles; vibrissal edges not bristly; genal bristle weak.

Thoracic chaetotaxy complete, only the *hm.* wanting; *dc.* in the middle between the transverse suture and the basis of the scutellum; a single *mpl.*; *pt.* proportionally strong. Scutellum rounded, a little swollen, black-spotted, with four bristles, the apical pair strong and divergent.

Sixth abdominal segment of the female distinct; ovipositor about as long as the abdomen, flat-cylindrical; fifth segment of the male with a row of strong bristles on the hind border. Fore femora with a row of bristles beneath; posterior femora not spinulose beneath; middle tibiae with two apical spurs.

The pattern of the wings is of the rivulet type, [illegible]ome blackish streaks at the ba[illegible]tle distinct; third vein bristly t[illegible]ut its length, but the bris[illegible]econd and fourth vein[illegible], small cross-vein a little beh[illegible]cal [illegible] posterior [illegible]vein almost perpendicular; second [illegible]t cell with [illegible]osterior angle dra[illegible] into a shor[illegible]nd basal cel[illegible]

[illegible]om Madagascar, as figured in Ann. Soc. Entom. Franc[illegible] [illegible]ngular resemblance to the present genus in the shape [illegible]he *hm.* is wanting; but it has no lower fronto-orbital [illegible]rtalid.[2]

10. An[illegible]

Tephritis fasciventris [illegible]art, Dipt. Ex[illegible] Suppl. 3, 225 (65), pl. 7, f 7 (1847), not of Macquart [illegible]

[illegible]e, large fly of a blac[illegible]h white patches on the pleurae [illegible] whitish broad transverse bands on the abdomen. Length of the male 6-8 mm., of the female 10-11 mm. (with the ovipositor).

[1] The first number indicates the upper fronto-orbital pairs, the second the lower fronto-orbital pairs.

[2] Through the kindness of the late Mr. Verrall, who has compared the type in Bigot's collection, I am now able to state that *Oedemachilus* is a true Ortalid, without humeral bristle.

Head white, the frontal band tawny; the upper part of the occiput from the vertex to the neck is black; a large brown spot on the cheeks under the eyes; antennae yellow; palpi whitish, darkened at the base, with some short black bristles; proboscis brownish; all the bristles are black; frons with a few short dark hairs; the swollen part of the occiput with longer white hairs; some very short black bristles on the upper posterior margin of the eyes.

Thorax wholly black, shining, with a short yellowish pubescence on the back; the following markings white: the humeral callosities, the whole mesopleura, the fore half of the pteropleura (all these three spots being united to form a very large oblique patch), a large spot on each side of the metanotum including the hypopleura. Scutellum white, shining, with a very narrow black band at the base and three black spots on the hind margin, one apical between the insertion of the two apical bristles, the others lateral beginning just beneath the insertion of each basal bristle. All the white parts are wax-like and shining. All the bristles are black; there are some white hairs on the propleura, on the white part of the pteropleura, and in the lower portion of the sternopleura. Halteres and squamae white, with white cilia.

Abdomen black, the first segment sometimes yellowish; the white bands are broad and equal, occupying the whole of the second and of the fourth segments; the dorsal surface is short-haired; at the base the hairs are somewhat longer and are black on the black parts and white on the white parts. Genitalia of the male black, a little prominent; the black bristles of the fifth segment are long and strong, 5–7 in number. The ovipositor is shining black, not depressed, with very short bristles; I cannot perceive any trace of bristles on the fifth or on the sixth segment of the female abdomen.

Legs yellow, the coxae also the four posterior femora intermediate tibiae wholly black; anterior femora bristles of the underside 5–6 bristles.

Wings whitish-hyaline, with the following markings: a little beneath the base, beginning at the base of the costa, streaks on the basal cells; the [illegible] *Ceratitis*; the stigma brown in the [illegible]) A broad, oblique cross-band which [illegible] to the posterior margin beyond the apex [illegible] all cross-vein and at the costa united with a broad [illegible] that extends from the costa to midway between the apices of the third and fourth veins, filling the margin to the third vein; in this band near the costa [illegible] brown dots. (iii) [illegible] the posterior cross-vein, which begins [illegible] fourth vein and reaches the posterior margin where it is widened. (iv) A oblique streak beginning at the third vein just in the middle between the small cross-vein and the tip, and reaching the posterior margin a little beyond the tip of the fourth vein. This streak is sometimes united across the fourth vein with the band on the posterior cross-vein, forming a V-shaped rivulet.

The description of *fasciventris*, Macquart, 1847 (not 1843), from Java, agrees

ell enough with th .t species; but as this name is preoccupied by Macquart hi self, I have ad . the appropriate MS. name of Bigot.

The collectio .cludes four specimens, ♂ and ♀, from Sikhim ($\frac{4788}{12}$ – $\frac{4791}{12}$), beari a label n the name *Tephritis flexuosa*, n. sp. in Bigot's handwriting. A much maller m (${}^{9572}_{15}$) 6 mm. in length, from Paresnath, W. Bengal, 4000-4400 ft., 13-iv-09 (*N. Annandale*). There are also cotypes in Bigot's (Verrall's) collection. An additional female from Karmatar, Bengal, 23-x-09 (*C. Paiva*).

4. Stictaspis, n. gen.

Distinguished by its strong chaetotaxy, plumose arista, pointed third antennal joint and black-spotted thorax and scutellum.

Head as in the preceding, but the occipital swelling much less developed and the face distinctly concave; third antennal joint pubescent, very sharply pointed at the end; arista very deeply plu , *or.* 2. 3; *pvt.* strong; *vt.* 2, the inner very strong and long; a pair of very strong and long *oc.*; occipital row of black bristles well developed; genal bristle very strong; vibrissal edges with some short bristles. Palpi with stout black bristles.

Thoracic chaetotaxy complete; *dc.* nearer to the transverse suture than to the scutellum; 2 *mpl.*; *pl.* strong and long. Scutellum swollen, rounded, black spotted, with four bristles, the apicals parallel.

Abdomen with six distinct segments, the last seg stly; ovipositor flattened, more long; male genitalia not promin femora not spinulose ben a row of bristles beneath; m iae with a single spur; mid row of bristles on th well developed; third vein ; costal the middle or cross-vein b nd basal cell a little enlar gle th out into a long point, longer than the

Typ

It is with plumose arista belong here

The spe s:—

1 (4). Sm ostal b e thorax with shining the sides; omen without blackish

median black stripe be erse suture; scutellum with 3 black spots .. .. *ceratitina*, n. sp.

3 (2). Thorax with a longitudinal black stripe; scutellum with a single great black spot .. .. *striata*, Froggatt.

4 (1). Small cross-vein on the middle of the discal cell; yellow costal border interrupted between the first and the second cross-band; lateral black spots of the thorax wanting; abdomen blackish banded .. .. *separata*, n. sp.

11. Stictaspis ceratitina, n. sp.

(Pl. viii, fig. 13).

A yellow species with black spots on the thorax and scutellum and with yellow banded wings. Length 8 mm., with the ovipositor.

Head yellow, opaque, shining only near the vertex; frons with a darker yellow spot above the antennae; all the bristles black, the occiput with yellow hairs below; some black hairs on the lower portion of the posterior orbits, above the genal bristle. Antennae reddish yellow, the two basal joints short, with short black bristles; third joint about three times as long as the two first taken together; palpi light yellow, with black bristles; proboscis yellow with pale hairs. The third pair of the lower *or.* smaller than the others; frons bearing in the middle some short black hairs.

Thorax shining yellow, with yellowish pu[illegible]escence on the dorsum; the *scp.* are yellow and weak, all the other bristles black and strong. On the anterior portion of the dorsum are to be seen two whitish median longitudinal stripes, which become obsolete after the transverse suture; a quadrate black spot in front of the scutellum, margined with white on the sides and behind, the lateral margins reaching the *dc.* The four lateral black spots are on the humeri, in the noto-pleural region, behind the suture, and on the postalar calli, this last being prolonged forward in a small s[illegible] Above the humeri are two black dots, the larger supra-humeral in position, [illegible]e smaller in the dorso-central regi[illegible] lateral spots are partially margine[illegible] whitish streaks. Pleura y[illegible] ome pale hairs; the superior po[illegible] the mesopleura whi[illegible] black streak just in front of t[illegible]erior *mpl.* [illegible] scutellum, with a white spot [illegible] sides. Sc[illegible] black spots, the middle one t[illegible] Halteres and squamulae whitish wi[illegible]

Abdomen narrowed at th[illegible] 5th segments with whitish trans[illegible] me erect black hairs; 3rd to[illegible] e 5th and 6th a complete row at the hin[illegible] larkened at the end, shining, about as long as the a[illegible]

Legs entirely pale y[illegible] ce; row of the front femora with 6–7 bristles; coxae with some bla[illegible] ristles; ro[illegible] bristles on the hind tibiae well developed.

Wings hyaline, with the [illegible] nd three cross ba[illegible] base is broadly hyaline, with brow[illegible]s on the basal cross-veins and [illegible] streaks; of the latter, two in the first basal cell, the outer curved beneath the prefurca, two in the second basal cell, the outer oblique, and one in the anal cell on the chitinised fold. The yellow border along the costa begins at the stigma and extends a little beyond the end of the third longitudinal vein, including some brown and hyaline spots. The first cross band begins at the costal border below the stigma,

etween the small ein and the prefurca, and extends perpendicularly to the hi d margin at the of the 6th vein; the second begins after the end of the first vei and extends on the posterior cross-vein to the hind margin at the end of the 5th in; these o cross bands are yellow above and brownish below. The third cross band is smaller and more oblique, wholly brownish, and reaches the hind margin a little beyond the end of the 4th vein. The anal cross-vein is strongly curved as in *Ceratitis*.

A single female from Paresnath, W. Bengal, 4400 ft., 11-iv-09 (*N. Annandale*) ($\frac{9}{15}$).

12. Stictaspis striata, Froggatt.

(Pl. viii, fig. 14).

Froggatt, Rep. on paras. and injur. ins., 1907-08, 111, pl. v, f. 17 [*Ceratitis*] (1909).

Very like the preceding, but smaller and with a different pattern on the thorax and scutellum.

Frontal spot darker than in the preceding. The thorax shows above the humeri a single large quadrate black spot; the median stripe is connected with the quadrate spot in front of the scutellum. The scutellum is wholly black, the basal border and two round subapical dots yellow; metanotum entirely black, with a median yellow spot and the lateral whitish spots as in the preceding, but with a brown dot beneath the 5th abdominal segment; in the male with six black bristles; the whitish transverse bands less distinct. The row stles on the anterior femora nu r 6; hind tibiae with shorter brist

xactly as in the precedi e smaller apical cross he cost border.

eradenyia on, August, 1903 ($\frac{8}{5}$) and me locali -10 ($\frac{6}{8}$).

a, n. sp. ♀.

Very of the small cross-vein and by the pattern of the ng the ovipositor.

There is only a single dam not possible to draw up a complete description, but e species because it is too characteristic to be overlo

Head as in the pre g, the fr l spot above the antennae brownish. Thorax with ot in front o utellum and two small black streaks after t are outside the *dc.* teral black spots of the pre- ces are wholly wanting. Pleura e cinereous. Scutellum with three black spots as in *ceratitina*; metanotum yellow, with whitish spots on the sides. Halteres yellow.

Abdomen yellow; the 3rd, 4th and 5th segments with a small blackish transverse band on the fore border, interrupted in the middle. Ovipositor reddish yellow, short trapezoidal, hardly at all longer than broad, not longer than the three last

abdominal segments. Legs entirely yellow; bristle-row [illegible] front femora with 4 or 5 bristles, hind tibiae with well-developed row of bristles.

Wings with the basal streaks as in the preceding species; the yellow cross-bands are similarly disposed, but the first is wholly separated from the second, owing to the fact that the hyaline space between the two first bands extends to the costa.

A female from Kohima, Assam ($\frac{1}{1}\frac{3}{2}\frac{7}{}$).

5. Gastrozona, n. gen.

Like the preceding, but easily distinguished by the weaker *oc.*, the unpointed third antennal joint and by the different pattern of the wings, which have also no distinct costal bristle.

Head as high as broad or higher than broad, the eyes being round or narrowed; face concave; third antennal joint rounded at the tip; arista plumose, with more or less long hairs; the chaetotaxy exactly the same as in the preceding, but the vibrissal edges without bristles and the *oc.* much weaker than the *or.* or the *vt.* Palpi without stout bristles. Thoracic and scutellar chaetotaxy also the same; *scp.* black; scutellum more flattened. Abdomen with the last segments bristly; ovipositor flattened and short. Legs as in the preceding. Wings also, but the pattern very different and not unlike that of the Neotropical genus *Anastrepha*; the base without black streaks; small cross-vein after the middle of the discal cell; anal cross-vein non-*Ceratitis*-like; the [illegible]r angle of the anal cell drawn out in a very narrow point, longer than the [illegible] basal cell.

Type: *Tephritis* [illegible] Macquart.

This genus seems to be [illegible] to the recently created [illegible] *oromyia*, Austen (Bull. entom. [illegible]rch, i. 7[illegible] [illegible] the flattened non-tubular ovipositor [illegible] less develope[illegible] [illegible]t shape of the anal cross-vein, the wa[illegible] [illegible]ack streak[illegible] [illegible] the thorax having longitudinal in place of transver[illegible]

The Indian species before me can be disti[illegible]

1 (4). Eyes not narrowed; t[illegible] longitudi[illegible]

2 (3). Thorax with [illegible]um with an apical black[illegible] [illegible]ss-band .. *fasciventris*, Macq.

3 (2) Thorax without [illegible]itish yellow; abdomen with two of [illegible] .. *montana*, n. sp.

4 (1). Eyes narrowed; thorax black w[illegible]inous longitu[illegible]tripes; • scutellum shining black, [illegible]pots on the side[illegible] *[illegible]nista*, n. sp.

14. Gastro[illegible]sciventris, Macquart.

(Pl. viii, fig. 16.)

Macquart, Dipt. exot., iii. 382 (225) 4, pl. 31, f. 2 [*Tephritis*] (1843); *fusciventris* in the index, p. 459 (302).

A yellow ferruginous species with two longitudinal black bands on the thorax and a transverse black band on the third abdominal segment.

The head is [illegible] as broad, and the eyes are rounded; frons reddish yellow, a little darkened above the antennae; arista shortly plumose.

The two black bands of the thorax are distant, complete, narrowly interrupted at the transverse suture, beginning after the external *sc.* and ending before the scutellum at the level of the internal posterior *sa.*; a black triangular spot in front of the scutellum, between the *prsc.*; humeri, sides and posterior portion of the dorsum whitish yellow, as also the mesopleura; pteropleura blackish; metanotum black, with a whitish lateral spot; hypopleura white. Scutellum whitish yellow with an apical black spot. All the bristles black. Halteres yellow.

Abdomen ferruginous, with pale pubescence; the transverse band on the hind border of the third segment is narrowly interrupted in the middle; venter black; male genitalia not prominent. Legs wholly yellow; coxae with some bristles; front femoral row of bristles numbering 7 or 8, middle tibiae with 4–5 bristles in the middle on the outside, hind tibiae with a complete row.

Pattern of the wings brownish yellow, disposed as in Macquart's figure, but the last cross-band not reaching the fore border and not connected with the band on the posterior cross-vein.

The species was originally described from East India. A single specimen from Sylhet, Assam, 26-iv-05 (*E. A. Hall*).

15. Gastrozona montana, n. sp.

(Pl. viii, fig. 17.)

[illegible]ng but distinguished by the [illegible] yellow scutellum and some[illegible] of the thorax, abdome[illegible]wings. Length 7 mm.

He[illegible]e spot on [illegible]ciput and a small black ocellar dot; all [illegible]llowish hairs [illegible]e lower portion of the occiput; eyes [illegible] antenn[illegible] little shorter than the face, the th[illegible] not pointed, with a short plumose arista; proboscis [illegible]

The [illegible] yellowish pubescence and black bristles; 2 *npl.*; *scp*[illegible]g and [illegible] a black notopleural stripe, which in the male is [illegible] the posterior *ntpl.*; in front of the scutellum the fema[illegible]oss-band, which in the male is broken into three sp[illegible] broad whitish stripe, from the humeri through the m[illegible]eura to the [illegible]pleura; this stripe is margined with brown above [illegible]sternopleura [illegible], with the upper border black; metan[illegible]wo lateral spots, [illegible]sed with the hypopleural spot, [illegible]ad white yellowish patch. Sc[illegible] entirely of a pale yellow colour, with four strong bristles. Squamulae and halteres dark ferruginous in the female, pale yellow in the male. All the black markings of the thorax are less distinct in the male.

Abdomen ferruginous at the base, greyish at the end, with long pale pubescence and black bristles; the first transverse black band is broad and entire, in the female filling the whole of the second segment and a narrow fore border of the third; the

second band is narrower and placed on the fore border of the fourth segment; the 5th segment is also black, forming a third narrow band in front of the ovipositor; the latter is as long as the four last segments, swollen, shining ferruginous with a black end. In the male the first band covers only the hind margin of the second segment, and the third band is not present. The third and fourth segments have a rather whitish colouring. Male genitalia prominent, shining black, with projecting yellow organs. Legs of the male entirely yellow; hind femora of the female darkened at the end.

Wing-pattern like that of the preceding species; stigma entirely brown, with a small yellowish dot on the apical corner; the first brown band from the stigma runs hindwards between the first and fourth veins to the root of the wing; second band and anterior arcuate border as in the preceding; the apical brown streak is united to the fore border through the middle of the last portion of the third vein; the band on the hind cross-vein is isolated and much widened at the hind margin.

A male and a female from Kurseong, 5000 ft., E. Himalayas, 8—20-ix-09 (*Annandale* and *Lynch*).

16. Gastrozona melanista, n. sp. ♀.

(Pl. viii, fig. 18.)

A black species with white patches on the thorax and scutellum, and a very similar but blacker pattern on the wings. Length 7 mm., including the ovipositor.

The shape of the head is different from that of the preceding species, and like that of *Stictaspis*, the eye narrowed; the colour is red in the middle and the lower orbits pale cinereous; darker and deeply plumose; light yellow in the hairs; proboscis yellow, black-haired; the preceding, but always much weaker than the

Thorax shining black on the dorsum, with two broad parallel ferruginous stripes which extend region and two large lateral spots behind ning, a large white patch filling the pteropleura and forming with the humeral angle very striking oblique band. Pubescence of the pleura lower portion of sternopleura thicker. Metanotum black eral spots; hypopleura white. Scutellum shining black, with two lateral yellowish yellow spots, in the middle of which are inserted the basal bristles. Halteres pale yellow.

Abdomen with pale and dark pubescence and black bristles of the last segments; the first two segments ferruginous, the second with a broader yellow hind border; the third wholly black; 4th, 5th and 6th black, with a broader yellow hind border; 5th and 6th with a complete row of bristles on the hind border. Venter ferruginous. Ovipositor black, shining, black haired, as long as the last three abdominal segments.

Legs yellow, the four posterior femora with the apical half black; the front

second band is narrower and placed on the fore border of the fourth segment; the 5th segment is also black, forming a third narrow band in front of the ovipositor; the latter is as long as the four last segments, swollen, shining ferruginous with a black end. In the male the first band covers only the hind margin of the second segment, and the third band is not present. The third and fourth segments have a rather whitish colouring. Male genitalia prominent, shining black, with projecting yellow organs. Legs of the male entirely yellow; hind femora of the female darkened at the end.

Wing-pattern like that of the preceding species; stigma entirely brown, with a small yellowish dot on the apical corner; the first brown band from the stigma runs hindwards between the first and fourth veins to the root of the wing; second band and anterior arcuate border as in the preceding; the apical brown streak is united to the fore border through the middle of the last portion of the third vein; the band on the hind cross-vein is isolated and much widened at the hind margin.

A male and a female from Kurseong, 5000 ft., E. Himalayas, 8—20-ix-09 (*Annandale* and *Lynch*).

16. Gastrozona melanista, n. sp. ♀.

(Pl. viii, fig. 18.)

A black species with white patches on the thorax and scutellum, and a very similar but blacker pa[illegible] the wings. Length 7 mm., including the ovipositor.

The shape of the [illegible] is different from that of the preced[illegible]ies, and like that of *Stictaspis*, the [illegible] narrowed; the colour is red[illegible] in the middle and the lower [illegible] orbits pale cinereous; [illegible] darker and deeply plumose; [illegible] light ye[illegible] [illegible]istly hairs; proboscis yellow, [illegible]-haired; the [illegible] preceding, but always much we[illegible]han the [illegible]

Thorax shining black on the dorsum; [illegible] broad parallel ferruginous stripes which extend [illegible] and two large lateral spots be[illegible] large white patch su[illegible]

Eas[illegible] and [illegible]

and [illegible] eyes, [illegible] above; palpi not b[illegible]ace[illegible] furrows reaching the epistom[illegible] 2.; [illegible] parallel; genal bristle weak; a[illegible]

Thoracic chaetotaxy com[illegible]etween transv[illegible] and scutellum; 2 *mpl.*; *pt*[illegible] of great size, triangular, [illegible] bristles, the apical [illegible]

Abde[illegible] the base, wi[illegible]t segments, the last bristly; [illegible], a little shorter than th[illegible]e abdominal segments together; male genitalia not prominent. Front femora with a row of bristles beneath; middle tibiae with two apical spurs; hind tibiae with a row of hairs on the outside.

Wings black, with hyaline indentations and spots; the longitudinal veins straight; small cross-vein a little beyond the middle of the discal cell; posterior cross-vein perpendicular; second basal cell a little enlarged; inferior angle of the anal cell drawn

femora covered wi[th] black bristles on the outside, the inferior row with 6–7 long bristles; middle tib[iae] with 4–5 bristles, hind tibiae with a complete row.

Wings hyaline with blackish bands. The first band begins at the stigma, which is wholly blackish, and extends obliquely to the first basal cell, the second basal cell and the anal cell being hyaline. The second band is parallel to the first, from which it is separated by an entire hyaline band; it begins at the costa some distance after the stigma and going upon the small cross-vein extends to the 6th vein, not reaching the hind margin; from the superior end of this band the border of the wing is filled with blackish, forming an arcuate band which extends to the tip, ending a little before the end of the 4th vein. In the hyaline triangular space limited by these bands are two blackish streaks not united together, one on the posterior cross-vein, the other on the middle of the last portion of the 4th vein, both reaching the hind margin, the last one united with the fore costal border.

A single female caught at light on board-ship 5 miles off Calicut, Malabar coast, 6-v-08 (*C. Paiva*) ($\frac{5}{15}\frac{7}{5}\frac{5}{3}$).

This species seems to be allied to *Tephritis vittata*, Macquart, Suppl. 4, 263, 15, pl. 27, f. 1 (1851), from Asia, which perhaps also belongs to the genus *Gastrozona*; the present species is, however, different in the colouration of the legs, abdomen and ovipositor; the pattern of the wing is very similar.

G. melanista, on account of the different shape of the head, is perhaps not congeneric with the two preceding species, but the colour of the wings and the white patch[es] of pleura show a real affinity with them.

Diarrhegma, n[ov. gen.]

[Th]e hume[ral] bristles on [sc]utellum, the shape of [the] head [as] of the pleu[ra]. Metanotum blac[k]. [Fr]ons shining black, with tw[o] occipital swellings much less developed than inserted the basal bristles. Antennae inserted above the middle of the [fa]ce, arista plumose, with longer hairs [on] basal half flattened; the antennal last segments; the first two seg[ments] ferruginous, the second with a hind border; the third wholly black; [the] 4th, 5th and 6th black, with a broader yellow hind border; 5th and 6th with a comp[lete] row of bristles on the hind border. Venter ferruginous. Ovipositor black, shini[ng], black haired, as long as the last three abdominal segments.

Legs yellow, the four posterior [fe]mora with the apical half black; the front

out into a point as long as the second basal cell; third [illegible]istly throughout it[illegible] length; costal bristle well developed.

Type: *Dacus modestus*, Fabricius, 1805.

This genus is very similar to the Neotropical genus *Hexachaeta*, Loew, from which it differs in the want of the *oc.*, in the presence of only two lower *or.*, in the face being not concave and in the plumose arista.

17. Diarrhegma modestum, Fabricius.

(Pl. viii, fig. 19.)

Fabricius, Syst. Antl., 278, 29 [*Dacus*] (1805); Wiedemann, Auss. Zweifl., ii. 493, 26 [*Trypeta*] (1830); Osten-Sacken, Berlin. entom. Zeitschr., xxvi. 227 [*Trypeta*] (1882); Wulp, Tijdschr. v. entom., xli. 219, 6, pl. 10, f. 17 [*Ptilona*] (1898); Meijere, Bijdr. tot de Dierk., xvii. 111 [*Rioxa*] (1904); Enderlein, Zoolog. Jahrbüch, xxxi, 449 [*Rioxa*] (1911);—*incisum*, Wiedemann, Anal., 53, 117 [*Trypeta*] (1824) and Auss. Zweifl., ii. 500, 37 [*Trypeta*] (1830);—*paritii*, Doleschall, Tijdschr. ned. Ind., x. 412, 38, pl. 1, f. 2 [*Tephritis*] (1856); Enderlein, Zoolog. Jahrbüch; xxxi, 449 [*Rioxa*] (1911).

A yellow middle-sized species, with brown spots on the thorax and black transverse bands on the abdomen.

Or. yellow; the inner *vt.* yellow, the outer black; *pvt.* dark yellow or black; genal bristle black, and above this some other (3-4) weaker black bristles. Thoracic and scutellar bristles yellow, sometimes darkened or blackish at the base, but the scapulars black. Row of the front femora with 7-9 black bristle[illegible] of the hind tibiae pale yellow. The stigma shows sometimes the t[illegible]ot, chiefly in immature specimens.

The species has been placed in *Rioxa* by [illegible] taxy and the pattern of the wing; but it differs [illegible] in the shape of the head, which res[illegible]bles the[illegible] patch on the mesopleura shows [illegible]

The species was originally [illegible] Amboina; it seems to be not u[illegible] specimens from Calc[illegible] wood. Some specime[illegible] Many additional speci[illegible]

7. [illegible]ona, Wulp.

This genus, as here restricted, is [illegible] known from[illegible] chaetotaxy of the head and th[illegible]

Shape of the head approaching t[illegible]at of the preceding, the head being higher than broad, but the eyes not so narrowed as in the preceding. No *oc.*; *vt.* 2, weak, the inner also very short; *pvt.* parallel; *or.* 1. 1, the second pair only of the superior *or.* being present in the middle of the front; genal bristle rather stout; vibrissal edges with short bristles; a row of black occipital bristles; antennae inserted at the middle of the eyes, very short, the third joint being about as long as the

second; arista plumose [illegible] the upper side with longer hairs; face flat, the epistome not prominent.

Thoracic chaetotaxy reduced; no *prst.* and no *dc.*, the *prsc.* more separated than in the other genera; 2 *mpl.*; *pl.* much weaker than in the preceding genera. Scutellum as flat as the dorsum of thorax, with four bristles.

Abdomen flat, narrowed at the base, with six distinct segments, the last bristly on the sides; male genitalia not prominent; ovipositor flattened, a little longer than the two last abdominal segments. Front femora with a row of bristles beneath; middle tibiae with a single spur; hind tibiae with a row of hairs on the outside.

Wings proportionally long and narrow, blackish with hyaline indentations and spots; a distinct costal bristle; veins straight, the 3rd and 4th parallel; the small cross-vein beyond the middle of the discal cell; hind cross-vein short and perpendicular; anal cell drawn out into a point as long as the second basal cell, the point broad.

Type: *Ptilona brevicornis*, Wulp.

This genus was originally erected by Van der Wulp (Tijdschr. v. Entom., xxiii, 183, 1880), for some different species, of which the first is to be considered as the type; subsequently the genus has been restricted by Osten-Sacken and Prof. Meijere, the other species being referred to *Rioxa*. Through the kindness of Prof. Meijere, who has examined the type of *Pt. brevicornis* at Amsterdam, I can say that the *dc.* are not present, an important circumstance which has been overlooked by other authors eve[illegible]erlein (Zool. Jahrbüch., xxxi, 415).

[illegible]ilona nigriventris, n. sp. ♂, ♀.

[illegible]viii, fig. 20.)

[illegible]ished by having the hyaline indentation of the [illegible]bdomen wholly black, except at

[illegible]n, besides the wing-pattern, in [illegible]re; the head is less [illegible]n yellow and shining; [illegible]orly in a tubercle on [illegible]e black; occiput below [illegible]ck bristle.

[illegible]horax and th[illegible]c. also black; the pubescence on the [illegible]nferior part of [illegible]and pteropleura and superior [illegible]ura black. Squamulae with [illegible]irs.

Abdomen black, with the two first segments dark yellow; the hairs black; ovipositor black. Bristles and hairs on the legs all black.

A consideration of the wide distribution of *brevicornis*, which ranges from Java to the Philippine Islands, may perhaps be taken as evidence that *P. nigriventris* is only an Indian form of that species; but the distinctions seem to me sufficient. In

the collection are three specimens from Assam, labelled "Bigo", *Trypeta nigricauda* n. sp., and one from Sylhet, June.

There is in the collection another specimen of this genus, from the Lushai Hills (*Macleod*), which is without the abdomen, and seems to be the true *brevicornis* (Pl. viii, fig. 21). The pleura is wholly yellow, without black markings; the wing-pattern is as shown in Wulp's figure, the hyaline spot of the third posterior cell being entire. The head and the eyes are not so narrowed as in Wulp's figure, but about as broad as in the following genus.

8. Rioxa, Walker.

A group comprising numerous species which have in common the wing-pattern, the shape of the head, the complete chaetotaxy of the thorax and the six bristles of the scutellum.

Head broader than high; eyes round; face concave, the epistome more or less but distinctly prominent; *oc.* very minute, sometimes wholly wanting; *or.* usually 2. 1, seldom 2. 2.; *vt.* 2, the inner strongly developed; antennae inserted on the middle of the eyes, short, the third joint rounded at the tip, not more than double the length of the second; arista variable, in some species plumose on both sides, in others pectinate on the upper side only; genal bristle well developed; a row of rather long occipital black bristles; palpi bristly.

Thoracic chaetotaxy complete; 2 *mpl.*; *pt.* weak. Scutellum flat, with six bristles, the intermediate pair being sometimes smaller. Abdomen elongate, sometimes narrowed, bristly on the sides and at the end; ovipositor [illegible] of moderate size. Legs in some species short and stout, in others long[illegible]nora with a row of bristles beneath; middle tibiae with a [illegible] hind tibiae with a complete row of hairs.

Wings broad or narrow, blackish or brown w[illegible]ntations; costal bristle present or wanting; [illegible]t its length; first vein often very elongate, ending [illegible]ary and the second vein, but sometimes [illegible]ross-vein; small cross-vein beyond the mid[illegible]vein perpendicular; inferior angl[illegible] a l[illegible]point, longer than the second basal cell, the [illegible]rp at the tip.

Type.—The type [illegible]*olata*, a slender form with pectinate arista; the stouter spec[illegible]ith plumose arista are perhaps not congeneric, as also those of the *stel*[illegible] group with [illegible]*bhritis*-like wing-pattern.

The species in the collection are to[illegible] distinguished [illegible]

1 (12). All the frontal bristles black[illegible] usually plumose.

2 (11). Stigma broadly hyaline at the [illegible], the wings therefore with two hyaline indentations on the fore border; arista with many hairs on the under side.

3 (8). Scutellum with six bristles of about equal size; stouter species, with broad wings and a distinct costal bristle; legs stout, short; sides of thorax wholly yellow.

4	(7).	Wings in the middle with three round hyaline dots, disposed in a triangle around the small cross vein.	
5	(6).	The three discal dots are rather large; abdomen with yellow spots	*vaga*, Wied.
6	(5).	The three discal dots very minute; abdomen without such spots	*mutyca*, Walk.
7	(4).	The discal dots wholly wanting	*vidua*, n. sp.
8	(3).	The intermediate bristles of the scutellum much weaker than the others; slender species, with narrower wings and no costal bristle; legs slender and long; thorax with blackish stripes on the sides.	
9	(10).	The second costal hyaline indentation of the wings not united with the second indentation of the hind margin; abdomen with black transverse bands	*dunlopi*, Wulp
10	(9)	The second indentation united with that of the hind margin to form a complete hyaline cross-band in the middle of the wings; abdomen without transverse black bands	*soluta*, n. sp.
11	(2).	Stigma wholly black, the wings with a single indentation on the fore border; arista with only a few minute hairs on the under side; two lower *or.*; no costal bristle; intermediate scutellar bristle weak	(*nausae*, Frogg.)
12	(1).	Superior *or.*, inner *vt.* and *pvt.* yellow; arista usually pectinate; stigma black; no costal bristle; intermediate bristle of the scutellum weak.	
13	(14).	First longitudinal vein ending in the middle between the auxiliary and the second vein; wings without hyaline dots in the middle; stigma wholly black	*quinquemaculata*, n. sp.
14	(13).	Fi[illegible]in very short; wings with many hyaline discal dots; [illegible]hyaline dot	*stellata*, Macq.

Rioxa vaga, Wiedemann.

(Pl. viii, fig. 22.)

W[illegible] (1830).

large size, with three large hyaline dots disposed [illegible] wings.

The singl[illegible] without a head. All the bristles black, the six scutell[illegible] abo[illegible] a row of 3 or 4 bristles beneath. First longitu[illegible] the costa before the middle between the auxiliary a[illegible]

A male specimen from T[illegible] (*H. Doherty*) $\frac{5\,8\,8\,0}{1\,5}$. Wiedemann records it from Benga[illegible]

20. Rioxa m[illegible]a, Walker.

(Pl. viii, fig. [illegible].)

Walker, List Dipt. Brit. Mus., iv, 1036 [*Trypeta, Euleia*] (1849).

Very like the preceding, but distinguished by the pattern of the wings and abdomen.

Head wholly yellow; *oc.* very small, but distinct; only a pair of lower *or.*;

bristles of the occipital row rather long; after the genal bristle are some other black smaller bristles. Thoracic and scutellar bristles black; pleura with dark and long pubescence. Abdomen shining, the pattern as described by Walker, the last segment of the male wholly black, with a small central yellow dot, and with long bristles on the sides and hind margin. Legs as in the preceding, wholly yellow. Wings with the same pattern, the three discal dots in the same position but much smaller; there are also two hyaline streaks at the tips of the submarginal and of the first posterior cell, which are wholly wanting in the preceding. The first vein has the same length, ending after the small cross-vein.

A single male from Sadiya, Assam ($\frac{5}{8}\frac{6}{1}\frac{6}{6}$) determined by Bigot as *Trypeta mutyca*, Walker. Walker records the species from East India.

21. Rioxa vidua, n. sp. ♀.

(Pl. viii, fig. 24.)

Very like the two preceding species, but without the discal hyaline dots. Length 8½ mm.

Head wholly yellow, opaque, a little shining about the vertex; antennae dark yellow; arista deeply plumose; proboscis and palpi yellow, pale-haired, the last with some black bristle-like hairs; *oc.* very small; *or.* stout, 2. 1.; *vt.* 2, the inner very long; *pvt.* parallel, strong; all the bristles black, those of the occipital row rather long; after the genal bristle some smaller black bristles.

Thorax wholly yellow, shining, with short yellow pubescence on the dorsum, and longer and darker pubescence on the pleura; all the bristles black. Scutellum like the thorax, its six bristles of equal size; metanotum blackish. Halteres yellow, squamulae pale-haired.

Abdomen damaged; it seems to be black, with the two basal segments yellow; venter yellow; black bristles on the sides. Legs wholly yellow; coxae with some black bristles; front femora with a [illegible] pubescence [illegible] hairs on the outside; hairs of the row on the hind [illegible] *ga*, but the discal dots wanting, or only [illegible] anal cell is prolonged into a point longer a[illegible] preceding species.

A single female f[illegible]

Wulp, Tijdschr. v. entom., xxiii, 186, 45, pl. [illegible] f. 8 and 9 [*Pl*[illegible]]; Meijere, Bijdr. tot de Dierk., xvii, 110 [*Rioxa*] (1904); Enderlein, Zoolog. Jahrbüch., [illegible]

A yellow middle-sized species with only two hyaline discal sp[illegible] airy front legs in the male.

Head broader than in the preceding; the inferior orbits with an argenteous stripe which is wanting in the three preceding species; *or.* 2. 1; all the bristles black; arista a little more shortly plumose. Thoracic and scutellar bristles black; the intermediate scutellar bristle much weaker than the others. Abdomen shining.

Legs longer and more slender than in the preceding; front femora of the male with a great many black bristles beneath; front tibiae beneath thickly pilose; front tibiae of the female with 5 or 6 bristles beneath and the tibiae bare; hairs of the row of the hind tibiae black.

The sides of the thorax in this species are not wholly yellow, but above the humerus is to be seen a small longitudinal brown streak and another broader one beneath it.

The species is known from Java. In the collection are some specimens from Sylhet, Assam (*Major Hall*) June and July, and one from Khargpur, Bengal, 17—30-vi-11 (*R. Hodgart*).

23. Rioxa soluta, n. sp. ♂.

(Pl. ix, fig 26.)

A small-sized, narrow elongate slender species, with a hyaline complete cross-band in the middle of the wings. Length 5½ mm.

A damaged specimen, without head. Thorax shining yellow, with a broad black stripe in the notopleural region; a small black stripe, parallel with the preceding, on the superior margin of the mesopleura; all the bristles black, scutellum shining yellow, short, triangular, the intermediate pair of bristles very small. Metanotum shining black; halteres yellow.

Abdomen very narrow and elongate, dark shining yellow, with yellow pubescence and black bristles on the sides; the last segment black at the tip; genitalia prominent, shining black with yellow base. Legs shining yellow, very long and slender; front femora with 4–5 long and slender dark yellowish bristles; front tibiae bare; hairs of the hind tibiae yellow.

Wings elongate, the first vein ending at one-third the distance between the auxiliary and second vein; pattern like that of the preceding, but very well characteristic, the complete hyaline [illegible] and, which is restricted in the middle just [illegible] two discal spots of *dunlopi* the outer only is present, and after [illegible] Before the basal hyaline portion of the stigma are [illegible] order therefore shows four black spots before the end [illegible] shows four black than in all the preced[illegible] cell is much shorter

The general fac[illegible] brown streaks on th[illegible] ness of the legs and the

A single male [illegible] with *dunlopi*.

The coll[illegible] asserim, Low[illegible] Burma (*W. Doherty*) $\frac{5\,8\,5\,0}{1\,5}$.

thi[illegible] a cotype of *Trypeta musae*, Froggatt, from N. S. Wales; [illegible], and I have placed the species in the above table because its [illegible]very in India is not impossible. *R. musae* differs from all the above species in having two lower *or.*; the arista is pectinate, but on the underside are to be seen some very small hairs. Pattern of the wings very like that of *dunlopi*, but the stigma wholly black; a triangular indentation at the tip of the wings, in the first posterior cell. Anal cell broad, the point broad and a little shorter than the second

basal cell. First vein ending opposite the small cross-vein. Thorax wholly yellow, without black lateral streaks.

24. Rioxa quinquemaculata, n. sp. ♀.

(Pl. ix, fig. 27.)

In this small-sized, narrow elongate, slender species, the black wings are devoid of hyaline discal spots and show only five marginal indentations. Length 7 mm., with the ovipositor.

This species is very like *sexmaculata*, Wulp, but easily distinguished by the unstriped pleura, the absence of bristles on the legs, and the wings with only five marginal hyaline indentations. Both these species seem to be congeneric with the type species *lanceolata* of Walker.

Head reddish yellow, very broad and low; antennae darkened, the third joint quadrangular; arista pectinate, with distant and long hairs on the upper side only; eyes round; cheeks narrow; two black lower *or.*; of the superior *or.* the superior is yellow and the inferior black; no *oc.*; *pvt.* yellow; two *vt.*, the outer black, the inner wanting; genal bristle black, and after this some other black bristles; the bristles of the occipital row are well developed, black.

Thorax damaged; it seems to be dark reddish yellow, the pleura cinereous and not striped; all the bristles black; intermediate bristle of the scutellum weak. Halteres darkened.

Abdomen narrow elongate, shining black, with a broad ferruginous median longitudinal band; the 6th segment wholly black like the ovipositor, which is as long as the four last segments together; some short bristles on the sides of the last three segments; pubescence blackish. Legs wholly yellow, short but not very slender; front femora with 3–4 bristles beneath; middle legs without bristles.

Wings as in *sexmaculata*; but the first hyaline marginal spot on the stigma wholly wanting; the four other spots [illegible] position [illegible] at the end of the 6th vein, but in the mid[illegible] [illegible]h and 6th vein. First vein ending in the mi[illegible] [illegible]d vein; the point of the anal cell very br[illegible] [illegible]er than the second basal cell; no distinct costal bristle.

A single specimen [illegible] (*W. Doherty*) $\frac{5\,8\,4\,1}{1\,5}$.

This species seems to [illegible] ently described *R. sumatrana*, Enderlein, Zoolog. Jahrbüch., xxxi, 449, f. U (1911).

25. Rioxa? stellata, Macquart.

(Pl. ix, fig. 28.)

Macquart, Dipt. exot., Suppl. 4, 266, (137) 9, pl. 27, f. 7 [*Acinia*] (1851); Osten-Sacken, Berlin. Entom. Zeitschr., xxvi, 227 [*Trypeta*] (1882); Enderlein, Zoolog. Jahrbüch., xxxi, 433, f. 4 [*Acinia*] (1911).

Very distinct from all the other species by reason of the *Tephritis*-like pattern of the wings.

A damaged specimen is in the collection which seems to belong to this species or to a very closely allied form. It shows six scutellar bristles, the intermediate being a little smaller; the wings are not as broad as in the Trypaneinae of the *Eutreta* group with which it has no affinity, the occipital row of black bristles being very distinct. The arista seems to be, as in the preceding, scarcely pectinate only on the upper side; only a lower *or.*, black; the two superior *or.*, the *pvt.* and the inner *vt.* are yellow.

Thoracic and scutellar bristles dark yellowish. Abdomen yellow, with four longitudinal rows of black spots; ovipositor reddish yellow, as long as the three last segments together.

Wings very like Macquart's figure; a hyaline dot on the stigma; the hyaline spot at the tip of the wings, between the ends of 3rd and 4th veins, is the largest of all. The discal dots are as follows: three in the same line in the submarginal cell, one on the tip of the first basal cell, two at the base of the first posterior cell, five in two lines in the discal cell and one in the third posterior cell. First vein not elongated, ending before the small cross-vein; anal cell as in the preceding. Costal bristle distinct.

I think that *stellipennis*, Walker, is a true Trypaneine with bare arista, broad wings and an occipital row of stout yellow bristles.

A single ♀ from Tenasserim, Lower Burma (*W. Doherty*) $\frac{5\,8\,4\,7}{1\,5}$.

9. **Acanthoneura**, Macquart.

Macquart, Dipt. exot., iii. 377 (220) 7 (1843).

Very distinct from the other Oriental genera by reason of the wavy second vein, the bristly 1st, 3rd and 5th veins, and the broad head of the male.

Head very broad, in the male much more so than in the female; face concave, the epistome a little prominent [illegible] antennae inserted on the middle of the eyes, short but almost reaching [illegible] third joint rounded at the tip, with plumose arista; *or.* 2, (?); *oc.* [illegible] enal bristle strong; bristles of the occipital row black and [illegible].

Thoracic chaetotaxy comp[illegible]llum with four bristles. Abdomen bristly at the tip; [illegible]e genitalia not prominent. Front femora with a ro[illegible]; middle tibiae with a single spur; hind tibiae with a row of s[illegible] bristles on the outside.

Wings pro[illegible]ry short and broad, brownish black with hyaline and luteous spots a[illegible]. First vein ending opposite the small cross-vein; second vein [illegible] and fourth a little sinuous, diverging near the extremity; small cross-vein much after the middle of the discal cell; posterior cross-vein long and perpendicular; anal cell drawn out into a triangular point, which is as long as the second basal cell. The costal vein is not so bristly as in Macquart's figure; first vein with long bristles; 3rd and 5th veins bristly throughout their length, but the bristles rather short; on the inferior side of the wings the 2nd, 3rd and 4th veins are bristly

throughout their length, the first bearing only some bristles at the tip; the posterior cross-vein also bristly on the underside.

It is very probable that the genus *Themara* of Walker is the same as the present, as already suggested by Osten-Sacken (Ann. Mus. civ. Genova, xvi, 461, 1881). From the Neotropical genus *Blepharoneura*, Loew, it differs in the waviness of the second vein, in the pattern of the wings being not reticulate, in the scutellum bearing only four bristles and in the sexual dimorphism of the head. The European *Platyparea poeciloptera*, Schrank, shows some relation to this group.

26. Acanthoneura? fuscipennis, Macquart.

(Pl. ix, fig. 29.)

Macquart, Dipt. exot., iii. 378 (221), pl. 30, f. 2 (1843); Enderlein, Zool. Jahrbüch., xxxi, 417 (1911).

A middle-sized species, with luteous indentations on the wings, the last one of the fore margin being whitish-hyaline like the single discal dot.

I am very doubtful if the present species is the same as that of Macquart, both figure and description being rather different; but I think that in this case Macquart's inaccuracy has been very great. The pattern of the wings of my species is exactly the same as in Walker's *Themara ampla* (Proc. Linn. Soc., i, pl. i, f. 5, 1856), and I should take this species as a synonym if Osten-Sacken had not said that it is the same as *Achias horsfieldi*, Westwood, in which the figure of the head is very different from my male specimen. As shown, however, by Prof. Meijere (Tijdschr. v. Entom., liv, 382) and by Dr. Enderlein (*l. c.*, 415) the width of the head is very variable.

Frons opaque, the vertex and the stripes on which are inserted the *or.* being shining. All the bristles black. Abdomen shining black, the first four segments of the male with the hind border yellow, in the female the first three only. The bristles on the posterior cross-vein are very distinct; the tip of the wing is devoid of spots; the narrow triangular indentation at the tip of the first vein and the round dot in the first posterior cell are whitish h[illegible] ather indentations being luteous hyaline.

Two damaged specimens from [illegible] one ($\frac{5}{8}\frac{6}{4}$) labelled by Bigot as *Trypeta lineata* ♀, n. sp., the oth[illegible] the same author as *Eurosta picta* ♂, n. sp.; Macquart [illegible] gal.

Themara ampla was ta[illegible]

10. Phaeospila, n. gen.

This genus is easily distinguished from the allied *Rioxa* by its black body, strong *oc.*, pointed third antennal joint and by the very peculiar pattern of the hind border of the wings.

Head as broad as high, with narrow cheeks; eyes round; face concave, the epistome a little prominent; antennae inserted on the middle of the eyes, the third joint more than three times the second in length, very sharply pointed at the tip; arista densely but shortly plumose; palpi bristly; bristles of the head long but rather weak, all black; *or.* 2. 3; *oc.* very long, longer than the superior *or.*; *vt.* 2, the inner

very long; *pvt.* parallel, short; the bristles of the occipital row not long, but well developed; genal bristle rather developed.

Thoracic chaetotaxy complete, all the bristles black but not very strong; 2 *mpl.*; *pl.* very long; scutellum light yellow, with four bristles, very broad at the base. Abdomen narrow-elongate, bristly on the sides and at the end; ovipositor longer than the last three abdominal segments. Legs rather long but not weak; front femora with a row of bristles beneath; middle tibiae with a single spur; bristle-row of the hind tibiae very short.

Wings proportionally long, with very small or indistinct costal bristle; first vein not elongate, ending before the small cross-vein; second vein straight; third vein a little curved, bristly over its whole length; small cross-vein after the middle of the discal cell; posterior cross-vein short, perpendicular; anal cell drawn out into a long point, longer than the second basal cell. Pattern of the wings like the type of hyaline indentations and spots; the hyaline indentations of the hind margin bearing a brown triangular spot in the middle.

Type: *Phaeospila varipes*, n. sp.

This genus has a rather isolated position, the pattern of the wing being, however, not unlike that of *Rioxa*; in some respects the type species is not unlike the European *Platyparea discoidea*.

27. Phaeospila varipes, n. sp. ♀.

(Pl. ix, fig. 30.)

Very distinct by reason of the black body with yellow scutellum, by the legs being variegated with black and by the black spots in the hyaline indentations of the hind border of the wings. Length 6-7 mm., including the ovipositor.

Head yellow, opaque, cinereous; frons darkened above the antennae and with an ocellar black dot; antennae dark yellow, with short black hairs on the basa joints; palpi and proboscis yellow[illegible]ed, the palpi with some black bristles; some short black bristles on [illegible]es; hairs of the lower portion of the occiput long and pale; the third [illegible] than the other.

Thorax black, shining, with [illegible]he humeri and a small streak near the external tips of the trans[illegible]ve[illegible], in the middle of the dorsum are two longitudinal cinereous [illegible]n black; the anterior margin of the hypopleura yellowish. Scutell[illegible]iangular, wholly yellow; bristles very long, the apical parallel, the basal divergent. Squamulae white; halteres yellowish.

Abdomen wholly black, rather shining, with pale pubescence; the bristles are black; ovipo[illegible] black, the apical segments yellow; venter yellowish at the base. Legs yellow, the coxae also; the apical half portion of the four posterior femora black and the four posterior tibiae darkened at the base; femora with black hairs, row of bristles on the front femora numbering 6 to 7.

Wings blackish brown, with the following hyaline markings on the fore border: the costal cell, an indentation below the base of the stigma, two approximate indentations beyond the stigma, reaching the third vein; on the hind border: three

very large triangular indentations, one in the second posterior cell and two in the third posterior cell, the first of these reaching the middle of the discal cell, the second incomplete along the 6th vein; the first and the second of these indentations show in the middle an obscure spot, which reaches the hind margin. The posterior cross-vein is margined with luteous. There are three hyaline spots in the middle; two small dots in the basal part of the first posterior cell, at equal distances upon the superior end of the posterior cross-vein, and an elongated oblique streak before the end of the submarginal cell. On the second basal cell and on the base of the anal cell there are also two hyaline dots. The stigma is black, with the base small, hyaline.

One female from Darjiling, 6000 ft., 21-ix-08 (*Brunetti*), and another from the same locality, 9-viii-09, 7000 ft. (*Paiva*); the species seems, therefore, to be confined to the E. Himalayas.

11. Taeniostola, n. gen.

Characterized by its complete and strongly developed chaetotaxy, very strong *oc.*, rounded third antennal joint, yellow black banded body and banded wings.

Head and eyes as in the preceding; third antennal joint rounded at the tip; arista with scanty but long plumosity; palpi bristly; bristles black, strongly developed; *oc.* very strong, and longer than the superior *or.*; *or.* 2. 2 or 2. 1; *vt.* 2, the inner very long; *pvt.* small and parallel; occipital row with long bristles; genal bristle strong; vibrissal edges with short bristles.

Thoracic chaetotaxy complete, the bristles black, also the *sc.*; two *mpl.*; *pt.* very strong. Scutellum flat, rounded, with four or two bristles, the apical parallel. Abdomen elongate, little narrowed at the base, bristly on the sides and at the tip; male genitalia not prominent; ovipositor short, flattened, the basal segment bearing in the type species some long bristles at the tip. Legs short, with the usual bristles; a single spur on the middle tibiae.

Wings proportionally short and broad, with well-developed costal bristle; first vein short; second straight; third a little curved, beset throughout its length with long bristles; small cross-vein a little beyond the middle of the discal cell; posterior cross-vein long and perpendicular; anal cell drawn out into a narrow point, a little longer than the second basal cell. The pattern consists of complete blackish cross-bands, which are partially confluent.

Type: *Taeniostola vittigera*, n. sp.

This genus has also no close allies, and differs in the pattern of the wings from the *Rioxa* group.

28. Taeniostola vittigera, n. sp. ♂, ♀.

(Pl. ix, fig. 31.)

A middle-sized yellow species with black longitudinal bands on the thorax and black transverse bands on the abdomen, very distinct from any other by reason of its ovipositor being bristly at the tip. Length 6½–7½ mm., with the ovipositor.

Head yellow, ferruginous, opaque; in the middle of the frons a fuscous longitudinal stripe which is connected with the black ocellar dot; antennae dark yellow,

with some black hairs at the base; arista yellow; palpi and proboscis yellow; all the bristles black, the occiput below without hairs, but with some black bristles; two lower *or*.

Thorax yellow, rather shining, with short pale pubescence on the dorsum and longer darker hairs on the pleura; there are five complete equidistant longitudinal black stripes, the median a little enlarged posteriorly and prolonged on to the scutellum, the two lateral are outside the *dc*. and on the notopleural suture; all the bristles strong and black as are also the four scutellar; metanotum black, shining, yellow on the sides. Scutellum yellow, with the median black stripe not reaching the tip; it bears on the upper side some blackish hairs. Halteres yellow; squamulae lurid with a dark border and a pale fringe.

Abdomen shining yellow, with black pubescence and black bristles; in the female the 2nd to 5th joints bear a broad black band on the fore border, the band of the 5th being broader than the others and emarginate in the middle posteriorly; the 6th segment is black, yellow in the middle; in the male the 2nd to 4th segments show an equally narrow and complete black band. The 5th is black, with a broad longitudinal yellow band; genitalia black. Venter yellow, with a black band before the tip. Ovipositor shining black, the apical segments yellow; it is as long as the three last abdominal segments together. The tip of the first segment bears four long black bristles.

Legs wholly yellow, rather short and strong, with black hairs and bristles; front femora of the male with 8–9 bristles beneath and between these with thick black pilosity; front femora of the female almost bare, with 5–6 bristles.

Wings hyaline, the stigma black with small luteous tip. There are four complete cross-bands, the two first separated, the other two united together on the fore border. On the base from the humeral cross-vein to the base of the anal cell is a small band, sometimes wanting. The first band begins at the stigma, where it is broader, and ends at the tip of the anal cell. The second begins a little beyond the tip of the first vein, reaches along the small cross-vein and ends on the hind border at the end of the 6th vein. The 3rd and 4th bands begin together before the tip of the 2nd vein, and diverge extending to the hind margin, the third along the posterior cross-vein and the 4th ending after the tip of the 4th vein; these two bands are dilated on the costal border and form a Λ-shaped band. The tip of the wings at the end of the 3rd vein is filled with brown. The hyaline space between the branches of the Λ-shaped band is variable, extending to the 3rd or only to the 4th vein. The apical spot is sometimes united with the base of the Λ-shaped band at the end of the second vein. The veins are luteous in the hyaline spaces, and fuscous in the brownish cross-bands.

Some specimens from Assam, Sylhet and Lungleh, April and July.

29. Taeniostola gracilis, n. sp. ♀.

(Pl. ix, fig. 32.)

A smaller, slender species, distinguished from the preceding by the presence

of only 1 lower *or.* and only 2 scutellar bristles, and by the different pattern of the abdomen, wings and scutellum. Length 5 mm., with the ovipositor.

Head light yellow, the frons dark yellow in the middle, but without distinct fuscous median stripe; on the occiput, below and outside the *vt.*, is a black spot on each side, which is wholly wanting in the preceding species. Antennae light yellow, the third joint broader and shorter, with the upper apical angle a little sharpened; arista black.

Thorax as in the preceding, the pleura much less hairy; the median black stripe is much smaller and abbreviated, not prolonged on the scutellum; the latter wholly yellow, with a black dot at the tip; metanotum as in the preceding, but the hypopleura also black. The 2 scutellar bristles are very long. Halteres and squamulae yellow.

Abdomen very narrow and elongate, not distinctly narrowed at the base; pubescence and bristles black. It is yellow, with a black cross band on the base of the second segment, and black spots on the sides of the others. Ovipositor shining black, as long as the 2 last abdominal segments together, without the apical bristles of the preceding. Venter yellow.

Legs wholly yellow, a little more slender than in the preceding.

Wings with the 1st and the 2nd band exactly as in the preceding; the 3rd band is united with the black of the tip forming a great single black patch, which includes a hyaline band before the posterior cross-vein from the 3rd to the 5th vein. The 2nd band is also united with the third at the hind margin of the wings.

This species is undoubtedly congeneric with the preceding, notwithstanding the different chaetotaxy on the head and scutellum, and the want of the bristles at the tip of the basal joint of the ovipositor.

A single female from the base of the Dawna Hills, L. Burma (*N. Annandale*), 4-iii-08 ($\frac{5764}{15}$).

12. Staurella, n. gen.

Distinguished from the other genera by the want of the *prst.*; from *Ptilona* it differs in having the *dc.* and 2 lower *or.*, a bare 3rd vein and a different pattern of the wings.

Head broader than high; eyes round; face concave and epistome prominent; antennae inserted on the middle of the eyes, reaching the epistome, the 3rd joint 3 times the length of the 2nd, rounded at the tip; arista shortly but densely plumose. *Or.* 1. 2, or 1. 3; *oc.* very small, almost indistinct or wanting; *vt.* 2, strong; *pvt.* weak; the bristles of the occipital row very weak and short; genal bristle strong; vibrissal edges without distinct bristles; palpi bristly.

Thorax elongate, with complete chaetotaxy, but the *prst.* wholly wanting; the bristles are not strong; 1 or 2 *mpl.*; *pt.* well developed. Scutellum triangular, flattened, bearing 4 bristles. Abdomen narrow and elongate, bristly at the tip; male genitalia strongly developed, prominent, with a pendulous middle organ; ovipositor flat, very narrow, not bristly at the tip, as long as the last 3 abdominal segments together.

Legs proportionally short and stout; femora not serrulated beneath, those of the

1st pair with a row of bristles below ; a single spur on the middle tibiae ; bristles of the hind tibiae rather long.

Wings elongate, hyaline with brown cross-bands, which are partially united together. No costal bristle ; all the veins straight ; the first not elongate ; the third wholly bare or with very few bristles at the base ; small cross-vein before or on the middle of the discal cell ; posterior cross-vein long, perpendicular ; anal cell drawn out into a short and broad point, which is shorter than the second basal cell.

Type : *Musca crux*, Fabricius, 1794.

The present genus seems to have also an isolated position, on account of its reduced chaetotaxy, strongly developed male genitalia and wing-pattern. In the elongated and narrow body of *Cordylura* or *Psila*-like shape, it shows affinity with the European genus *Euphranta*, Loew ; but in this genus the chaetotaxy is even more reduced, the *dc.* also being absent as in *Ptilona*. The third vein in *Euphranta* has some bristles at the base only ; in the present genus, the first two species have an entirely bare third vein ; the third species (*nigripeda*) shows some bristles at the base and one or two also after the small cross-vein ; but these are present in one wing only, and therefore it seems to be subject to variation or caduceus.

The species in the collection can be distinguished as follows :—

1 (4). Predominant colouring greyish yellow ; legs entirely pale yellow ; *or.* 1. 2 ; bands of the wings partly united.

2 (3). Wing-pattern paler and variegated, with a cross-shaped double band at the tip .. .. *crux*, Fabr.

3 (2). Wing-pattern darker and not variegated, the apical cross being broken in two separate bands .. .. *dissoluta*, n. sp.

4 (1). Predominant colouring black ; legs almost entirely black ; *or.* 1. 3 ; wing bands isolated, those of the middle divided into two streaks .. .. *nigripeda*, n. sp.

30. Staurella crux, Fabricius.

(Pl. ix, fig. 33.)

Fabricius, Entom. Syst., iv, 358, 190 [*Musca*] (1794) and Syst. Antl., 277, 23 [*Dacus*] (1805) ; Wiedemann, Auss. Zweifl., ii, 488, 19 [*Trypeta*] (1830).

A narrow elongate, middle-sized, greyish species, very distinct by reason of the variegated cross band at the tip of the wings.

Head greyish yellow, occiput, vertex and face shining ; frons opaque, with few dark hairs in the middle ; ocellar black dot very small ; a small black streak on each side below the vibrissal edges ; the bristles are black ; the 2 lower *or.* are long and of equal size ; the single superior *or.* is not inserted upon a tubercle as is the case in *Ptilona* ; occiput with long pale hairs below ; palpi with some black bristles ; arista with longer hairs on the upper side.

All the bristles of the thorax are black, the *sc.* also ; dorsum with short yellow pubescence, which is longer on the pleura ; pleura shining, darkened, reddish brown ; the dorsum opaque, whitish-tomentose ; metanotum dark reddish brown, very shining in the middle. Scutellum light yellow. Squamulae whitish ; halteres yellow.

Abdomen with black pubescence and black bristles; venter yellowish; 5th segment black with yellow tip in both sexes, 6th in the female wholly yellow. Ovipositor yellowish, black at the base on each side. Genitalia of the male round, prominent, reddish brown, shining, pale-haired; the pendulous middle organ is light yellow with a pale fringe; on the middle of the venter are two prominent approximate yellow lamellae, provided with black bristles. The dark portions of the legs are reddish brown; front femora in both sexes with only 3–4 bristles beneath.

Wing-pattern as described by Wiedemann: the brownish cross-bands are interrupted by clearer streaks, that of the middle band is between the 4th and 5th veins, and those of the apical band between 2nd and 3rd and 3rd and 4th, this last the broader. The stigma is brownish, with the extreme superior apical angle pale; the posterior cross-vein is margined interiorly with fuscous and exteriorly with cinereous.

Some specimens of both sexes from Calcutta, April 3rd, 1903.

31. Staurella dissoluta, n. sp. ♂ ♀.

(Pl. ix, fig. 34.)

Very like the preceding, but easily distinguished by the darker and unvariegated pattern of the wings and by the crossed apical band being divided into two. Length 7—8 mm., with the ovipositor.

The body is a little more robust than in the preceding and the abdomen is more darkened; the male genitalia are exactly of the same shape but the lower lamellae are blackish. The principal difference is shown by the pattern of the wings, which is much darker and not variegated by lighter portions; the small band on the humeral cross-vein is a little broader; the Λ-shaped middle band has the same appearance, the greater branch being narrowly interrupted just above the fifth vein. At the tip are two cross-bands, one on the posterior cross-vein, extending from the hind margin to the third vein; the other is broader, beginning at the fore border before the tip of the second vein and ending at the hind border after the end of the fourth vein; on the fore border a little beyond the stigma, is a brown spot, which reaches below the second vein, and sometimes the third. The border of the posterior cross-vein is only blackish, without lighter margin.

A single pair from Maldhan, Naini Tal dist., U. P., 12-iv-08 ($\frac{5839}{15}$, $\frac{5840}{15}$).

32. Staurella nigripeda, n. sp. ♀.

(Pl. ix, fig. 35.)

Easily distinguished from the two preceding species by the black colouring of the body and legs, and by the different pattern of the wings. Length 7 mm., with the ovipositor.

Occiput shining black, with a yellow spot on the sides and a ferruginous spot at the vertex; frons in the middle blackish, yellowish on the sides and in front of the antennae; face dark, with grey pollen; cheeks yellowish. All the bristles are black, the superior *or.* are not inserted upon a prominent tubercle; *or* entirely wanting

Antennae yellow, the third joint grey pollinose; arista black, long, shortly pilose; proboscis and palpi dark yellow

Thorax shining black, with very short pale pubescence and dark grey pollinose; on the back are to be seen three less distinct narrow longitudinal grey stripes; the humeri are yellowish; the bristles are black; there is a single *mpl.* Pleura shining black, without pollen, narrowly reddish along the sutures; sternopleura below with short white pubescence. Metanotum shining black, unspotted. Scutellum of smaller size, triangular, reddish-yellow, with a broad basal black spot and greyish pollen; the four bristles are strong and long, the median pair crossed at the apex. Halteres and squamulae pale yellow.

Abdomen narrow and elongated, shining black, with a broad longitudinal middle yellow stripe, which is quite distinct on the two first segments, and after them becomes greyish and less distinct, being also interrupted at the base of the segments. The bristles are black; venter dark yellow. Ovipositor flattened, densely but very shortly pilose, as long as the three last segments, narrow and truncate at the end and shining black. Legs black, with grey pollen; coxae and trocanters yellow and also the knees narrowly; tibiae at the end and the first tarsal joint dark yellow, chiefly those of the front legs.

Wings without costal bristle; veins black, only the costa at base and the subcosta yellow; stigma black, narrowly yellow at the base. The pattern consists of four blackish bands. The first is near the base, short and narrow, extending from the bifurcation of the second vein to the apex of the anal cell. The second band reaches from the stigma over the small cross-vein to the hind margin, where it terminates in the middle of the third posterior cell; it is broadly interrupted at the third vein, the first portion forming an isolated streak after the stigma, the second being much broader. The third band begins beyond the stigma, and passing over the hind cross-vein, reaches the hind margin at the apex of the fifth vein; it is also interrupted at the third vein, the second portion being much broader than the first. The fourth band is much broader than the others, filling out all the apex; it contains two hyaline spots, one at the distal corner of the marginal cell, the other semilunar just at the tip, between the ends of the third and fourth veins.

A single specimen from Kurseong, 5000 ft., E. Himalayas, ix-09.

13. Callistomyia, n. gen.

Easily distinguished from any other genus by the presence of a small but distinct *pp.*, and by the four posterior femora being serrulate beneath, and also by the peculiar pattern of the wings.

Head as broad as high, the frons and the face much narrower than in all the preceding genera; eyes round, with the anterior facets enlarged; occiput not swollen; cheeks very narrow; face concave, the epistome a little prominent; antennae inserted at the middle of the eyes, not reaching the epistome; third joint 2½ times the length of the second, rounded at the tip; arista shortly plumose; palpi not bristly; no *oc.*; *or.* 2. 3, the superior weaker than the lower; *pvt.* very small; *vt.* 2, the outer

very small; black bristles of the occipital row well-developed; genal bristle weak; vibrissal edges bare.

Thorax robust, with complete chaetotaxy and moreover with a black *pp.*, which is as strong as the *scp.*, and is wanting in all the other genera; *dc.* very close to the scutellum; two *mpl.*; *pl.* strongly developed. Scutellum triangular, flat, with four bristles. Abdomen broad and rounded, very convex, narrowed at the base and almost pedunculate, with short lateral and apical bristles; ovipositor short truncate, shorter than the two last abdominal segments together; male genitalia not prominent. Legs short and stout; front femora with a row of bristles beneath; the four posterior femora with a row of short spinules below on each side; middle tibiae with two spurs; hind tibiae ciliated.

Wings long, without costal bristle; they are hyaline with a middle arcuated brown cross-band and a large round apical spot of the same colour. All the veins straight; the first ending a little after the small cross-vein; third bristly; third and fourth parallel; the small cross-vein before the middle of the discal cell; the posterior cross-vein short and perpendicular; second basal cell a little enlarged and hyaline; anal cell drawn out into a middle-sized point, which is as long as the second basal cell.

Type: the following species.

This genus is very distinct from any other and has no near allies; it shows some resemblance to *Dacus* in general appearance and colouration as it does in the shape of the second basal cell; but has nothing to do with that genus. It is possible that *Dacus klugii* of Wiedemann belongs here; the *Dacus icarus* of Osten Sacken seems to me undoubtedly a species of this genus, and some of Walker's species also.

33. Callistomyia pavonina, n. sp. ♂ ♀.

(Pl. ix, fig. 36.)

A handsome fly of proportionally great size, very distinct by its peacock-like pattern of the wings. Length 8—9 mm., with the ovipositor.

Head yellow, opaque, shining on the occiput, at the vertex and on the lower portion of the face; frons with two opaque dark spots, one, the greater, before the ocellar black dot and the other which is smaller above the antennae; a brown shining spot in the lower portion of the face at the middle of the epistome; basal joints of antennae dark reddish, with some black hairs; third joint light yellow; arista dark. All the bristles black; occiput below with a few short pale hairs and two or three black stronger hairs above the genal bristle; the first superior *or.* very weak and short. Palpi and proboscis yellow, dark reddish above; margin of eyes narrowly white.

Thorax tawny reddish, opaque, with yellow pubescence, the pleurae almost bare; three narrow black longitudinal stripes on the dorsum, the laterals sometimes abbreviated; a short black streak in the notopleural region and above this a yellow spot. Pleura reddish, darkened on the mesopleura and with an arcuate yellow band, which is formed by a horizontal streak on the superior margin of the mesopleura connected with a vertical streak on the anterior margin of the pteropleura; hypopleura yellow,

black beneath ; metanotum black, reddish yellow on the sides ; sternopleura with a blackish spot beneath. Scutellum yellow, narrowly reddish at the base. All the bristles black, not very strong ; propleura with long pale hairs. Squamulae white ; halteres reddish yellow.

Abdomen reddish, with pale pubescence and black short bristles ; the 2nd to 5th segments in the female and 2nd to 4th in the male show at the base a narrow complete transverse black band ; the lateral margins also narrowly black ; venter reddish ; ovipositor reddish, almost bare ; male genitalia black ; in the male the black cross-band of the 4th segment is often abbreviated on the sides.

Legs yellow, the apical half of femora and the tibiae darkened, reddish ; bristles and hairs black ; front femora in the male with many, in the female with few weak bristles beneath ; the serrulation of the four posterior femora begins after the middle.

Wings hyaline, with the following markings : a yellow irregular band at the base from the stigma to the anal cell, interrrupted by the hyaline second basal cell ; along the anal cell this band is prolonged in a dark point upon the 6th vein. The stigma is wholly yellow. In the middle of the wings is a narrow brown cross-band, which begins on the fore border a little after the stigma and extends in the form of an arch over the small cross-vein to the hind margin ; this band is prolonged along the costa on the fore border to the end of the 2nd vein. At the apex of the wings is a large, rounded, brown area which extends from the tip to the posterior cross vein and from the 3rd to the 5th vein, filling up the apical portion of the discal cell, two-thirds of the first posterior cell and almost the whole of the 2nd posterior cell, the inferior external angle alone excepted.

Several specimens of both sexes from Gopkuda Island, Lake Chilka, Orissa, August 7—15th, '07 ; some others from Calcutta in June, labelled by Bigot *Dacus pavoninus* ; a male from Rajmahal, Bengal, July 6th, 1909 (*N. Annandale*). Some additional specimens from Gangapur Pattia and Bindukhera, Naini Tal distr., base of W. Himalayas, 3—4-iv-1910.

I have given to the species the appropriate MS. name of Mr. Bigot.

14. Chaetellipsis, n. gen.

Easily distinguished from any other by the absence of the *or.* and the thickly pilose frons.

Head broader than high ; eyes oval, a little compressed, with the anterior facets enlarged ; antennae inserted below the middle of the eyes, the frons therefore longer than the face ; face flat, the epistome not prominent ; frons broad, flat, thickly pilose in its whole expanse. Antennae very short, the 3rd joint scarcely double the 2nd, rounded ; arista long, pectinate on the upper side only ; no *oc.* and no *or.* ; *vt.* 2, the inner three times as long as the outer ; *pvt.* weak, parallel ; bristles of the occipital row weak, yellow ; genal bristle almost indistinct ; palpi without black bristles.

Thoracic chaetotaxy complete, the bristles strong ; *dc.* a little before the middle between the transverse suture and the scutellum ; 2 *mpl.* ; *pt.* strong ; scutellum flat, triangular, with 4 bristles. Abdomen short, round, convex and narrowed at the

base, with strong bristles on the sides and at the tip; male genitalia a little prominent. Legs short and stout; middle tibiae with a single spur; claws of the male very short, the last tarsal joint a little dilated.

Wings long, with a small costal bristle; auxiliary vein indistinct at the end; first vein short; 2nd straight; 3rd bristly throughout its length, curved beneath near the tip; small cross-vein after the middle of the discal cell; posterior cross-vein perpendicular; anal cell drawn out into a broad point, as long as the 2nd basal cell. Pattern consisting of a broad yellow band along the fore border and of some streaks in the posterior half.

Type: the following species.

This genus is an aberrant one in the absence of the *or.*, but it shows all the other characters of a true Trypaneid. It is very probable that some Oriental species, placed by the authors in the Ortalids, belong here, as some *Xiria*, etc. The Neotropic genus *Xanthacrona*, Wulp, has a very similar shape of the head; but this genus is a true Ortalid, as stated by Prof. Hendel in his recent paper on the "Pterocallina." More affinity is perhaps presented with the Oriental genus *Lagarosia*, which however is unknown to me. The genus *Chaetellipsis* shows a remarkable likeness with *Ceratitis s. str.*, and notwithstanding the yellow bristles of the occipital row is a true Ceratitinine.

34. Chaetellipsis paradoxa, n. sp. ♂.

(Pl. ix, fig. 37.)

A middle-sized yellow species, easily distinguished by the broad yellow band on the fore border of the wings. Length 6 mm.

Head yellow, with cinereous tomentum and a brown cross-band on the occiput above the neck; a small black ocellar dot; the frons shows a small darker yellow longitudinal stripe in the middle and is covered with pale hairs; antennae light yellow, with some pale hairs at the base; arista yellow; all the bristles yellow, except the *vt.* which are black; palpi and proboscis yellow.

Thorax yellow, shining, opaque in the middle of the dorsum, with short yellow pubescence, which on the pleura is longer and darker; all the bristles black, only the median pair of *scp.* being yellow. The post-alar calli and a transverse band in front of the scutellum black; the humeri and a band on the upper portion of the mesopleura extending to the anterior part of the pteropleura are whitish yellow; hypopleura white; metanotum shining black, with a yellow longitudinal stripe in the middle and a white lateral spot which is connected with that on the hypopleura. Scutellum whitish yellow. Squamulae and halteres yellowish.

Abdomen shining yellow, with pale pubescence and black bristles; 3rd segment with a black round spot on the sides; 4th with a complete black transverse band at the base; 5th with a triangular lateral black spot on each side; genitalia black; venter yellow cinereous, with some blackish spots on the sides.

Legs wholly yellow; bristles black, yellow on the fore coxae; front femora with a row of 2—3 bristles beneath and yellow hairs on the upper side; hairs of the hind tibial row black.

Wings with yellow veins; the small costal bristle is black; the yellow band at the fore border extends from the base of the wings to the tip of the 3rd vein, where it is connected with a brown spot which reaches the middle of the costa between the tips of the 3rd and 4th veins; this band is cut obliquely below and covers the base of the anal cell, the whole of the 2nd and of the 1st basal cells and the bases of the discoidal and of the 1st posterior cells. Beyond the stigma there is a hyaline spot on the costa, and two other smaller ones at the end of the 2nd vein and before the end of the 3rd. The stigma is yellow, with a brown spot at the tip. Upon the posterior cross-vein is a yellowish brown band which extends from the hind border to the middle of the first posterior cell; another smaller oblique brown band begins at the costal band in the middle of the last portion of the 3rd vein and extends to the hind border, reaching it after the end of 4th vein. On the middle of the third posterior cell is an uncertain yellow longitudinal band, which extends anteriorly to the middle of the discal cell.

A single male caught by Dr. Annandale at Paresnath, W. Bengal, 4400 ft., April 11th, 1909.

15. Poecillis, n. gen.

Very like the preceding, but distinguished by the complete chaetotaxy of the head and the different pattern of the body.

Head, antennae and frons exactly the same as in the preceding; no *oc.*; *or.* 2. 4–5; the first superior very small; the other bristles as in the preceding, but those of the occipital row black; genal bristle strong, black. Thoracic and scutellar chaetotaxy as in the preceding; the abdomen also; ovipositor flat, as long as the 3 last abdominal segments together. Legs and wings as in the preceding genus, but the pattern of the wings blackish, not yellow.

Type: the following species.

Notwithstanding the very different chaetotaxy of the head and the different pattern of the body, it is very probable that this genus represents the female sex of *Chaetellipsis*, and if this extraordinary sexual dimorphism should be proved, the genus will retain this last name. *Lagarosia*, Wulp, is perhaps allied.

35. Poecillis judicanda, n. sp. ♀.

(Pl. ix, fig. 38).

A black species with yellow and whitish markings, and with blackish pattern of the wings. Length 7 mm., with the ovipositor.

Head as in the preceding, but the pubescence of the frons dark and all the bristles black; antennae darker. Thorax shining black, with two broad reddish stripes in the middle, which at the suture are so dilated as to reach the sides; the whitish yellow lateral stripe from the humeri to the hypopleura is very striking and below this is a broad brown stripe; sternopleura yellow beneath; scutellum whitish yellow; metanotum without the median yellow stripe. Squamulae and halteres whitish yellow. Abdomen black, the 2 basal segments yellow; hind borders of 4th–6th segments with a broad yellow band, which does not reach the sides. Ovipositor black,

shining, black pilose; venter yellow. Legs with the 4 posterior femora blackish at the tip.

Wings with the same pattern as in the preceding, but the veins are fuscous and the broad band on the fore border is blackish; the costal cell is light; the 3 hyaline spots at the costa are in the same position. The 2 bands of the hind border are brownish; that on the hind cross-vein is often evanescent and there is no trace of the longitudinal band in the middle of the third posterior cell.

Two specimens caught by Dr. Annandale at the same place as the preceding: Paresnath, W. Bengal, 4300 ft., 9th and 11th April 1909 ($\frac{9565}{15}$, $\frac{9568}{15}$).

If it is proved that this species is the female of *Chaetellipsis paradoxa*, we have here the most remarkable case of sexual dimorphism as yet known in the family.

16. Ceratitis, MacLeay.

MacLeay, Zoolog. Journ., iv, 475 (1829).
Petalophora, Macquart, Hist. Nat. des ins. Dipt., ii, 454. 5 (1835).
Halterophora, Rondani, Dipt. ital. Prodr., iv. 10 (1861).

As restricted here, this genus is easily known by the pubescent arista on the upper side only, the oblique position of the hind cross-vein, and the very peculiar pattern of the wings.

Head as broad as high; face very broad beneath, flat, the epistome not prominent; cheeks rather broad; antennae inserted on the middle of the eyes, short, the third joint double the length of the second, rounded at the tip; arista long, shortly pubescent on the upper side only; *oc.* long and robust; *or.* 2. 2; *vt.* 2; *pvt.* parallel, yellow; occipital row with black bristles; genal bristle indistinct; palpi shortly bristled.

Thoracic chaetotaxy complete; *dc.* nearer to the suture than to the scutellum; 1 *mpl.*; *pt.* strong; mesopleura with long and stout hairs. Scutellum swollen, with 4 bristles and stout hairs on the middle. Abdomen broad and short, bristly on the sides and at the end; male genitalia prominent; ovipositor flat, short. Legs short and robust; front femora of the male much more bristly than those of the female; middle tibiae with a single spur; bristles of the row of the hind tibiae rather long.

Wings very broad and short, with yellow and brown cross bands and black streaks on the base; costal bristle short, but distinct; 1st vein short; 2nd straight; 3rd straight, bristly throughout its length; last portion of the 4th vein curved; small cross-vein on the middle of the discal cell; hind cross-vein oblique, the inferior angle of the discal cell therefore acute; second basal cell a little dilated; anal cell drawn out into a point as long as the 2nd basal cell; anal cross-vein very deeply curved in the middle.

Type: *Trypeta capitata*, Wiedemann, 1824.

As here restricted, the genus will comprise only a few species; the spatulated appendages of the front of the male are not present in all the species. The African species with feathered legs in the male seems to belong to a peculiar genus.

I think that the name *Ceratitis* is not preoccupied in zoology by *Ceratites*, and I

use it notwithstanding the reasons advanced by Mr. R. von Ihering in *Entomologista brasileiro*, ii, 212 (1909).

36 Ceratitis capitata, Wiedemann.

Wiedemann, Anal. entom., 55, 124 [*Trypeta*] (1824). For a complete bibliography of this species see Bezzi, Boll. Labor. Zool. Portici, iii, 276 (1909) and Froggatt, Report 1907-1908, 100 (1909).

Easily distinguished by the peculiar colouration of the body and wings, and by the spatulate appendages of the frons of the male.

In the collection of the Indian Museum there are only 2 specimens from Australia presented by Mr. Froggatt; but this cosmopolitan species is recorded here because it was first described from East India, and is known as a fruit-pest in this country.

The species is well known ; I will add to the description that the frons is pilose in the middle ; the thoracic and scutellar bristles are black, except the *scp.* which are yellow ; the stout hairs on the mesopleura are black in the male and yellow in the female and the hairs on the upper side of the front femora are also black in the male, yellow in the female.

17. Phagocarpus, Rondani.

Rondani, Bull. Soc. entom. ital., iii, 171, xix (1871).

Anomoia, Walker, Entom. Magaz., iii, 80 (1836), not of Chevrolat, Coleoptera, 1834.

Distinct by reason of the long and very oblique hind cross-vein and by the peculiar wing-pattern; from *Ceratitis* it is distinguished by the arista being pubescent on both sides, by the different shape of the discal cell and by the absence of the black streaks at the base of the wings.

Head as high as broad, not produced below ; cheeks narrow ; eyes rounded ; occiput not swollen superiorly ; face flattened, epistome not at all prominent ; antennae inserted towards the middle of the eyes, a little shorter than the face, the third joint rounded at the end, the arista shortly pubescent on both sides ; palpi with short bristles ; proboscis short. Chaetotaxy complete ; *oc.* short and weak ; *pvt.* strong and parallel ; *or.* 2. 3 ; genal bristle strong ; bristles of the occipital row well-developed and black ; frons thinly pilose toward the middle.

Thorax with black pubescence and complete chaetotaxy ; *sc.* well-developed and black ; *dc.* near the scutellum ; 2 *mpl.* ; *pt.* weak. Scutellum with four bristles, the apical parallel. Abdomen narrowed at base, bristly at end. Legs short and robust ; front femora with a row of bristles below ; middle tibiae with a single spur ; hind tibiae not ciliated.

Wings of usual shape and with short costal bristle ; first longitudinal vein short, ending before the small cross-vein ; stigma very short ; second vein ending in the middle between the ends of the first and third veins, or a little after ; third and fourth veins parallel with one another ; third bristly at the base only ; small cross-vein placed on the middle of the discal cell, but apparently before the middle, because the hind cross-vein is very long and oblique, on the upper end very close to the small cross-vein and on the lower end very near the hind margin of the wing ; the discal cell is therefore short

above and long below, its inferior external angle being very pointed ; anal cell drawn out into a long point, as long as the second basal cell. Wing-pattern consisting of a yellowish or blackish large basal spot extending to the small cross-vein, and of two divergent narrow black streaks on the apical half.

Type : *Musca purmundus*, Harris, 1776.

Walker's name, which was corrected to *Anomoea* by Loew, being preoccupied in the Coleoptera, must be changed to that given by Rondani, the latter accordingly is used here.

37. Phagocarpus immsi, n. sp. ♂.

(Pl. x, fig. 72).

A dark yellow species, with the basal spot of the wings broadly yellow. Length of the body 6 mm., of the wings 5½ mm.

Head entirely yellow, covered with white pollen on the face ; all the bristles black ; a few pale hairs on the occiput below ; antennae dark yellow, the third joint very shortly pubescent ; palpi pale yellow, proboscis darker.

Thorax on the back dark reddish, covered with dark grey pollen and black pubescence, on the pleura and humeri pale reddish and shining ; all the bristles are black. Scutellum flattened, pale reddish, shining, with very long marginal bristles. Squamulae brownish, halteres dark yellow. Abdomen dark reddish, shining, with black pubescence, second and third segment blackish, the first three segments with a broad greyish border on the hind margin ; belly yellowish, the middle segments partly blackened ; genitalia yellow, small, not prominent. Legs entirely yellow, with black hairs and bristles ; femora rather thickened.

Wing veins yellow, darkened only on the blackish portions of the pattern ; they are hyaline, with a peculiar pattern ; stigma entirely black. There is a broad basal patch which leaves the costal cell free, except for a yellowish spot on the humeral cross-vein, and ends below on the fifth vein, filling out the whole of the anal cell ; this large patch is yellow, but outwardly ends in an arcuate black band, which begins below the stigma, reaches the small cross-vein and ends on the fifth vein, which is prolonged in a narrow greyish streak to the hind margin of the wing at the end of the sixth-vein ; there is a small hyaline spot in the first basal cell, below the stigma. From the black band, just over the small cross-vein, extends a narrow black streak which reaches the fore margin, and forms a triangular hyaline indentation beyond the stigma, with the vertex on the third vein. The two apical diverging blackish streaks are as follows : one, the shorter, on the hind cross-vein, reaching the hind margin ; the other, longer and arcuate, begins at the base of the first posterior cell and follows the end of the second vein, and from here along the costa to the apex of the wings, ending a little after the end of the third vein. These two streaks are not fused together at the base and are never united with the black band.

A single male, collected near Bhowali, Kumaon, 5700 ft., June 22, 1910, by Dr. A. D. Imms, in whose honour the pretty species is named.

This species is a true *Phagocarpus* resembling *purmundus* in venation and pattern

of the wings. It differs from this last species, which is the only one known, in being of greater size and yellower colouring ; the basal wing-pattern is also more yellow and more broadened ; the second longitudinal vein is distinctly shorter. *Fossata*, Fabr., which was placed in this genus by Van der Wulp, has no connection with these forms and will be found in *Acidia*.

18. Myiopardalis, Bezzi.

Bezzi, Boll. Labor. Zool. Portici, v, 8 (1910).

Easily distinguished by the bare third vein, the short proboscis, the strong ocellar bristles, the stump on the second vein and the very short point of the anal cell ; very characteristic also is the colour of the thorax, yellow with black spots.

Head distinctly higher than broad, the face elongated below and the cheeks very broad ; occiput a little swollen below ; eyes rounded, not distinctly narrowed ; frons convex, prominent ; face flat, without carina and with the epistome not prominent ; proboscis short and not geniculate ; palpi without bristles ; antennae inserted above the middle of the eyes, very short, the third joint 1½ times as long as the second, a little pointed at the tip ; arista shortly pubescent on both sides.

Chaetotaxy of head and thorax complete ; *oc.* long and robust ; *or.* 2. 3 ; *vt.* 2 ; *pvt.* weak and long ; bristles of the occipital row almost indistinct, dark yellowish ; genal bristle not distinct ; *scp.* very weak ; *dc.* near the suture ; 2 *mpl* ; *pl.* strong. Scutellum flat, black-spotted, with 4 bristles. Abdomen broad, convex, bristly at end ; male genitalia prominent, with a perpendicular middle organ below ; ovipositor short, not flattened, swollen, with the apical joint very small. Legs short and stout ; middle tibiae with a single spur.

Wings narrow, with yellow cross-bands and without basal black streaks ; costal bristle distinct ; first longitudinal vein short ; all the veins straight, the 3rd and 4th parallel ; second vein with a stump ; third vein bare ; small cross-vein before the middle of the discal cell ; posterior cross-vein perpendicular ; inferior angle of the anal cell drawn out into a very short point, shorter than the second basal cell.

Type : *Carpomyia pardalina*, Bigot, 1891.

This species was originally placed in the genus *Carpomyia*, but in my paper of 1910 I have shown that it demands the erection of a new genus.

38. Myiopardalis pardalina, Bigot.

(Pl. ix, fig. 39).

Bigot, Indian Museum Notes, i, 77, pl. 5 f. 1 [*Carpomyia*] (1891) ; Cleghorn, l. c., ii, 24 [*id.*] (1893) ; Maxwell-Lefroy, Indian Insect Pests, 171, f. 194 [*id.*] (1906), Mem. Dept. Agriculture, i, 129, f. 72 [*id.*] (1907) and Indian Insect Life, 230 [*id.*] (1909) ; Froggatt, Report, 112 [*id.*] (1909) ; Bezzi, Boll. Labor. Zool. Portici, v, 9, 2, fig i, 3, 4 (1910).

A yellow middle-sized species, with 4 yellow bands on the wings and black spots on the thorax and scutellum.

To the description of Mr. Bigot, reported also by Mr. Froggatt, I have to add :—

Head wholly yellow, the frons a little darkened above the antennae ; the bristles

black, but the *pvt.* yellow; genal bristle yellow, indistinct; on the lower portion of the occiput some yellow hairs; palpi and proboscis yellow, clothed with pale hairs.

Thorax clothed with yellow pubescence, which on the pleura is longer; bristles black, except the *st.* and the very weak *scp.* which are yellow. The black spots on the sides are disposed as follows: one small, opaque, on the humeri above the *hm.*; one larger, before the suture between *npl.* and *prst.*, shining above, opaque beneath; one still larger after the anterior *sa.*, extending to the *dc.*, shining above and opaque below, sometimes divided into two spots; and a fourth, shining and small, on the postalar calli. There is also a large rounded black spot just in front of the scutellum. The scutellar spots are opaque, two on the sides at the base, one rounded in the middle before the tip, and one on the underside below the tip. Pleura wholly yellow, metanotum with a black streak above. Halteres and squamulae whitish yellow.

Abdomen wholly yellow, unspotted, the last segments shining; the 2nd to 4th segments show a cinereous cross-band along the hind margin. Genitalia reddish yellow, shining; ovipositor shining yellow. The pubescence of the abdomen is yellow, the bristles are black. Front femora in both sexes with very few bristles. Wing veins yellow; the stump of the second vein is narrowly bordered with a dark yellow shade.

This species is recorded only from India; the bionomics are well known, and the larvae and puparium have been figured many times. The larva breeds in cultivated melons, to which it is very injurious; it is known as the Baluchistan Melon-fly.

In the collection before me are 5 specimens, all co-types of Bigot and labelled Baluchistan (*J. Cleghorn*) $\frac{2\,3\,2\,5 \cdot 2\,3\,3\,0}{1\,3}$.

19. Carpomyia, A. Costa.

A Costa, Annal. scient., i, 87 (1854); Rondani, Bull. soc. entom. ital., i, 164 (1869).

This genus is very near the preceding and shows a similar pattern of body and wings; but is distinguished from it and from any other of the group by the absence of the ocellar bristles.

Head less high, the face being not so produced below and the cheeks being narrower; eyes a little narrowed; frons less prominent. The chaetotaxy and other characters are the same as in the preceding; antennae more elongate, the third joint not attenuated; arista with shorter pubescence. On the wings the stump of the second vein is wanting and the small cross-vein is placed towards the middle of the discal cell; the yellow cross-bands are sometimes much reduced.

Type: *C. vesuviana*, A. Costa, 1854.

There is great confusion about this genus. It was evidently named in MS. by Rondani; but the first notice is found in the rare paper of Prof. Achille Costa, *Frammenti di entomologia napoletana*, printed in Naples in 1854. Schiner has named it *Orellia*, and has mixed up some species belonging to other genera; moreover Rondani has stated that *Orellia flavicans*, Rob. Desv., is the same as *Trypeta falcata*, Scopoli. The division proposed by Rondani in 1869 was accepted by Loew in 1873 (Monogr. iii, 260) as follows: *Oedaspis* with the species *dichotoma*, *fissa* and *multifasciata*, *Goniglossum* with *wiedemanni* and *Carpomyia* with *vesuviana* (*bucchichii*) and *schineri*.

I take here the genus as proposed in 1869; but the name was proposed in 1856 with the type *arctii*, Degeer (=*Trypeta*); in 1870 *signata*, Meigen (=*Rhagoletis*) was proposed as the type. For further information see my paper of 1910.

39. Carpomyia vesuviana, A. Costa.

(Pl. ix, fig. 40).

A. Costa, Annal. scient., i, 87, 10 (1854); Rondani, Bull. soc. entom. ital., i, 164 (1869) and ii, 23, 1 (1870); Roder, Ent. Nachr., xvii, 210 [*Orellia*] (1891); Becker, Kat. pal. Dipt., iv, 116 [*id.*] (1905); Bezzi, Boll. Labor. Zool. Portici., v, 10, 4, f. 5, 6 (1910).—*Bucchichi*, Frauenfeld, Verh. Zool-bot. Ges., xvii, 500, pl. xii, f. 23 [*Orellia*] (1867) and xviii. 154, 5 [*id.*] (1868); Kaltenbach, Pflanzenf., 776, 1 [*id.*] (1874).

A yellow black-spotted species, with four yellow cross bands on the wings, very like *M. pardalina*, but besides the generic characters, distinguished by the two apical black spots of the scutellum; see the figures and descriptions of the above cited authors. The *or.* are yellowish and the *vt.* yellow; occipital row well-developed, yellow. The thoracic bristles are yellowish at the end, the scutellar ones almost entirely yellow. The two scutellar black spots are separated by a narrow yellow line.

The species is only known from South Italy and Dalmatia; the larva lives in the fruits of *Zizyphus*, as observed long ago by A. Costa, but the metamorphosis has not yet been properly described.

In the collection there is a single specimen from Calcutta ($\frac{8\ 2\ 8\ 7}{1\ 5}$) bearing the label: "*Carpomyia* sp., fly injurious to Plum in Calcutta; reared in Museum, 4-ii-92," and another label which says: "by 'plums' the fruits of *Zizyphus jujuba* must be meant, N. A., 1908."

20. Zonosema, Loew.

Loew, Monogr. Trypet., 43, viii (1862).

Distinguished by the yellow body, which is without any black spot, by the pointed third antennal joint and the bare third longitudinal vein of the wings.

Head formed as in the preceding genus, but with the epistome a little more prominent; third antennal joint twice as long as the second, oval-shaped, a little pointed at the tip; arista shortly pubescent. *Oc.* strong; *or.* 2. 3; *vt.* 2; *pvt.* parallel; bristles of the occipital row well-developed, black. Thoracic chaetotaxy complete; *mpl.* 1; scutellum with 4 bristles. Middle tibiae with 2 spurs.

Wings narrow and elongate, with the veins all straight; no distinct costal bristle; first vein short; third vein bare, parallel with the fourth; small cross-vein placed after the middle of the discal cell; posterior cross-vein perpendicular; second basal cell narrow; inferior angle of the anal cell drawn out into a broad point, which is longer than the second basal cell.

Type: *Tephritis alternata*, Fallen, 1820.

I have drawn the above characters from the following Indian species, which differs in some points from the European typical ones; but owing to the general appearance it is better placed here than elsewhere. The single specimen is moreover badly preserved.

40. Zonosema dubium, n. sp. ♂.

(Pl. ix, fig. 41).

A yellow middle-sized species, with narrow elongate brown-spotted wings. Length 5·5 mm.

Head yellow, the frons darkened above the antennae and with a small black ocellar dot; face below on the cheeks whitish-cinereous; antennae, palpi and proboscis yellow. All the bristles on the head and thorax are black. Thorax wholly yellow, opaque (?) on the back, shining on the pleura. Scutellum yellow, metanotum black. Abdomen wholly yellow, shining. Legs yellow. Wings hyaline, with yellowish veins and the following marks: a broad black spot on the anal cross-vein, which is the most striking of all; a brown streak at the fore border after the small cross-vein, running from the border to the third vein; a broad brown spot before the tip of the second vein, which does not reach below the third vein; a broad border at the tip of the wing, beginning at the middle between the 2nd and 3rd veins and extending to the tip of the 4th; the two cross-veins are bordered with brown, the border of the hind vein being continued above into a small streak reaching the third vein; the stigma is pale yellow and below this, in the base of the submarginal cell, in the base of the first basal cell and in the base of the discal cell, are to be seen yellow shades.

A single male specimen from Naini Tal, May or June 1893, Lucknow Mus., $\frac{5989}{15}$.

21. Vidalia, Robineau-Desvoidy.

Robineau-Desvoidy, Essai sur les Myodaires, 719, xii (1830).

Distinguished by the very short antennae, by the retreating face, by the small cross-vein placed after the middle of the discal cell, and in the male sex by the broad and deep excavated frons, bearing horn-like processes and rigid and incrassated *or.*

Head as high as broad, the eyes a little narrowed; antennae very short, not reaching the middle of the face, third joint only a little longer than the second, rounded at the end, with a very short pilose arista; face flat, distinctly retreating inferiorly; cheeks more or less broad; frons of the male broad, deeply excavated towards the middle, with lateral edges elevated, often forming horn-like processes, bearing the very incrassated and rigid orbital bristles, which are truncated at the end; *oc.* very small or indistinct; *or.* variable in number, being partly very incrassate, rigid and erect; 2 *vt.*; *pvt.* short and convergent; occipital row black; genal bristle strong.

Thoracic chaetotaxy complete; 2 *mpl.*; *pt.* strong. Scutellum flattened, triangular, with four bristles, the apical not crossed. Abdomen broad, narrowed at the base, bristly at the tip. Legs short and robust; middle tibiae with a single spur; the row of the hind tibiae well developed.

Wings with a small indistinct costal bristle; first longitudinal vein short; second straight; third and fourth parallel, the third bristly; small cross-vein placed after the middle of the discal cell; posterior cross-vein perpendicular; lower angle of the anal cell drawn out into a small point, as long as the second basal cell, which is rather

broad at the tip. Wings with extended brown pattern with hyaline indentations and spots, or with isolated black spots.

Type : *V. impressifrons*, R.-D., 1830.

The genus is placed here, notwithstanding the resemblance of one species to *Rioxa*, in respect of the very characteristic armature of the frons in the male, which is very like that to be observed in the European *Stemonocera cornuta*, Scop., and in the North American *Straussia longipennis*, Wied. ; both these genera are evidently related to *Spilographa*.

The two species are to be distinguished as follows :—

1 (2). Superior edges of the frons elevated in the shape of two flattened horns ; *or.* 2. 1, the two superiors being incrassated and rigid ; abdomen black at the end ; wing-pattern of the *Rioxa* type. .. .. .. *ceratophora*, n. sp.

2 (1). Inferior edges of the frons elevated ; *or.* 2. 4, the last three inferior being incrassated and rigid ; abdomen entirely yellow ; wing-pattern of the *Spilographa* type .. .. *triceratops*, n. sp.

41. Vidalia ceratophora, n. sp. ♂.

(Pl. ix, fig. 42).

Easily distinguished from the type species of the genus, as described by Desvoidy, by the base of the abdomen and the femora being wholly yellow. Length 5 mm.

Head wholly yellow, with a small black ocellar dot ; antennae yellow, with some black hairs at the base ; proboscis and palpi yellow, these last with some black bristles ; the middle of the frons is opaque, but the vertical horns are shining ; all the bristles are black, the single lower *or.* is placed at the base of the horns and curved forwards ; on the sides of the frons are some small hairs disposed in a single row ; the two incrassated superior *or.* are placed at the tip of the horn and very close together, the first being shorter and curved forwards, the second straight and longer. The 2 *vt.* are situated at the interior base of the horn.

Thorax wholly yellow, rather shining ; it seems to be a little cinereous on the middle of the back ; a small yellowish white streak is to be seen along the notopleural suture ; pleura and metanotum yellow, shining, unspotted ; all the bristles are black, only the middle pair of *scp.* being yellowish. Scutellum light yellow, shining. Squamulae and halteres yellowish. Abdomen shining, with black bristles ; the three first segments are reddish-yellow, the last two black ; the pubescence is pale on the reddish portion and black on the black. Belly reddish, black at tip ; genitalia prominent, of reddish colour. Legs wholly yellow ; front femora with 5–6 black bristles beneath ; hairs of the hind tibiae black.

Wings brownish black, with the base narrowly hyaline. Costal cell hyaline, with a brown spot on the humeral cross-vein ; stigma wholly black. At the fore border are two hyaline indentations, close together, one just after the stigma, extending to the third vein, the other reaching the middle of the first posterior cell just after the small cross-vein. At the hind border are two triangular hyaline indentations, one in the base of the second posterior cell and one after this in the apex of the third

posterior cell extending to the apex of the discal cell; the posterior cross-vein is therefore margined with brown. The hind half of the third posterior cell and the whole of the fourth are hyaline; the base of the discal cell is filled with yellow; the basal and anal cells are wholly brown. The single hyaline dot in the middle is a very small one before the middle of the first posterior cell.

A single male specimen from Siliguri, N. Bengal, 18—20-vii-07 ($\frac{5\,8\,3\,2}{15}$).

42. Vidalia triceratops, n. sp. ♂.

(Pl. ix, fig. 43).

An entirely yellow species, distinguished from the preceding by the different wing-pattern and by the lower and not the superior *or.* being incrassate. Length 5 mm.

Head wholly yellow, with brown geminate spot on the occiput; frons very broad, pale yellow, the lateral elevated edges black; face whitish; antennae and arista pale yellow, this last shortly pubescent; palpi and proboscis yellow; epistome prominent as a narrow hem; face long and distinctly retreating inferiorly; cheeks broad. The frons has the lateral edges on the anterior portion very prominent but not horn-like. The three last pair of lower *or.* are very incrassate, black and rigid, as long as the height of the head and truncated at the tip; there is also another lower *or.* not incrassated, and two pairs of small superior.

Thorax and scutellum entirely ferruginous, shining, the pleura paler, the yellowish lateral stripes less distinct; all the bristles are black. Halteres and squamulae dark yellow. Abdomen entirely shining ferruginous, the last segment black on the sides below; genitalia with a thick prominent point below. Legs entirely yellow; front femora rather incrassate.

Wings hyaline, narrower and more elongate than in the preceding, with indistinct costal bristle; veins black, only the costa at the base and the subcosta yellow; stigma wholly black. The black markings are as follows: a broad patch just below the stigma and in contact with it and giving off two branches, one backwards to the apex of the second basal cell, which is hyaline, and one forwards to the small cross-vein, ending at the fourth vein; the discal cell shows a yellowish shade just below its end. Anal cell at apex with a small brown spot. A narrow perpendicular streak just after the stigma, reaching the third vein. A broad band on the hind cross-vein, beginning towards the middle of the first posterior cell, and becoming broader towards the hind margin. A broad apical patch, which begins at the last third of the distance between the first and second veins, runs perpendicularly to the third vein, and from here goes obliquely to the hind margin, which it reaches after the end of the fourth vein.

A single specimen from Darjiling, 7000 ft., 27-v-10, caught by Mr. Brunetti.

Spilographa armifrons, Portschinsky, Hor. Soc. Entom. Ross., xxvi, 221 (1891), from Siberia, seems to be a species of the present genus allied to *ceratophora*, on account of the pattern of the wings.

22. Xanthorrachis, n. gen.

Not unlike the European *Acidia*, but very distinct by reason of the black dots on the thorax and scutellum, by the wavy second longitudinal vein and by the three yellow rays of the wings.

Head as high as broad, the eyes a little narrowed; face a little concave; antennae placed on the middle of the eyes, the third joint 2½ times as long as the second, rounded at the tip; arista plumose, the hairs scarce and scattered, those on the upper side a little longer; palpi with bristles; no *oc.*; *or.* 2. 3, the superiors very thick; *vt.* 2; *pvt.* weak; occipital row yellow; genal bristle strong.

Thorax with complete chaetotaxy; *pt.* weak. Scutellum rounded, convex, with 4 bristles. Abdomen elongated, bristly on the sides and at the end; ovipositor flattened, as long as the abdomen. Legs robust, middle tibiae with a single spur.

Wings long, with a distinct costal bristle; first longitudinal vein short; second wavy at the base, straight at the end; third bristly, its last portion very much curved forwards towards the middle; small cross-vein placed on the middle of the discal cell; posterior cross-vein a little oblique; second basal cell twice as broad as the first; inferior angle of the anal cell drawn out into a narrow point, longer than the second basal cell. Pattern of the wings very peculiar, consisting of three longitudinal yellow rays, diverging from the base.

Type: the following new species.

This genus is a very peculiar one, but seems to be related to the European yellow species of *Acidia*. The American genus *Plagiotoma* has nothing to do with the present genus, notwithstanding the rather similar pattern of the wing. Allied to the present genus seems to be the African species which Loew has described as *Trypeta jucunda* in 1861; and I have in my collection an undescribed species from Central Africa, which is allied with that here described, but not congeneric. The genus *Chelyophora*, Rondani, placed in the Ortalids by Wulp, is perhaps allied, but has a very different pattern of wing.

43. Xanthorrachis annandalei, n. sp. ♀.

(Pl. ix, fig. 43).

A yellow handsome species of great size, with 6 black dots on the thorax and scutellum, yellow bristles and 3 yellow rays on the wings. Length 7 mm., without the ovipositor which measures 4 mm.

Head wholly yellow, shining; antennae yellow, the third joint darkened at the tip; arista yellow; proboscis and palpi yellow, these last with short yellow bristles; a small black ocellar dot; all the bristles yellow; on the lower portion of the occiput some yellow hairs; the second superior *or.* is very thick and inserted on a small tubercle.

Thorax shining, wholly yellow, with all the bristles yellow; a black dot on the post-alar calli; metanotum yellow; scutellum light yellow, with four black dots, on which are inserted the 4 yellow bristles. Squamulae and halteres yellow. Abdomen wholly yellow, with yellow pubescence, but black bristles; ovipositor reddish yellow, shining. Legs wholly yellow and with yellow bristles, those of the front femora being 6-7 in number; the tibial spurs black.

Wings hyaline, with yellow veins. The three yellow rays are disposed as follows: the first extends along the costa, filling out the costal, marginal and submarginal cells; this ray is united at the base with the second, from which it is separated by a

hyaline streak near the base of the marginal and submarginal cells. The second ray extends along the fourth vein to the tip of the wings, filling up the small cross-vein. The third ray is separated at the base from the other two by the hyaline second basal cell and extends to the hind margin along the fifth vein, filling up the whole of the anal cell. The stigma is yellow. The costal ray shows 4 black dots along the costa, the first after the end of the first vein, the second and third, one before and one after the end of the second vein, the fourth at the tip of the third vein; between the three last spots are placed two hyaline streaks along the costa. The tips of the other two rays are also spotted with brown but the apical spot of the third ray is placed just at the end of the fifth vein, while that of the second is placed beneath, and therefore leaves the end of the fourth vein free.

A single female specimen from the Dawna Hills, L. Burma, 2—3000 ft., 2—3-iii-08 ($\frac{5}{15}\frac{76}{9}$), collected by Dr. Annandale; I take pleasure in naming this handsome and distinct species in honour of the Superintendent of the Indian Museum.

23. Acidia, Robineau-Desovidy.

Rob.-Desv., Essai sur les Myodaires, 720, xiv (1830).

The species of this genus show a short pilose arista, a head not widened below, a scutellum with four bristles, a bristly third vein and the small cross-vein placed after the middle of the discal cell.

Head a little broader than high, not widened beneath, with the mouth-opening small; eyes very large and rounded; face flat, the epistome not prominent; frons not or little prominent; antennae inserted on the middle of the eyes, much shorter than the face, the third joint being about twice as long as the second, rounded at the tip, distinctly pubescent or bare; arista shortly pilose or pubescent; cheeks narrow or broad; *oc.* developed, but not strong; *or.* 2. 3, rarely 1. 3; *vt.* strong, curved backwards; *pvt.* parallel; genal bristle well-developed; bristles of the occipital row black; palpi very broad, spatulate, almost bare; proboscis short.

Thoracic chaetotaxy complete; *scp.* well-developed, black; 2 *mpl.*; *pt.* strong; 4 scutellar bristles, the apicals shorter than the basals or of equal size, parallel or a little diverging. Abdomen narrow, elongate, bristly on the sides and at the end; ovipositor short and broad, flattened, triangular. Front femora with a row of 5—6 bristles below; middle tibiae with a spur; hind tibiae with a row of short hairs.

Wings broad and short, or narrow and elongate, with a small but distinct costal bristle; first vein short, ending much before the small cross-vein, but sometimes very long; 2nd, 3rd and 4th veins almost straight, wide apart from each other and slightly diverging outwards in the broad winged species, in the narrow winged species parallel; small cross-vein placed beyond the middle of the discal cell, often in the apical third or fourth, long and oblique or short and perpendicular; posterior cross-vein long or short, parallel with the small, very close to the hind margin; third vein bristly from the base to the small cross-vein or a little beyond it; inferior angle of the anal cell drawn out into a long and very narrow point, which is equal in length to the second basal cell.

Type : *Tephritis cognata*, Wiedemann, 1817.

This genus is rather heterogenous ; the species are yellow or black, with very different patterns of the wings ; the length of the first vein, the approximation of the cross-veins and the shape of the wings are also very different in the different species. The typical species *cognata* and *lucida* have a yellow body, less approximate cross-veins, narrow wings with the rivulet pattern.

The three yellow Indian species here described are different in the wing-pattern, which is sometimes like that of *Rioxa*. The species of this group are not satisfactorily distinguished from those of *Spilographa*, the only valuable distinction being the position of the small cross-vein, which in the last genus is placed before the middle or on the middle of the discal cell.

The other Indian species have a black body and are allied to the European *caesio* ; they have broad wings with more approximate cross-veins and with a pattern consisting of a black basal portion with hyaline indentations and of apical black bands.

Most of the remaining species, of which none are present in the collection, I refer to the genus *Philophylla*, Rondani, 1870 (=*Euleja*, Walker, 1836, preocc.), which is very well distinguished by its bare arista, by the shape of the head being broader below with the occiput swollen beneath and the mouth-opening very broad, by the narrow eyes and by the narrow and elongate wings.

I recognize as belonging to this genus the European *heraclei*, *centaureae*, *separata*, the North American *fratria* and the South African *excellens*. This last species was previously placed in *Hemilea*, which genus is also only a section of *Acidia*, and the name of which must be *Ocneros*, O.G. Costa, 1844, as stated by Rondani.

The species are characterised as follows :—

1 (2). Wings dimidiate, the fore half black, the hind half hyaline .. .. *praestans*, n. sp.

2 (1). Wings not dimidiate.

3 (8). Colouring of the body yellow or ferruginous; arista pubescent; wings long and narrow, with the middle longitudinal veins parallel and of a *Rioxa*-like pattern ; species of larger size (5—7 mm.).

4 (5). Only a superior *or.*; cheeks very narrow; cross-veins less approximate, the distance being greater than the length of the hind cross-vein; wings with three black bands .. .. *himalayensis*, n. sp.

5 (4). Two superior *or.*, as usual ; cross-veins more approximate, the distance being shorter than or equal to the length of the hind cross-vein ; wings with *Rioxa*-like pattern.

6 (7). First vein short, ending much before the small cross-vein, the stigma of usual shape ; cheeks rather narrow ; metanotum and abdomen entirely yellow ; third joint of the antennæ of male black ; apical black patch of the wing united to the rest of the pattern, and without hyaline spot .. .. *rioxaeformis*, n. sp.

7 (6). First vein very long, passing the small cross-vein, the stigma twice as long as in the preceding ; cheeks very broad ; metanotum with two large black spots and the abdomen black at the end ; antennae of the male yellow ; apical black patch isolated and including a hyaline spot *apicalis*, n. sp

8 (3). Colouring of body black ; arista shortly pilose ; wings short and broad,

with the middle veins diverging and *caesio*-like pattern: species of smaller size (4-5 mm.).

9 (12). Front femora yellow; halteres black; scutellum black, reddish only at the hind margin and beneath; wings short and broad, with the cross-veins approached, and the basal half black, the apical hyaline with black bands.

10 (11). The 4 posterior femora black: an isolated oblique black band between 3rd and 4th veins in the apical portion of the wings *fossata*, Fabr.

11 (10). All the femora wholly yellow; wings without such a cross-band in the hyaline portion .. .. *alboscutellata*, Wulp.

12 (9). Front femora black; halteres yellow; scutellum entirely red; wings more elongate, the cross-veins less approximate, entirely black, with the base and some indentations hyaline .. *erythraspis*, n. sp.

44. Acidia (Ocneros) praestans, n. sp. ♀.

(Pl. x, fig. 51).

Very like *Acidia (Ocneros, Hemilea) dimidiata*, but easily distinguished by being twice as large, by having the abdomen more reddish basally and by a straighter and more sharply defined lower margin of the black fore band of the wings. Length of the body 6½ mm., of the wing 7 mm.

Head yellow, face and cheeks whitish; frons darker yellow, and brownish above the antennae; all the bristles black; *oc.* weak and short; *or.* 2. 3; antennae dark yellow, rather short, the third joint rounded at the end, but a little pointed forwards; arista shortly pubescent; palpi pale yellow, with black bristles; proboscis dark yellow; cheeks narrow.

Thorax dark reddish, shining, clothed with black pubescence; humeri and notopleural streak pale yellow; pleurae paler reddish; all the bristles black. Scutellum flattened, pale reddish. Squamulae pale, halteres dark yellow with blackened knob. Abdomen shining black, with black hairs and bristles; the base of the first segment, and the sides of this and of the other segments broadly reddish, but the last segment is entirely black. Ovipositor short, shorter than the two last abdominal segments together, flat, rounded, shining black. Belly reddish, black at the end. Legs entirely yellow; hind tibiae ciliated with short hairs.

Wings black, with the hind border hyaline from the base to the second posterior cell; the limit is sharply defined, and always forward of the fourth vein; anal cell almost entirely hyaline; stigma rather long, entirely black; after the stigma, at the fore margin along the costa, are to be seen two hyaline very narrow streaks. Second longitudinal vein very long; third and fourth parallel; cross-veins perpendicular, the smaller approached to the hinder; third vein bristly to the small cross-vein.

A single female specimen, near Bhowali, Kumaon, 5700 ft., June 13, 1910, collected on herbage by Dr. A. D. Imms.

This species is very near *dimidiata*, which is the type of the genus *Hemilea* of Prof. Loew; but as the species was originally described by Prof. O. G. Costa in a new genus *Ocneros* (with *Musca pulchella*, Rossi), the last name must be employed in place

of the first. I think, however, that Rondani (Bull. Soc. Entom. Ital., iii, p. 180) is right in leaving the species in the genus *Acidia*, from which it differs only in the wing-pattern.

45. Acidia himalayensis, n. sp. ♀.

(Pl. ix, fig. 45).

A dark ferruginous species, with pale yellow notopleural stripe and scutellum, only a pair of superior *or.*, and hyaline wings with three black bands. Length of the body 5 mm., of the wing 5½ mm.

Head entirely yellow, without occipital spot; frons rather narrow, shining on the sides, without white reflections; face with whitish pollen; antennae yellow, the third joint twice as long as the second; arista yellow, with very short pubescence; cheeks very narrow, with pale hairs below and a black genal bristle; all the bristles black, those of the occipital row thin and short; the single superior orbital is inserted upon a small tubercle; *oc.* very small, less distinct; *pvt.* dark yellowish at end; palpi and proboscis yellow.

Thorax shining ferruginous, with very short pale pubescence and grey pollen; all the bristles black; two equally strong *mpl.*, with some dark hairs near; the pale yellow notopleural stripe is rather distinct. Scutellum pale yellow, flattened, with the apical pair of bristles strong and crossed at the end. Metanotum shining ferruginous, unspotted. Halteres and squamulae dark yellow. Abdomen entirely shining ferruginous, with dark pubescence and black bristles; ovipositor shining black, very short, broader than long, shorter than the last two segments together. Legs entirely yellow, with black bristles and black hairs on the hind tibiae.

Wings not so long or so narrow as in the following two species; costal bristle small; veins black, yellow at the base; third vein bristly to the small cross-vein, lightly bent in the middle of the last portion and behind parallel with the fourth, which is straight after the hind cross-vein; first vein short, ending much before the small cross-vein; stigma short, entirely black; distance of the cross-vein a little greater than the length of the hind cross-vein, but the small cross-vein always placed after the middle of the discal cell. The first brownish-black band is V-shaped, one branch beginning at the stigma, the other going over the small cross-vein; this last is smaller, and is united with the other at the third vein, forming a single broad band which reaches the hind margin in a point before the apex of the third posterior cell. The second band is narrow and straight, beginning at the fore margin before the end of the second vein and running over the hind cross-vein to the hind margin, which it reaches at the end of the fourth vein. This band is united at the fore border with the third band, which forms a broad apical patch, passing a little beyond the end of the fourth vein.

Four specimens from Kurseong, 5000 ft., E. Himalayan, 10—26-ix-09 (*Lynch*).

I am doubtful if the present species can represent the other sex of *Vidalia triceratops* from Darjiling; the wing-pattern is very different, but the North American *Straussia longipennis*, Wied., has also striking differences in the pattern of the wing in

both sexes, showing in some varieties that of the *Rioxa*-type. But it seems that this is not possible for the face does not retreat inferiorly, the antennae are longer, the arista less pubescent and the thorax has pale yellow markings.

46. Acidia rioxaeformis, n. sp. ♂ ♀.

(Pl. ix, fig. 46).

A yellow species with unspotted metanotum, black third antennal joint of male and black wings with hyaline indentations and spots. Length of the body 5½—7 mm., of wing 6—7½ mm.

Head entirely yellow; frons dark ferruginous, opaque, with strong white reflections; face with whitish pollen; cheeks also, a little broader than in the preceding, with some short black bristles; occiput a little swollen inferiorly; proboscis ferruginous, palpi dark yellow, with some bristly hairs; antennae dark ferruginous, the third joint 1½ times as long as the second, very darkened or quite black in the male; arista black, shortly pubescent; all the bristles black; *oc.* rather long but weak; occipital row well-developed.

Thorax as in the preceding but of paler colouring, and with the lateral pale stripe not distinct; scutellum of the same colour as the thorax; metanotum unspotted; there is a very small black spot below the postalar calli, at the root of the wings, but it is not easily seen more especially in some positions of the wings. Halteres yellow. Abdomen entirely yellow as in the preceding; male genitalia partly black; ovipositor shining black, not so short as in the preceding, as long as broad. Legs entirely pale yellow.

Wings as in the preceding but distinctly narrower and longer; the first vein longer, reaching the small cross-vein, the stigma therefore a little longer than in the preceding; cross-veins more approximate, the distance being smaller than the length of the hind cross-vein; stigma entirely black. Costal cell hyaline, with blackened humeral cross-vein and a brown spot in the middle; the basal cells are filled with black, the anal cell is hyaline with a black apex. Just after the stigma are two hyaline triangular indentations, the first, which is the larger, passing forwards of the second vein, the second, the smaller, not passing this vein. Hind margin with two very large hyaline indentations; one in the second posterior cell reaching the middle of the first posterior cell; the other smaller in the apex of the third posterior cell and of the discal cell, ending on the fourth vein; the hind cross-vein is therefore bordered with a narrow black streak, dividing the two indentations. Third posterior and axillar cells entirely hyaline; base of the discal cell with a rounded hyaline indentation. There is a round hyaline discal spot towards the apex of first basal cell, before the small cross-vein, which sometimes is very small and indistinct. The black streak dividing the triangular indentations of the fore border is sometimes incomplete, the two spots being fused into a single spot, bearing an isolated black streak in the middle.

Four ♂ and 2 ♀ from Simla, 7000 ft., 20-vii-11, caught by Dr. Annandale in low-growing herbage.

47. Acidia apicalis, n. sp. ♂.

(Pl. ix, fig. 47).

A yellow species closely allied to the preceding, but distinct by reason of the very broad cheeks, the black-spotted metanotum, the very long stigma and different pattern of the wings. Length of the body 7 mm., of the wing 9 mm.

Head as in the preceding, but the cheeks very broad, and the occiput swollen inferiorly; the black bristles of the cheeks are also wanting, only the genal bristle of dark yellowish colour being present; antennae of the male dark ferruginous.

Thorax as in the preceding; a single *mpl.*; two small black spots on the fore border, near the *scp.*; metanotum with two very large shining black spots; hypopleura with a small basal black border. Scutellum pale yellow toward the hind border. Abdomen with the last segment shining black, ferruginous toward the middle and on the sides. Legs entirely pale yellow.

Wings very long, the fourth vein a little bent after the hind cross-vein; cross-veins very approximate, the distance being smaller than the length of the hind cross-vein; first vein very long, passing the small cross-vein, the stigma therefore twice as long as in the preceding, entirely black. Costal cell hyaline, with less distinct spots. Just below the stigma and in contact with it is a broad black patch, reaching backwards to the apex of the second basal cell, which is hyaline, and sending forwards a shortened band over the small cross-vein, which ends towards the middle of the discal cell with a yellowish indistinct spot below. A large apical patch beginning before the end of the second vein and extending forwards to the end of the 4th vein, including a hyaline subapical spot over the end of the 4th vein, and a basal indentation on the base of the last portion of the 4th vein; hind cross-vein with a narrow, isolated brown border; there is also a brown isolated streak on the fore border after the stigma. By uniting along the third vein the apical black spot with the basal one, the pattern of this species becomes very like that of the preceding.

A single specimen from Darjiling, 7000 ft., 23-v-10, caught by Mr. Brunetti.

48. Acidia fossata, Fabricius.

(Pl. ix, fig. 48).

Fabricius, Syst. Antl., 320, 20 [*Tephritis*] (1805); Wiedemann, Auss. Zweifl., ii, 503, 41 [*Trypeta*] (1830); Wulp, Cat. describ. Dipt. S. Asia, 192 [*id.*] (1896), Tijdschr. v. entom., xli. 216, 3, pl. x, fig. 14 [*Anomoea*] (1898) and *l. c.*, xlii, 54 and 57 [*id.*] (1899).—*Elimia*, Walker, List Dipt. Brit. Mus., iv, 1033 [*Anomoia*] (1849); Osten-Sacken, Berlin. entom. Zeitschr., xxvi, 227 [*Trypeta*] (1882).—*regularis*, Doleschall, Nat. Tijdschr. Ned. Ind., xvii, 119, 75 [*Ortalis*] (1859).—*fessata*, Bigot, Journ. Asiat. Soc. Bengal, lxi, 224 [*Trypeta*] (1892).

A black, well-known species with yellow head and appendages, easily distinguished by the apical isolated black band of the wings.

Scutellum dark reddish at the hind margin and below; thorax narrowly reddish at the humeri; all the bristles of body and legs black; halteres black; front coxae yellow.

The wing-pattern is not correctly figured by Wulp. The brown band along the

sixth vein is separated from the black central part by an entirely hyaline streak, which is situated in the posterior part of the third posterior cell ; and along the fore border, from the end of the second vein to the apex of the wing, there is a narrow black border which is omitted in Wulp's figure.

The species has a wide distribution in the Oriental Region, being known from Tranquebar, Amboina, Java and the Philippine Islands. In the collection are many specimens from Assam, labelled *Urophora rufipes*, n. sp., Bigot, MS. ; but Bigot has not published the species. A specimen from Tenasserim, Lower Burma (*W. Doherty*) ($\frac{5}{15}\frac{9}{2}\frac{1}{1}$) ; 4 specimens from Kulattûpuzha, W. base of W. Ghats, Travancore, 19-xi-08, 2 from Shasthancottah, 12 miles N.-N.-E. of Quilon, Travancore, 8-xi-08, and 2 from Sukna, 5000 ft., E. Himalayas, 1-vii-08, all caught by Dr. Annandale.

49. Acidia alboscutellata, Wulp.

(Pl. x, fig. 49).

Wulp, Tijdschr. v. Entom., xli, 217, 4, pl. x, fig. 15 [*Anomoea*] (1898) and xlii, 51 [*id.*] (1899).

Very like the preceding, but distinguished by the yellow front femora and by the absence of the apical isolated black streak on the wings.

Head wholly yellow, the bristles long and black ; antennae, palpi and proboscis yellow and shaped as in the preceding, but the palpi are a little more hairy. Thorax black, with light cinereous pollen ; humeri broadly yellow ; pleura shining black, a little brown and reddish along the sutures ; all the bristles black. Scutellum black, reddish at the hind margin and beneath, as in the preceding. I do not understand why Wulp has, by the specific name he uses, called the scutellum white. Apical bristles longer than in the preceding. Halteres black. Abdomen shining black, with very long apical bristles ; ovipositor much shorter, with the apical segment yellow. Legs wholly yellow, only the coxae being blackish. Wing-pattern as figured by Wulp, but the hyaline streak of the third posterior cell reaches the hind margin ; the short black streak after the stigma is connected with the black central portion just over the small cross-vein as in *fossata* ; the apical border along the wing margin is also as in *fossata*, and is also shown here in the figure.

Wulp has placed this and the preceding species in the genus *Anomoea*, but I think erroneously, having regard to the very different position of the hind cross-vein ; there is only a resemblance in the wing-pattern.

The species was originally described from Sumatra. In the collection is a female only, not well preserved, from Tenasserim, Lower Burma (*W. Doherty*) ($\frac{5}{15}\frac{8}{2}\frac{1}{1}$).

50. Acidia erythraspis, n. sp. ♀.

(Pl. x, fig. 50).

Very distinct from the two preceding species by reason of its more elongate wings, the black pattern of which is much more extended, by the entirely red scutellum and the darker legs. Length of the body 5 mm., of the wing 6 mm.

Head entirely yellow, of the same shape as in the two preceding, but the frons a little prominent and the cheeks more broad ; antennae the same, the arista shortly pilose ; palpi little developed ; proboscis of usual shape ; bristles long, black.

Thorax black, with scarce grey pollen, more shining on the pleura ; humeri reddish, and the pleural sutures also ; all the bristles are long and black ; the *scp.* black, but weak. Scutellum triangular, flattened, entirely of a red colour ; it bears 4 bristles, the apical pair not much weaker than the basal. Squamulae whitish ; halteres yellow. Abdomen entirely black and shining ; lateral and apical bristles well-developed, black ; ovipositor as long as in *fossata*. Legs black, the fore coxae also blackish ; fore tibiae entirely yellow, the others towards the end ; tarsi wholly yellow.

Wings more elongate and narrow, the first 4 longitudinal veins being therefore not so apart from each other, the 3rd and 4th being parallel outwards ; cross-veins more remote, the small cross-vein being much beyond the middle of the discal cell, but separated from the hind cross-vein by a distance equal to the length of the latter. Base, alula and axillar lobe hyaline ; costal cell hyaline to the stigma, which is wholly black. The rest of the wing is black, with the following hyaline indentations : two are placed towards the middle of the fore margin, and are of triangular shape, with the vertex on the third vein and the base on the costa, which is of a yellow colour at this point ; the first begins just after the stigma, the second is very close to it and a little narrower ; the brown streak dividing these two indentations is placed symmetrically above the small cross-vein. Two other large and narrow approximate indentations are at the hind margin, just after the tip of the wing. The first is curved as an arch, being parallel to the wing border ; it begins very narrowly in the middle of the submarginal cell towards its apex and runs, becoming always more broad, to the hind margin, which it reaches at the end of the 4th vein ; the second is parallel to the first, but a little smaller and shorter, beginning at the third vein and ending at the hind border in the fore half of the second posterior cell. There is a fifth hyaline streak in the posterior part of the third posterior cell, which separates, as in the preceding two species, the brown streak along the sixth vein from the black central part of the wing. There is also a hyaline vertical discal streak running towards the end of the discal cell, just below the small cross-vein ; but this seems to be variable, being wanting in one specimen.

Two female specimens ; one typical from Kurseong, 5000 ft., E. Himalayas, 8-vii-08 ($\frac{5\,9\,8\,1}{15}$) ; the other, badly preserved, from the same locality ($\frac{3\,7\,7\,1}{12}$), but of an older collection ; this is without the hyaline discal streak, but otherwise similar.

24. Spheniscomyia, nom. nov.

Spheniscus, Becker, Mitteil. Zoolog. Mus. Berlin, iv, 138 [*Sphaeniscus*] (1908).

Easily distinguished by the bare third vein, the well-developed costal bristle, the approximate cross-veins, by only 2 pairs of lower *or.*, by the black colour of the body and by the pattern of wing, which is very like that of some species of *Urophora*. Characteristic also is the absence of bristles on the abdomen.

Becker has characterised the genus well and considers it allied to *Acidia*, but distinguished by its bare third vein and different head. He calls it erroneously *Sphaeniscus*, which must be amended to *Spheniscus*; but in this form the name is twice preoccupied in zoology, by Brisson, 1760, in birds and by Kirby, 1817, in Coleoptera. I have therefore proposed the new name given above.

Head broader than high; face a little concave, narrower than the frons, which is broad at the vertex and becomes more narrow toward the base of the antennae; eyes large, almost rounded; frons a little prominent, the epistome not prominent at all; cheeks narrow; antennae placed a little below the middle of the eyes, the third joint pubescent, rounded at the tip, twice as long as the second; arista bare or with only microscopic pubescence; *oc.* strong; *or.* 2. 2; *vt.* very long; *pvt.* parallel; genal bristle strong; occipital row well-developed, black. Proboscis short; palpi not large, bristly.

Thorax short and convex, entirely black and with complete chaetotaxy; 1 mpl.; *pl.* strong. Scutellum rounded, convex, with 4 bristles, the apical pair only a little weaker than the basal, converging at the apex. Abdomen short, rounded, convex, distinctly narrowed at the base, without any lateral or apical bristles; ovipositor long and broad, flattened. Legs short; front femora below with a row of 4—5 bristles; middle tibiae with a single spur.

Wings of usual shape, with distinct costal bristle; first vein short, ending far in front of the small cross-vein; second straight; 3rd and 4th a little curved; small cross-vein placed toward the apical fourth of the discal cell, perpendicular, its distance from the hind cross-vein equal to its length; posterior cross-vein long and perpendicular; third vein bare; inferior angle of anal cell short and broad, shorter than the second basal cell. Pattern of the wings very characteristic, black, with deep hyaline indentations at fore and hind border, or, to put it in another way, hyaline, with 4 black bands united together at the fore border or in the middle.

Type: *Trypeta quadrincisa*, Wiedemann, 1824.

It seems that only two species of this genus are known; but they have a very wide distribution in South Europe, Africa and Asia, as may be gathered from the numerous synonyms here reported.

The two Indian species can be distinguished as follows:—

1 (2). Hind tibiae black with yellow ends; wings with only three hyaline indentations at the hind margin .. .. .. *quadrincisa*, Wied.

2 (1). Hind tibiae entirely yellow; wings with four hyaline indentations at the hind margin .. .. *sexmaculata*, Macq.

51. Spheniscomyia quadrincisa, Wiedemann.

(Pl. x, fig. 52).

Wiedemann, Anal. entom., 55, 122 [*Trypeta*] (1824) and Auss. Zweifl., ii. 508, 50 [*id.*] (1830); Schiner, Dipt. Novara Reise, 264. 99 [*Acidia*] (1868); Osten-Sacken, Annal Mus. civ. Genova, xvi. 459 [*id.*] (1881); Wulp, Cat. describ. Dipt. S. Asia, 189 [*id.*] (1896).—*brevicauda*, Becker, Mitteil. Zool. Mus. Berlin, iv, 138, 401, pl. iii, fig. 42 [*Sphaeniscus*] (1908).—*filiola*, Loew, Zeitschr. f. ges. Naturwiss., xxxiv, 12, 1 [*Aciura*] (1869).—*Tucia*, Walker, List Dipt. Brit. Mus., iv, 1021 [*Trypeta*] (1849).—*Tacia* Wulp,

Cat. describ. Dipt. S. Asia, 192 [*id.*] (1896).—*parvula*, Wulp, Termesz. Füzet., xx, 141, 20, pl. iii, fig 2 [*Euxesta*] (1897); Meijere, Tijdschr. v. Entom., 41, 126 [*id.*] (1908); Hendel, Ann. Mus. nat. hung., vii, 172; 12 [*Acidia*] (1909).

A short black species, with yellow head and appendages, with black wings, the base and four indentations being hyaline.

All the bristles are black. Squamulae whitish, halteres light yellow. The hind tibiae seem to be variable in colour, as Loew and Becker describe them as entirely yellow. There is also in some specimens a slight trace of the smaller hyaline indentation of the hind margin of the wings, characteristic of the following species.

If the above synonymy is right, as I think, the species is known from Spain, from Teneriffe, from India and Ceylon and from Java and the Nicobar Islands. The collection includes three female specimens from Balugaon, Puri Dist., Orissa, 14-xii-08 (*J. Caunter*) ($^{8814}_{15}$–^{8816}), and one caught at light by Mr. Gravely in Diamond Harbour—Calcutta train, 4-xii-10.

52. Spheniscomyia sexmaculata, Macquart.

(Pl. x, fig. 53).

Macquart, Mem. Soc. Lille, 1842, 379. 2, pl. 30, fig. 5 [*Urophora*] (1843).—*atilia*, Walker, List Dipt. Brit. Mus., iv, 1021 [*Trypeta*] (1849); Wulp, Cat. describ. Dipt. S. Asia, 189 [*Acidia*] (1896).—*melaleuca*, Walker, Proc. Linn. Soc., vii, 238, 40 [*Trypeta*] (1864); Osten-Sacken, Annal. Mus. civ. Genova, xvi, 459 [*Acidia*] (1888) and Berlin. entom. Zeitschr., xxvi, 227 [*id.*] (1882).—*sanctae-mariae*, Bigot, Bull. Soc. ent. France (3) vii, 548, pl. 13, fig. 3 [*Ortalis*] (1859); Hendel, Ann. Mus. Nat. hung., vii, 172, 12 [*Acidia*] (1909).—*melania*, Bezzi, Denkschr. med.-naturwiss. Ges. Jena, xiii, 193, 34, fig. 3 [*Acidia*] (1908).—*sexincisa*, Thomson, Dipt. Eugen. Resa, 579, 252 [*Trypeta*] (1868).—*formosana*, Enderlein, Zoolog. Jahrbüch., xxxi, 427, fig. H [*id.*] (1911).

Very like the preceding, but distinct in having four (not three) hyaline indentations at the hind margin of the wings.

The hyaline indentation characteristic of this species is shorter than the others, beginning only at the fifth vein, while the others begin at the fourth or at the third (the apical). The hind tibiae seems to be also variable, from wholly yellow to yellow with blackened base.

I think that the above synonymy is doubtless correct; *atilia*, *melaleuca* and *sexincisa* are quite certain; the description of *sexmaculata*, Macquart, also agrees well, only the figure shows the indentations of the fore border much smaller. Of *sanctae-mariae*, Bigot says that the antennae are black, but in the coloured figure they are yellow; the figure shows a hyaline spot at the fore border before the stigma, which is absent in my specimens, which have only a thin hyaline streak at this point. My *melania* is also the same species, only the antennae are described as darker.

The species is therefore known from South Africa, from Madagascar and Bourbon I., from China and from Celebes, Ceram, the Philippines and Formosa.

In the collection are many specimens from Calcutta collected in the months January, April and November, one from Rajshai, E. Bengal, 1—6-ii-07, by Dr. Annandale; one from Naini Tal, Kumaon, 6000 ft., 5-vi-09. There are also four specimens

collected at Batavia, 27-vi—9-viii-06 by Mr. Brunetti ; an additional specimen is from Sibu, Sarawak, 2-vii-10, coll. Beebe.

25. Aciura, Robineau-Desvoidy.

Rob.-Desv., Essai sur les Myodaires, 773, xiii (1830).

Allied to the preceding, but distinguished from it and from the others by the presence of only the basal pair of scutellar bristles, the apical being entirely wanting ; the pubescence of the thorax is black.

Head broader than high ; eyes large, rounded ; face a little concave ; frons and epistome not prominent ; antennae inserted toward the middle of the eyes, the third joint rounded, the arista pubescent or almost bare ; cheeks narrow ; frons not much narrowed forwards ; proboscis short, palpi bristly ; *oc.* strong ; *or.* 2. 3 or 1. 3 ; genal bristle strong. The occipital row seems to be variable, a feature which shows in my opinion that the genus is still composed of heterogeneous elements ; in the typical species the bristles are black and thin ; in some American species (*insecta, phoenicura*)[1] are all yellow and thin ; in one of the Indian species here described, those on the vertex (4) are yellow, short and stout, the others are black.

Thoracic chaetotaxy complete ; *pl.* strong and only 1 strong *mpl.* Scutellum convex, bearing only the basal pair of bristles. Abdomen narrowed at the base, convex, with or without small apical and lateral bristles ; ovipositor variable, short and broad, flattened, or long and narrow, less flattened, or very long, longer than the abdomen. Front femora bristly below ; middle tibiae with a single spur.

Wings elongate, with the costal bristle more or less developed ; first vein very short ; 4th curved in the middle of the last portion, 3rd bare ; the cross-veins perpendicular and approximate, the small one is placed in the apical third or fourth of the discal cell ; inferior angle of the anal cell more or less drawn out into a point, which is always short. Pattern of the wing somewhat variable, but the wings usually black, with hyaline indentations and hyaline discal spots ; in the middle of the fore border, after the stigma, there are usually two hyaline triangular indentations, while in *Spheniscomyia* only one is present.

Type : *Musca coryli*, Rossi, 1790.

The species of this genus are not common. Of the Palaearctic species only *coryli*, *rotundiventris* and *tibialis* are typical ; *alacris*, *caloptera* and *winnertzi* shows a different wing-pattern ; *filiola* is described as having 4 scutellar bristles, and belongs to *Spheniscomyia*, as stated above.

The two Indian species before me are distinguished as follows :—

1. (2). *Pvl.* and superior occipital bristles black; frons bearing in the middle very few pale hairs; ovipositor narrow, as long as the abdomen .. . . *monochaeta*, n. sp.

[1] These two species, having yellow pubescence on thorax, are perhaps better placed in the new genus *Tephrella*.

2. (1). *Pvt.* and the two superior occipital bristles pale yellowish; frons in the middle clothed with short and thick whitish hairs; ovipositor broader, shorter than the abdomen .. .. *xanthotricha*, n. sp.

53. Aciura monochaeta, n. sp. ♀.

(Pl. x, fig. 54).

A black species with yellow head, antennae, tibiae and tarsi, only a pair of superior *or.*, very long ovipositor, and wings black, the base being also black, the axillar lobe hyaline with 6 indentations and 2 discal spots whitish-hyaline. Length of the body 4 mm., of the ovipositor 3 mm.

Head yellow, with some grey pollen; all the bristles black, including those of the occipital row which are scarce and weak; *pvt.* very weak; only a pair of superior *or.*; frons in the middle with a few pale thick hairs; antennae yellow, the third joint being twice as long as the second; arista pubescent, the hairs being longer than in the European species.

Thorax shining black, with scarce greyish pollen; humeri and pleura entirely black; scutellum also wholly black, rather developed, triangular; all the bristles are black. Squamulae dark; halteres light yellow. Abdomen coloured like the thorax, elongate, narrowed at the base, convex in the middle, without bristles; ovipositor as long as the abdomen, or longer if the apical joint is included, convex, narrow, with short black pubescence and small yellow apical style. Legs with black coxae and femora, the tarsi darkened towards the tip; hind tibiae with the two basal thirds black; front femora bearing only 2 bristles beneath at the apex.

Wings blackened to the extreme base, only the alula and the axillar lobe being hyaline. There are the following 6 indentations. One very small in the base of the costal cell, after the humeral cross-vein, extending below to the third vein. The second and third are placed toward the middle of the fore border, just after the stigma, and are close together; they are of triangular shape, the first has the vertex on the third vein, the second is smaller and shorter and does not touch the third vein; the costa is yellow in correspondence with the bases of these triangles, and the vertex of the second triangle is over the small cross-vein. The three other indentations are at the hind margin, and equidistant from each other; the first is in the base of the second posterior cell, with the apex before the superior end of the hind cross-vein; the second is in the apex of the third posterior cell with the apex on the fifth vein; the third is in the base of the same cell with the apex on the same vein, and is therefore longer. The two hyaline rounded spots are: one in the middle of the base of the first posterior cell, a little beyond the posterior cross-vein; the second towards the end of the discal cell, just below the small cross-vein. All these spots and indentations are of a white colour; the axillar lobe is greyish hyaline, except in the middle where it is white. Costal bristle very minute; stigma black, with its superior external angle yellow; small cross-vein close to the hind cross-vein, being at a distance from it which is a little greater than its own length.

A single female from Calcutta, 5-i-08 ($\frac{5}{15}\frac{7}{2}\frac{1}{2}$).

54. Aciura xanthotricha, n. sp. ♀.

(Pl. x, fig. 55).

Very like the preceding, but smaller and distinguished by the pale yellow *pvt.* and superior occipital bristles; and by the shorter ovipositor. Length of the body 3 mm., of the ovipositor 2 mm.

This species is identical with the preceding in all the particulars of colour and pattern of the wings. The *pvt.* are not longer than the other 4 pale yellowish superior occipital bristles; these 6 yellow bristles are similar in colour and thickness to those which are characteristic of the section Trypaneininae, and are also obtuse at the end; the other bristles of the occipital row are black and thin. Arista with only microscopic pubescence. The pale yellowish pile of the frons are more developed and numerous, recalling those which are so developed in the American *insecta*, where they also cover the thorax, which in the present species shows no trace of such hairs. The ovipositor is distinctly shorter, broader and more flattened. Wing-pattern identical; the only difference which I can see is in the first indentations in the costal cell, which in one specimen is much smaller but distinct, while in the other is entirely wanting.

Two female specimens, both not well preserved, the type from Dhikata, Gharwal Dist., W. Himalayas, U. P., 9-v-09 ($\frac{11}{16}\frac{86}{6}$); the other from Tenasserim, Lower Burma (*W. Doherty*) ($\frac{18}{13}\frac{41}{5}$).

Very striking is the difference in the postvertical and occipital bristles in these two species, which are almost identical in other particulars.

3. Section *Trypaneininae.*

26. Tephrella, n. gen.

Very like *Aciura* and bearing also only the basal pair of bristles on the scutellum, but differing in the bristles of the occipital row being entirely pale yellowish and in the thorax being clothed with pale pubescence.

Head broader than high; frons and epistome not prominent; face a little concave, with a light longitudinal keel in the middle; cheeks rather broad; eyes rounded; antennae inserted a little over the middle of the eyes, the third joint 1½ times as long as the second, rounded at the tip, pubescent, not reaching the epistome, with bare arista; proboscis short; palpi bristly; *oc.* well developed; *or.* 2. 3; genal bristle well developed; bristles of the occipital row well developed and entirely pale yellowish.

Thorax with yellow pubescence and complete chaetotaxy; *pl.* strong; 1 *mpl.* Scutellum with only the basal pair of bristles. Abdomen with the bristles less developed; ovipositor flattened, long and narrow. Front femora with a row of bristles beneath; middle tibiae with a single spur; hind tibiae almost bare.

Wings narrow and elongate, with distinct costal bristle; first vein short; 2nd, 3rd and 4th straight, the third bare and parallel with the 4th; cross-veins perpendicular, close together; the small one placed after the middle of the discal cell; inferior angle of the anal cell broad and pointed, but not drawn out into a point and shorter than

the second basal cell. Wing-pattern as in typical *Aciura*, with hyaline indentations (two at the fore border) and discal spots.

Type : the following new species.

The present genus is one of those which link the two tribes Ceratitininae and Trypaneininae ; it is very probable that many species described as *Aciura*, such as the Neotropical *insecta* and *phoenicura*, belong here.

55. Tephrella decipiens, n. sp. ♀.

(Pl. x, fig. 56).

A black species with yellow head, thorax densely covered with grey pollen and shining abdomen ; the wings are black with hyaline base, 6 hyaline indentations (2 at fore and 4 at hind border) and 3 discal spots. Length 5 mm., with the ovipositor, which is 1½ mm. long.

Head yellow, the cheeks remarkably silvery white and shining ; antennae, palpi and proboscis yellow, all the bristles dark yellowish, those of the occipital row whitish ; occiput black with grey pollen.

Thorax black, but on the back covered by dense yellowish pollen, which on the pleurae is lighter and grey, the pleura being also more black and a little shining ; the bristles are of a dark yellowish colour, like those of the head ; the yellowish hairs are rather long and directed backwards. Scutellum coloured like the thorax, the two bristles very long and black at the base. Squamulae dark, halteres yellow. Abdomen shining black with short pale pubescence ; ovipositor as long as the last four segments, black-haired. Coxae dark, the 4 posterior femora black ; the front femora yellow, but black on the upper side ; tibiae and tarsi yellow ; front femora with 3 very long bristles beneath.

Wings broadly hyaline at the base to the stigma and to the basal cross-veins ; there is a black spot on the costa at the upper end of the humeral cross-vein ; the veins are yellow in this hyaline portion ; the stigma black, with a small yellowish spot at the basal lower angle. The six hyaline indentations are disposed as follows : two approached together in the middle of the fore border, just after the stigma ; they are of equal size and of triangular shape, with the broad rounded vertex on the third vein ; the brown streak dividing these two indentations is placed before the small cross-vein and becomes paler towards the costa, the separation at the base being therefore not very sharp ; the costa is yellow in correspondence with the bases of these hyaline triangles, and the second vein also is yellow in the hyaline space and black in the black streak. The other four indentations are placed at the hind margin ; 2 are in the second posterior cell, one on the base, large and triangular, with the vertex towards the superior end of the hind cross-vein, the other on the middle, much smaller and in the shape of a rounded spot. The other 2 are placed in the third posterior cell, approached together, of almost equal size, with the vertex on the fifth vein. The three discal rounded spots are : one in the first posterior cell, a little beyond the hind cross-vein ; and two in the discal cell, one, the larger, towards the base below the stigma, the other, which is smaller, below the small cross-vein. Anal cell hyaline, with dark-

ened lower angle, and an intensely black spot on the upper angle. The hyaline portions are of a whitish colour, but those on the hind margin are more greyish; axillar lobe grey.

Two female specimens, the type from Darjiling, 7000 ft., 27-v-10, caught by Mr. Brunetti ($\frac{6}{16}\frac{7}{4}$) ; the other from Kurseong, 5000 ft., E. Himalayas, 8-vii-08 ($\frac{5}{15}\frac{7}{9}$).

27. Tephrostola, n. gen.

Distinguished from the preceding by the 4 scutellar bristles and from *Acidia* by the bare third vein, the pale hairs of the thorax and the whitish bristles of the occipital row.

Head as in the preceding ; antennae very short, reaching the middle of the face, the third joint rounded, a little longer than the second, with a pubescent arista ; cheeks narrow ; *oc.* strong ; *or.* 2. 3 ; the genal bristles and those of the occipital row are strong.

Thoracic chaetotaxy complete, as in the preceding, the pale hairs of the thorax well-developed ; scutellum with four bristles, those of the apical pair shorter and crossed. Abdomen without bristles or with less developed apical bristles in the male ; ovipositor flattened, long, triangular. Legs with a row of bristles on the front femora, a single spur on the middle tibiae and the hind tibiae almost bare.

Wings broad and short, with well developed and often double costal bristle ; wing veins directed as in the preceding, but the cross-veins more or less approached, the small one being always placed after the middle of the discal cell ; third vein bare. Pattern of the wing like that of *Aciura*.

Type : *Trypeta acrostacta*, Wiedemann, 1824.

It is very probable that some species of *Acidia* and *Aciura* belong here, having pale pubescence on the thorax and whitish occipital bristles, as my African species *caeca*, *cyclopica* and *tephronota*. It is also probable that the present genus is the same as *Platensina*, Enderlein, 1911.

In the collection are 2 species of this genus, which may be distinguished as follows:—

1 (2). Thorax yellow at the sides ; halteres and legs yellow ; wings with a hyaline spot at the tip between the ends of the 3rd and 4th longitudinal veins ; cross-veins less approximate. .. *acrostacta*, Wied.

2. (1). Thorax black on the sides ; halteres and femora black ; wings without apical spot and with the cross-veins more approximate. .. .. *reinhardi*, Wied.

56. Tephrostola acrostacta, Wiedemann.

(Pl. x, fig. 57).

Wiedemann, Anal. entom., 54, 119 [*Trypeta*] (1824) and Auss. Zweifl., ii. 501, 39 [*id.*] (1830) — *guttata*, Macquart, Mem. Soc. Lille, 1842, 387, 1. pl. 31, f. 10 [*Ensina*] (1843).

A black species, the thorax with dense grey pollen and with yellow sides, very distinct by reason of the colouration of the cheeks in the male and the apical spot of the wings in both sexes.

Antennae, proboscis and palpi yellow ; the female has the face and the cheeks entirely yellow like the rest ; the male has the face and cheeks of a velvety black colour, with a broad cinereous cross-band on the inferior portion of the face and an argenteous spot on the cheeks below the inferior corner of the eye ; the third antennal joint in the male is moreover infuscated at the end.

The bristles of the head and thorax are dark yellowish, those of the occipital row are very thick and whitish. Pleurae of the male with cinereous pollen, those of the female lighter yellow. Abdomen shining black, narrowly reddish at the base in both sexes. Coxae yellow ; hind femora of the male a little infuscated.

Wing-pattern as described by Wiedemann ; there are often supernumerary hyaline spots in the third posterior cell and at the end of the marginal and submarginal cells. The spots are of a whitish colour ; the axillar lobe is blackish, with a marginal whitish spot in the middle. The present species has also wings entirely black to the extreme base ; the stigma is black, unspotted. There are two very strong costal bristles.

Wiedemann describes the species from India, where it seems to be very common ; the collection includes many specimens from Puri, Orissa, 4—7-xii-08 (*J. Caunter*) ; Moulmein, L. Burma, ii—iii-08 (*N. Annandale*) ; Calcutta, iii—v ; Ranchi (*Irvine*) ; Khoolna, E. Bengal, 10-viii-07 ; and from Sikkim, *Knyvett* coll. Macquart records the species from Coromandel.

57. Tephrostola reinhardi, Wiedemann.

Wiedemann, Anal. entom., 54, 121 [*Trypeta*] (1824) and Auss. Zweifl., ii, 507, 48 [*id.*] (1830).

Distinguished from the preceding by the black colour of the thorax, halteres and femora, and by the different pattern of the wing, which has no hyaline discal spots, but only the base, axillar lobe and 5 indentations hyaline.

Head yellow, with dark yellowish bristles and conspicuous whitish occipital row ; frons narrower than in the preceding. Cinereous pollen of the thorax light, pleurae shining, a little reddish along the sutures and at the humeri. Squamulae and halteres blackish. Abdomen shining black, not reddish at the base. Wing with distinct but simple costal bristle ; small cross-vein at a distance from the hind cross-vein equal to its own length. Pattern as described by Wiedemann ; the two hyaline triangular indentations of the fore border are very large ; axillar lobe hyaline ; base hyaline, but with a conspicuous black border along the costa in the costal cell ; stigma short, black.

A single specimen from Calcutta, without date of capture ($\frac{2\,8\,3\,2}{1\,1}$).

28. Paralleloptera, n. gen.

Very distinct from all the other genera by reason of its slender body and legs and by the wings being narrow and elongate, with parallel margins, obtuse at the tip, without prolonged anal cell and with very peculiar pattern.

Head as broad as high, frons becoming narrower in front and face also narrowed ; eyes rounded ; epistome and frons not prominent ; cheeks narrow ; antennae very

short, inserted a little below the middle of the eyes, the third joint rounded at the tip, with short pubescent arista. *Oc.* strong ; *or.* 2. 3 ; occipital row very strong, whitish ; *pvt.* divergent ; genal bristle well developed ; proboscis short, palpi bristly.

Thorax with pale pubescence and complete chaetotaxy ; *mpl.* 2 ; *pt.* strong. Scutellum with four bristles, the middle pair short and crossed. Abdomen very slender and elongate ; ovipositor flattened, short, triangular. Legs long and slender, the first tarsal joint elongate ; middle tibiae with a single spur ; hind tibiae almost bare.

Wings of a very characteristic shape, being long and narrow, with entirely parallel sides and obtuse apex ; costal bristle small, but distinct ; first vein long ; stigma very long ; 2nd, 3rd and 4th veins straight and parallel ; third vein bare ; cross-veins perpendicular, the smaller placed after the middle of the discal cell, but not very close to the hind cross-vein ; anal cell small, with the inferior angle not prolonged. The wings are wholly darkened, with a narrow hyaline hind border and very numerous small subhyaline dots.

Type : the following new species.

This genus shows a striking resemblance to the American genus *Pterocalla*, both in wing shape and pattern. The African *Trypeta ulula*, Loew, certainly belongs here, and Loew placed it lately in *Pterocalla* (the head was wanting in his specimen) ; but Hendel in the " Genera Insectorum " has stated that it is a true Trypaneid. It seems very probable that Walker's *Trypeta adatha* is the same species.

58. Paralleloptera pterocallaeformis, n. sp. ♀.

(Pl. x, fig. 58).

Very near *P. ulula*, Loew, but distinguished by having four black spots in the last two segments of the abdomen and more hyaline spots in the second posterior cell. Length of the body 5 mm., of wing 5 mm.

Head yellow ; the occiput black with grey pollen ; antennae, palpi and proboscis yellow ; the bristles dark yellowish, those of the occipital row pale whitish.

Thorax black, covered with cinereous pollen, with the humeri and the pleura yellow ; on the back there is a pale pubescence. The bristles are dark yellow, those on the pleura of much paler colour. Scutellum like the thorax. Halteres yellowish. Abdomen very elongate and narrow, entirely pale yellow, little shining, with pale pubescence and without bristles ; the two last segments bear each in the middle a pair of black rounded spots. Ovipositor reddish, shining, with short hairs, as long as the three last abdominal segments. Legs slender and long, entirely pale yellow, with pale pubescence.

Wings with yellow costa and black veins. They are entirely brownish black, only the axillar lobe and the hind half of the third posterior cell being cinereous-hyaline in the shape of a streak extending from the base of the wings to the end of the 5th vein ; stigma long, dark, with two hyaline dots. In the costal and marginal cells along the costa the spots are larger and hyaline ; the others have numerous smaller dots of yellowish colour, disposed in regular rows, one in the marginal, two in the submarginal, two in the first posterior and first basal, and two in the discal cells ; second posterior

cell with 4 subhyaline spots placed along the hind margin of the wing. The grey hind portion of the wing shows two rows of larger and more hyaline spots.

A single female specimen from Dharampur, 5000 ft., Simla Hills, 14-v-08 (*N. Annandale*) ($\frac{5}{1}\frac{8}{3}\frac{3}{0}$), and another from Bhowali, Kumaon, 5700 ft., June 1910 (*A. D. Imms*).

29 Craspedoxantha, n. gen.

Easily distinguished from the preceding genera by its entirely yellow body, black spotted thorax and hyaline wings with yellow longitudinal rays.

Head as high as broad ; frons and epistome a little prominent ; face concave, very short, the narrow cheeks appearing therefore to be produced below ; mouth opening very broad ; proboscis short, palpi bristly ; antennae inserted toward the middle of the eyes, rather long, reaching the epistome, the third joint rounded at tip, pubescent, 1½ times as long as the second, which is rather elongate ; arista with microscopic pubescence. *Oc.* strong ; *or.* 1. 3, accompanied by a row of short hairs on the eye margin ; *pvt.* parallel ; bristles of the occipital row all yellow, but neither long nor thick, pointed ; genal bristle strong.

Thorax with yellow pubescence and complete chaetotaxy ; scutellum with 4 bristles, those of the apical pair touching at the end. Abdomen contracted towards the base, with short but abundant lateral bristles ; ovipositor flattened, broad, short. Legs short and robust ; front femora with a row of very strong bristles ; middle tibiae with a single spur ; hind tibiae with a very developed row of short equidistant bristles.

Wings long and narrow, with a short but distinct costal bristle. Stigma long ; first vein long, reaching the small cross-vein ; 2nd long, straight ; third bare, strongly curved below towards the end, the first posterior cell being therefore narrowed at the end ; 4th almost straight ; small cross-vein placed after the middle of the discal cell, perpendicular, not much approached to the hind cross-vein, which is oblique ; inferior angle of the anal cell drawn out into a narrow and long point, longer than the second basal cell. Wing-pattern consisting of yellow longitudinal rays, one of which is placed along the fore border.

Type : the following new species.

This genus seems to be allied to *Xanthorrhachis* in the group *Acidia*, but is placed here on account of the pale pubescence of the thorax. In the pattern of the wings it approaches the American genus *Xanthacrona*, which belongs to the Pterocallinae in the family Ortalidae. The resemblance between this and the preceding genus and the American *Pterocallinae*, which show perhaps natural affinity, is very notable. The *Trypeta marginalis* of Wiedemann, from Cape of Good Hope, in all probability belongs here.

59. Craspedoxantha octopunctata, n. sp. ♀.

(Pl. x, fig. 59).

A handsome yellow species, with 8 black dots on the thorax, a broad yellow border along the whole fore margin of the wing and a yellow ray along the 5th vein. Length 6 mm., including the ovipositor, which measures 1½ mm.

Head wholly yellow, the occiput opaque and covered with grey pollen, the face and frons shining, especially the last, which is highly polished; all the bristles are yellow, those of the occipital row short and thin. Antennae, palpi, and proboscis yellow.

Thorax wholly yellow, with pale pubescence and yellow bristles; on the back it is dark ferruginous, a broad notopleural band is light yellow, the pleura are also paler. The black dots are: two pairs in the middle after the suture, shining, bearing the *prsc.* and the *dc.*; two on each side in the notopleural depression, larger and velvety-opaque, one below the *prst.*, the other before the first *sa.*; besides there is another black spot below the post-alar callus and one smaller at the root of the wings. Scutellum like the thorax, but without black spots; halteres and squamulae yellowish. Abdomen entirely reddish yellow, with pale pubescence and numerous but short yellow bristles on the sides. Ovipositor shining reddish, as long as the three last abdominal segments. Legs wholly yellow; front femora below with 5–6 very long and strong bristles; hind tibial row very developed, the bristles being black, and disposed like a comb.

Wings wholly hyaline, with yellow veins; the stigma long, entirely yellow, of the same colour as the costal band. Costal band extending in almost equal width from the base to the tip of the wing; it reaches below the third vein, but just after the small cross-vein leaves a narrow hyaline streak in the middle of the submarginal cell. The colour of this costal border is light yellow, but it includes some dark spots, one lighter in the costal cell and two darker towards the end of the marginal cell; the arcuate tip, from the end of the second to the end of the third vein, is, moreover, blackened. The yellow posterior ray begins in the anal cell and runs along the fifth vein, being much broader below than above; at the apex it rejoins the hind margin of the wing; its colour is paler yellow than the fore border.

A single female specimen from the Dawna Hills, 2000—3000 ft., E. Burma, 2-iii-08 (*N. Annandale*).

30. Sphenella, Robineau-Desvoidy.

Rob.-Desv., Essai sur les Myodaires, 773, xiv (1830)

Distinguished by the prominent epistome, the long and geniculate proboscis, the 4 bristles of the scutellum and the banded wings with very approximate cross-veins.

Head broader than high; the frons rather long and depressed, broad, prominent; face short and very concave, the epistome strongly prominent and cut off; antennae inserted below the middle of the eyes, reaching the epistome, the third joint a little shorter than twice the second, a little pointed at the upper corner; arista bare; proboscis long, geniculate; palpi not bristly. *Oc.* strong; *or.* 1. 2; *pvt.* divergent; bristles of the occipital row strong, whitish; genal bristle less developed.

Thorax with paler pubescence and complete chaetotaxy, but the *scp.* less distinct; only a strong *mpl.* Scutellum with four bristles of almost equal size, the apical pair crossed, at least at the end. Abdomen with apical bristles; ovipositor short and flattened. Legs short and strong; front femora with a less developed row of bristles beneath; middle tibiae with a single spur; hind tibiae with some short hairs.

Wings narrow and elongate with small costal bristle; first vein short, not reaching

the small cross-vein ; 2nd, 3rd and 4th veins almost straight, 3rd and 4th parallel, 3rd bare ; cross-veins very approximate, the small cross-vein being separated from the hind cross-vein by a distance less than its own length ; inferior angle of the anal cell drawn out into a short and broad point, as long as the second basal cell. Pattern of the wings very characteristic, with a complete cross-band in the middle.

Type : *Tephritis marginata*, Fallen, 1820.

With this genus begins a series of genera which are often difficult to distinguish ; I have followed here the usual division, based sometimes only upon the characters of the pattern of the wings.

60. Sphenella indica, Schiner.

(Pl. x, fig. 60).

Schiner, Dipt. Novara Reise, 267, 110 (1868).

Very near the European *marginata*, but distinguished by the unspotted stigma and the darker pattern of the wings.

Thoracic and scutellar bristles black ; beneath the black *npl.* there are two weaker yellow bristles. Abdomen with rich yellow pubescence ; the apical bristles black. Squamulae whitish, halteres yellowish. Legs entirely yellow. Costal cell black, with two yellowish hyaline spots at the two ends ; stigma entirely black ; a conspicuous yellowish hyaline spot just after the stigma, but the median band besides this shows only 2 or 3 small yellowish dots ; in Schiner's description these dots are more numerous. There is a brown spot in the middle of the 5th vein, and another which is paler on the 6th vein.

Schiner describes the species from Madras ; in the collection is a single specimen without head from Puri, Orissa, 20—21-i-08 ($\frac{5}{1}\frac{8}{5}\frac{8}{5}$).

31. Oxyna, Robineau-Desvoidy.

Rob.-Desv., Essai sur les Myodaires, 755, iii (1830).

Very near the preceding, but distinct by reason of the cross-veins being not so approximate and the pattern of the wings reticulate not banded (and in the species here described by the absence of the apical scutellar bristles).

Head broader than high, long and depressed ; face short and concave, the epistome prominent ; antennae as in the preceding ; proboscis long and geniculate, often very long and slender ; palpi with some bristles at end. *Oc.* well developed ; *or.* 1. 2 (in the species here described) ; occipital row well developed.

Thorax with pale pubescence and complete chaetotaxy ; scutellar bristles 4 or 2, the apical bristles being sometimes very small. Abdomen slender, with short bristles and short flattened ovipositor. Legs as in the preceding, but slender.

Wings narrow and elongate, with small costal bristle ; first vein not reaching the small cross-vein ; cross-vein less approximate, the distance of the small cross-vein from the hind cross-vein always greater than the length of the same vein. Pattern of the wings reticulate, sometimes very little developed.

Type : *Tephritis absinthii*, Fabricius, 1805.

Of the two species here described, the first shows more resemblance to the genus *Ensina*, in which it and the allied species are often placed. But at present I prefer to leave it in *Oxyna*, the genus *Ensina* being restricted to the single species *sonchi*, which is distinguished by the very depressed head, hyaline wings with the first vein reaching the small cross-vein and the body partly yellow.

The two species are very easy to distinguish :—

1 (2). Proboscis very long and slender, the terminal portion being as long as the basal; abdomen grey with black spots; wings with less marked pattern and rather diffuse reticulation. .. *sororcula*, Wied.

2 (1). Proboscis shorter and thicker, the terminal portion shorter than the basal; abdomen shining black; wings with intensive pattern .. .. *parca*, n. sp.

61. Oxyna sororcula, Wiedemann.

(Pl. x, fig. 61).

Wiedemann, Auss. Zweifl., ii, 509, 52 [*Trypeta*] (1830); Becker, Mitteil. Zool. Museum Berlin, iv, 144, 420 (1908).—*vacillans*, Wollaston, Ann. Mag. N. Hist. (3) i, 115 [*Ensina*] (1858); Bezzi, Bull. Soc. entom. ital., xxxix, 159, 217 [*id.*] (1908).—*variipennis*, Wulp, Termesz. Füzet., xx, 143, 28, pl. iii, f. 3-4 [*Leptomyza*] (1897); Czerny, Wien. entom. Zeit., xxi, 256 (1902) and xxv, 254, fig. 1—2 (1906).

This species is very like the European *elongatula*, but is distinguished by the unspotted stigma and the more diffuse reticulation of the wings. Thorax, scutellum and abdomen entirely grey, the abdominal black spots more or less distinct. Bristles black; ovipositor shining black. The wing-pattern more or less dark, often very light.

This species seems to have a wide distribution in warm countries; Wiedemann described it originally from Teneriffe, where Becker found it very common; Wollaston records the species from Madeira and I have seen numerous specimens from Erythraea, East Africa; the species is also found in Egypt. Van der Wulp describes his *variipennis* from Ceylon, and I think that the synonymy is right, because Czerny compares the species with *elongatula*. The Central American species *picciola*, Bigot (=*aurifera*, Thoms. and *humilis*, Loew), which is placed in *Ensina* by American writers, is an allied form; but it seems to be distinct in having always a pair of very small but distinct apical bristles on the scutellum, which in the present species are only found exceptionally.

The collection includes numerous specimens from Rajshai, E. Bengal, 1—6-ii-07 (*N. Annandale*); Puri, Orissa, 18—19-i-08 (*N. Annandale*); Calcutta, ii-08 (*id.*); Paresnath, W. Bengal, 4000-4400 ft., May, 1909 (*J. T. Jenkins*); Kufri, Simla Hills, 8000 ft., 11-v-09 (*N. Annandale*); Karmater, Bengal, 23-x-09 (*C. A. Paiva*).

62. Oxyna parca, n. sp. ♂ ♀.

(Pl. x, fig. 62).

A small dark species, with grey thorax, shining black abdomen and black wings with about 17 hyaline spots. Length 2¼—2½ mm.

Head yellow; occiput black with grey pollen; a whitish border along the eyes;

antennae, palpi and proboscis yellow ; arista shortly pubescent ; *or.* 1. 2 ; bristles black ; occipital row well developed, whitish.

Thorax with densely grey pollination, the pleura yellowish ; pale pubescence well-developed ; bristles black, some yellow on the pleura ; scutellum like the thorax, with only the basal pair of bristles. Squamulae white, halteres yellowish. Abdomen shining black, with black bristles ; ovipositor black, and more shining than the abdomen. Legs with the coxae entirely yellow.

Wings black, with hyaline base and entirely black stigma. There are the following hyaline spots along the fore border : one before the stigma, with another smaller one just below ; a row of three in the marginal cell, that of the middle being of larger size and having another spot below, from which it is divided only by the second vein. Two spots are at the tip, one, larger, between the ends of the 3rd and 4th veins, and one smaller just above the end of the 3rd vein. At the hind margin : two in the second posterior cell, the second being larger and three in the third posterior cell, the third being of larger size. The discal spots are : one in the first basal and one in the first posterior cell, at equal distance from the small cross-vein ; two in the discal cell, one greater in contact with that of the first basal cell and one smaller on the lower external angle, in contact with the first of the three spots of the third posterior cell.

A single pair from Calcutta, 2-ix-07 and 9-x-07 ($\frac{5}{1}\frac{7}{5}\frac{5}{9}$, $\frac{5}{1}\frac{7}{5}\frac{4}{7}$).

This species belongs to a small well-characterized group, distinguished by the black abdomen, black wings with only a few hyaline spots and the apical scutellar bristles wanting. Of these species, *tristis*, Loew, has more spots at the tip of the wing and therefore the black pattern is here radiate ; *semiatra*, Loew, has a hyaline spot in the first posterior cell after the small cross-vein ; *parce-guttata*, Becker, is very like the present species, but shows two hyaline discal spots in the first posterior cell ; *margaritifera*, Bezzi, has a spotted stigma and more numerous hyaline spots. The first and third of these species are Mediterranean, the second and fourth Ethiopian.

The collection includes, in addition, a single specimen, without head, of a species from Theog, Simla Hills, 8000 ft., 13-v-09 (*N. Annandale*), which seems to be allied to the European *tessellata*.

32. Campiglossa, Rondani.

Rondani, Bull. Soc. entom. ital., ii, 121 (1870).

Distinguished by the robust cinereous black-spotted body, by the short but geniculate proboscis, its apical portion being thick and membranous, and by the radiating pattern of the wings.

Head broader than high, frons and epistome prominent ; cheeks rather broad ; border of the mouth fringed with short and thick whitish hairs ; eyes rather narrowed ; frons broad, with the lunula greatly developed ; antennae placed below the middle of the eyes, with the third joint a little pointed and almost bare arista ; *oc.* strong ; *or.* 2. 2 ; occipital row very strong ; occiput below with many whitish thick bristly hairs ; genal bristle less distinct ; palpi bristly ; proboscis thick, with the terminal portion cubitate but short and thick.

Thorax with pale pubescence and complete chaetotaxy; scutellum with 4 bristles. Abdomen bristly; ovipositor short, flattened. Legs robust, the front femora with a row of bristles developed beneath; middle tibiae with a single spur; hind tibiae not pectinate.

Wings broad, with small costal bristle; first vein reaching the small cross-vein; 2nd, 3rd and 4th veins straight, 3rd bare and parallel with the 4th; small cross-vein after the middle of the discal cell, but not much approached; lower angle of the anal cell drawn out into a short and broad point, shorter than the second basal cell.

Type: *Tephritis irrorata*, Fallen, 1814.

If the other species of *Tephritis* with a radiating wing-pattern can be conveniently placed here, Rondani's name *Campiglossa*, 1870, must be used in place of *Euaresta*, Loew, 1873.

63. Campiglossa cribellata, n. sp. ♂.

(Pl. x, fig. 63).

A handsome robust species very near *irrorata*, but distinguished by the black orbital bristles, and separated from *grandinata*, Rondani, by the radiated pattern of the tip of the wing. Length 4½ mm.

Entirely cinereous, whitish on the head, frons with a geminate ferruginous spot above the lunula; antennae dark yellow, palpi paler, proboscis darkened; *oc.*, *or.* and *vt.* black, but the superior *or.* and the other vertical and occipital bristles whitish; those of the row very strong; very conspicuous are the whitish bristly hairs of the inferior portion of the head.

Thorax entirely grey, with well developed yellow pubescence and black bristles; black round spots are on the insertion of the *prsct.*, *dc.* and *prst.*; and on the insertion of the *sa.* are smaller and less distinct. Pleura with long yellow hairs and a row of whitish bristles on the hind border of the mesopleura; below the humeral bristle and before the prothoracic stigma are dense tufts of bristly whitish hairs. Scutellum like the thorax, with 4 bristles, the basal pair being stronger and inserted upon a pair of black spots like those of the back. Squamulae whitish, halteres dark yellow. Abdomen wholly grey, with strong pale yellowish pubescence and short yellow bristles on the sides; first segment unspotted, the others with a pair of round black spots in the middle and one on each side less distinct. Legs yellow, the femora cinereous, the front femora with black bristles.

Wings black, with the base whitish hyaline; stigma with two hyaline round spots, the second being of larger size. Pattern as in *irrorata*, but more closed and the hyaline spots more numerous; the portion after the fifth vein and the axillar lobe are also black with numerous hyaline spots. The whole pattern is blacker than in *irrorata*; the rays of the fore border are shorter, but equal in number; the second posterior cell shows the 3 marginal spots and 5 discal spots, all of smaller size, two not being greater as in *irrorata*.

A single specimen from Kurseong, E. Himalayas, 4700—5000 ft., 23-vi-10 (*N. Annandale*) ($\frac{8}{18}\frac{15}{8}\frac{7}{}$).

33. Tephritis, Latreille.

Latreille, Hist. Nat. d. Crust. et Ins., xiv, 389 (1804).

In this genus are placed the species with a short non-geniculate proboscis, with a bare third vein and with the pattern of the wing not radiating; the scutellum has usually 4 bristles.

Eyes rounded; cheeks narrow, epistome but little prominent; proboscis short, with the flaps not prolonged; antennae placed at the middle of the eyes, the third joint not pointed, the arista bare, pubescent or shortly plumose; *oc.* strong; *or.* 2. 3 or 1. 2; occipital row very well developed; genal bristle less developed.

Thorax with grey pollen, yellow pubescence and complete chaetotaxy. Scutellum not swollen, with 4, rarely 2, bristles. Abdomen with bristles; ovipositor short. Legs usually robust; front femora with a well-developed row of bristles beneath; middle tibiae with 1 spur; hind tibiae usually bare, but sometimes pectinate.

Wings usually long and narrow, but in some species short and very broad; costal bristle distinct; first vein not reaching the small cross-vein; 2nd, 3rd and 4th straight and parallel, but the 2nd diverging in the broad-winged species; third bare; cross-veins parallel and perpendicular, the small one placed in the last third of the discal cell; lower angle of the anal cell drawn out into a short and broad point, as long as or shorter than the second basal cell. Wing pattern reticulate, not radiating; rarely broken into dark spots; exceptionally the wings are black with hyaline spots.

Type: *Musca leontodontis*, DeGeer, 1776.

In the collection are the following species, which are all described as new, on account of the difficulty of recognizing the species from the older descriptions.

1 (2). Wings very much dilated, almost as long as broad, entirely black, with very few hyaline or subhyaline spots .. .. *curyptera*, n. sp.

2 (1). Wings not dilated, much longer than broad, with more numerous hyaline spots.

3 (4). Scutellum with 2 bristles only; arista with rather long pubescence; *or.* 2. 3 .. .. *zodiacalis*, n. sp.

4 (3). Scutellum with 4 bristles, the apicals being sometimes smaller; arista bare or with very short pubescence.

5 (6). *Or.* 2. 3; hind tibiae shortly pectinate; thoracic bristles yellow; abdomen yellow, with black cross-bands .. .. *zonogastra*, n. sp.

6 (5). *Or.* 1. 2; hind tibiae almost bare; thoracic bristles black; abdomen grey, with or without black spots.

7 (8). Stigma with a broad hyaline spot; thorax without dark longitudinal stripes; abdomen not spotted; reticulation of the wing distinct .. .. *lyncea*, n. sp.

8 (7). Stigma unspotted; thorax striped and abdomen spotted; reticulation of the wing partly broken into spots .. .. *spiloptera*, n. sp.

64. Tephritis euryptera, n. sp. ♀.

(Pl. x, fig. 64).

A species very easily distinguished from the others by its very dilated black wings, which have only a few marginal hyaline spots and very few discal subhyaline dots. Length of the body 7 mm., of the wing 6 mm., width of the wing 5 mm.

Head wanting. Thorax with dense grey pollination, on the pleura dark ferruginous; pubescence long and yellow; bristles dark ferruginous. Scutellum with 4 bristles, apical pair strong. Squamulae dark brown; halteres black. Abdomen narrow and elongate, shining black, with light dark greyish pollen and dark pubescence; bristles less developed; ovipositor flattened, as long as the two last segments. Legs slender, entirely reddish yellow; hind tibiae bare.

Wings entirely black, only the extreme base and the axillar lobe being a little paler; costal bristle very strong and long, accompanied by another smaller one; veins black; marginal and discal cell very broad, and therefore second and fifth veins very divergent from the third and fourth, which are parallel; third entirely bare; stigma black, short, with a small yellowish spot on the upper basal corner. The hyaline marginal spots are disposed as follows: three in the costal cell, one before and two after the humeral cross-vein; a large triangular indentation just after the stigma, surpassing the second but not reaching the third vein, with a small isolated black spot at the costa; a small spot before the end of the second vein, and another in the middle between the ends of the second and third veins; one, the largest of all, at the tip, between the ends of the third and fourth veins; two of smaller size, placed at equal distances, in the second posterior cell; and two very small in the third posterior cell, near the anal vein. The discal spots are not whitish-hyaline, but brownish yellow and therefore less distinct; there are two in the submarginal, one in the first basal, two in the first posterior and two in the discal cell; there is also a hyaline very small dot below the fifth vein, towards its middle.

A single specimen, without head, from Tenasserim, L. Burma (*W. Doherty*).

The arista of this species is probably shortly plumose, as in the following. The species seems to be allied to *amplipennis*, Walker, which, with some others, belongs to a group that recalls the American genus *Eutreta*. But Osten-Sacken says that the species of this group have a bristly third vein and six scutellar bristles, characters which do not belong to the species here described, which perhaps shows affinity with the group *Rioxa*.

65. Tephritis zodiacalis, n. sp. ♀.

(Pl. x, fig. 65).

Allied to the preceding, but smaller and with undilated wings, which have more numerous hyaline spots. Length of body 4½ mm., of the wing 4 mm.; width of the wing 2½ mm.

Frons yellowish and face whitish; antennae yellow, with the third joint rounded and a short plumose arista; palpi and proboscis yellow; bristles black, *or.* 2. 3; *pvt.*, exterior *vt.* and those of the occipital row whitish and strong. Thorax grey, with short yellow pubescence and black bristles. Scutellum with only the basal pair of bristles. Squamulae and halteres yellowish. Abdomen as in the preceding, but at the base in the middle of the first segment with a short yellowish longitudinal stripe. Legs as in the preceding, entirely yellow.

Wings less broad, but the direction of the veins as in the preceding; they are

black, but the stigma shows a large yellowish basal spot. Costal cell as in *euryptera*; the large hyaline indentation after the stigma is divided into two rectangular spots by a perpendicular median black streak; and in contact with these are two other hyaline spots between the second and third veins; the other hyaline marginal spots are as in *euryptera*, but the third posterior cell has one more below the hind cross-vein; and the axillar lobe shows also two spots, which are wanting in the preceding. The discal spots are in number and position the same as in the preceding, but are larger and whitish-hyaline; there is a spot in the upper corner of the second posterior cell; the third posterior cell has also three hyaline discal spots, two of which are connected with the two basal marginal spots; before the anal cell is also a small hyaline spot.

A single specimen from Calcutta, 21-xi-07.

66. Tephritis zonogastra, n. sp. ♂.

(Pl. x, fig. 66).

Distinguished by the yellow bristles of the head and body, by the colouring of the abdomen and by the pectinated hind tibiae. Length 4 mm.

Head yellow, with yellow appendages and bristles; third antennal joint short, with bare arista; *or.* 2. 3; occipital row well developed, whitish.

Thorax with dense grey pollination, with the humeri yellowish; pubescence short; all the bristles yellow. Scutellum grey, with yellow hind border, and 4 yellow bristles. Squamulae whitish, halteres pale yellow. Abdomen entirely reddish yellow, grey on the belly; pubescence yellow; bristles well developed, yellowish; each segment bears at the base a broad black band, only that of the last segment being narrowly interrupted in the middle. Legs short and robust, entirely yellow, with yellow bristles, those of the front femora very abundant; hind tibiae with a distinct comb of yellow bristles.

Wings of usual shape and neuration; veins black, yellowish towards the base. They are black, the base being hyaline from the stigma to the anal cell; costal cell with a small brown spot; stigma black, with a small basal yellow dot. Fore margin with two hyaline indentations; one just after the stigma, of larger size and triangular shape, with the vertex on the third vein and including in the middle a black spot extending from the costa to the second vein; the second, triangular but of smaller size, is just after the end of the second vein. An apical semilunar spot between the ends of 3rd and 4th veins. At the hind margin are two groups of hyaline spots; one in the second posterior cell, composed of three parallel stripes partly fused together. The second is in the third posterior cell, composed of 6 spots, 3 at the hind margin and 3 in the middle; besides there is a small spot before the anal cell. Axillar lobe grey, with 4 spots. The discal spots are: 1 in the first basal, 2 in the first posterior, all of smaller size; and 2 in the discal cell, the median very large, the exterior smaller, all rounded. The hyaline spots are whitish, those toward the hind border more grey.

A single specimen from Puri, Orissa, 4—7-xii-08 (*J. Caunter*).

67. Tephritis lyncea, n. sp. ♂ ♀.

(Pl. x, fig. 67).

An entirely grey species, without dark margins on the thorax and abdomen, with reticulate wings and black stigma, bearing a large round hyaline spot. Length 3—3½ mm.

Head grey, with reddish frons and whitish face ; a small whitish border along the eyes. Bristles black ; *or.* 1. 2 ; *pvt.*, exterior *vt.* and those of the hind row whitish ; antennae reddish, the third joint obtuse, with bare arista ; palpi and proboscis yellow, the last very short.

Thorax with dense pollen, yellowish on the back and grey on the pleura ; pubescence long, of pale yellow colour ; bristles black, inserted on less distinct black dots. Scutellum like the thorax, reddish at the apex, with 4 black bristles, the apical pair being smaller and not crossed. Squamulae and halteres yellowish. Abdomen entirely grey, with long yellow pubescence and few black bristles at end ; last segment of the male as long as the two preceding together, the genitalia grey ; ovipositor flattened, black shining, as long as the three last segments together. Legs yellow, the hind femora with the last half blackish grey ; other femora a little grey ; front femora with the bristles less developed ; hind tibiae not pectinate.

Wings long and narrow, with small costal bristle ; they are broadly hyaline from the base to the stigma, and here the veins are yellowish ; stigma black, with a large hyaline round spot in the middle. The reticulation of the wings is formed by large hyaline spots ; there are two larger black patches, one below the stigma, the other at the end of the first vein ; between these, the marginal cell shows three large quadrate spots of equal size, and below these three others in the submarginal cell. Apex of submarginal and of first posterior cells, the whole second posterior and apex of the third posterior cells with many hyaline spots ; discal cell almost hyaline, with some spots at apex. Axillar lobe hyaline.

One male and two female specimens from Darjiling, E. Himalayas (*Lynch*).

This and the following species are very distinct from the preceding by the *or.* bristles being only 1. 2.

68. Tephritis spiloptera, n. sp. ♂.

(Pl. x, fig. 68).

Closely allied to the preceding, but distinguished by the striped thorax, spotted abdomen and different pattern of the wings. Length 3 mm.

Head as in the preceding, with the same colouring and bristles ; a reddish spot over the middle of the epistome. Thorax with three distinct longitudinal blackish stripes on the middle, the two exterior corresponding to the *dc.* row ; a notopleural stripe is less distinct ; besides the bristles of the thorax and the two basal bristles of the scutellum are inserted on distinct black dots. Abdomen with two longitudinal rows of median black spots, the lateral being less distinct ; the hind margin of the segments, moreover, narrowly yellowish, and the last segment broadly reddish at the

hind margin ; genitalia reddish. The abdominal bristles are black, rather developed. Legs entirely yellow, the hind femora only with a less distinct grey spot below in the middle.

Wing-reticulation broken into spots ; stigma black, without spots but with yellowish base ; the brown streaks form two cross bands, one less distinct below the stigma, and one more distinct praeapical, from the end of the second vein to the middle of the second posterior cell ; this band shows some hyaline spots. Third posterior cell in the middle with only three small brown spots.

Two male specimens from Calcutta, 5-ii-08 and 28-x-07.

This species seems to be allied to *orientalis*, Meijere, from Java.

34. Trypanea, Schrank.

Schrank, Briefe Donaumoor, 147 (1795).

Urellia, Robineau-Desvoidy, Essai sur les Myod., 774, xv (1830).

Distinguished by the slender body, by the scutellum bearing usually only two bristles and by the pattern of the wing being star-shaped and limited to the apex.

All the characters of the preceding genus are present, but the third joint of the antennae ends in a point on its external lower angle ; arista bare ; *or.* 2. 3 or 1. 3 ; proboscis usually short and not geniculate. Scutellum usually with only a pair of bristles. Wings as in *Tephritis*, but the black pattern limited to the apex and star-shaped, the remaining surface immaculate, or with very few spots ; at any rate the wings are not reticulate.

Type : *Musca stellata*, Fuessly, 1775.

As I have shown in *Wien. entom. Zeit.*, xxxvi, 54 (1907) the name *Trypanea* must be used for the present genus in place of *Urellia*, used by most authors ; the genera *Ditricha* and *Actinoptera* of Rondani are also synonymous. The collection contains the following species :—

1 (2). Epistome very prominent ; *or.* 2. 3 ; proboscis rather long with the flaps a little prolonged ; inferior angle of the anal cell not prolonged ; a complete cross-band through the middle of the fifth vein .. .. *aucta*, n. sp.

2 (1). Epistome less prominent ; *or.* 1. 3 ; proboscis short ; inferior angle of the anal cell prolonged into a short but distinct point ; no complete cross-band on the fifth vein.

3 (4). Apical ray of the star not reaching the hind margin ; scutellum and abdomen usually entirely grey ; face and antennae yellow in both sexes . .. . *amoena*, Frauenf.

4 (3). Apical ra reaching the hind margin ; scutellum and abdomen partly yellow ; antennae and face of the male black .. *asteria*, Schiner.

69. Trypanea aucta, n. sp. ♀.

(Pl. x, fig. 69).

Of usual shape and pattern, but distinguished by the very prominent epistome, elongate proboscis, obtuse anal cell and complete cross-band through the middle of the fifth vein. Length 4 mm.

Face whitish yellow, frons reddish, a whitish border along the eyes; antennae yellow, the third joint with a distinct anterior point, arista with microscopic pubescence; epistome very prominent, cut off; palpi pale yellow; proboscis yellow, thick, long, with short but geniculate terminal flaps. The bristles of the head are dark yellow, those of the hind border whitish; 2 superior *or*.

Thorax with dense grey pollination, with pale pubescence and dark yellow bristles. Scutellum with 2 bristles. Squamulae pale, halteres yellowish. Abdomen entirely grey yellowish, unspotted, with well-developed pubescence and few yellow bristles, ovipositor flattened, black, shining, as long as the two last segments. Legs entirely yellow; front femora very hairy above.

Wings hyaline, with pale veins, which are darkened in the black portion; stigma pale yellow, with a black anterior basal spot. The star-shaped apical spot gives off 5 rays to the hind margin, the first 4 reaching the hind border, the fifth ending at the fifth vein; the fourth runs along the posterior cross-vein. Fore border with the usual basal anterior triangular hyaline indentation and the rounded spot at the end of the second vein; apical border very narrow, less distinct. Small cross-vein narrowly margined with fuscous, isolated. From the stigma a pale band runs obliquely forwards, which at the fourth vein becomes broader, and passing across the middle of the fifth vein reaches the hind border at the end of the sixth vein, where it is widened. Inferior angle of the anal cell cut off, not drawn out into a distinct point.

A single female specimen from Puri, Orissa, 18—19-i-08, caught by Dr. Annandale.

70. Trypanea amoena, Frauenfeld.

(Pl. x, fig. 70).

Frauenfeld, Sitzgsber. Akad. Wiss. Wien, xxii, 542, f. 2 [*Trypeta*] (1856); for the rest see Becker, Kat. pal. Dipt., iv, 141 (1905).

A grey species distinguished by the face and antennae of the male being yellow and the apical ray of the star not reaching the hind border.

Some specimens of this European species, from Calcutta, v—x, and Paresnath, W. Bengal, 4000—4400 ft., May '09, and Lahore, Punjab, 8-v-08 (*N. Annandale*). The species is known from Central and Southern Europe, North Africa and Madeira and other species of this genus show a wide distribution.

71. Trypanea asteria, Schiner.

(Pl. x, fig. 71).

Schiner, Dipt. Nov. Reise, 270, 118 [*Tephritis*] (1868); Meijere, Tijdschr. v. Entom., li, 132, 2, pl. 4, f. 6 [*id.*] (1908).

Closely allied to the preceding, but distinguished by the apical ray being complete, by the yellower scutellum and abdomen, and by the black antennae and face in the male.

To the description of Schiner is to be added: third joint of the antennae of the male black; face in the same sex entirely of a velvety black colour, only a narrow band on the epistome being yellow. As it seems very strange that Schiner could have

overlooked such a striking character as this feature of the male, it is probable that the present species is different ; the figure given by Prof. Meijere is also rather different.

Schiner records the species from Madras, and Meijere from Java. The collection includes specimens from Paresnath, W. Bengal, 4000—4400 ft., iv-09 (*N. Annandale*), and May '09 (*J. T. Jenkins*).

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AN ACCOUNT OF THE ORIENTAL PASSALIDAE (COLEOPTERA), BASED PRIMARILY ON THE COLLECTION IN THE INDIAN MUSEUM

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

(Plates XI—XIII.)

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1. INTRODUCTION.

The present Memoir is in effect Part II of the "Annotated List of the Asiatic Beetles in the collection of the Indian Museum." Its scope is, however, much larger than that of Part I; on this account and for other reasons which need not be detailed, it has been decided to discontinue the publication of the "List" as a separate series.

After I had commenced the catalogue of our Asiatic Passalidae it soon became evident, on account of the present confused state of knowledge of the family, that the value to specialists of the locality-records it was to contain would be greatly increased by the inclusion of full illustrated descriptions of all the species referred to; and that if these were included its value to collectors in the East would be still further increased by the inclusion of a key for the identification of all genera known from the Oriental Region.

This led to an enquiry into the general principles on which the classification of the family has been based; and to the conclusion that, by a little modification of Kuwert's system, the Passalid fauna of the whole Indo-Australian area, together with that of China and Japan, could be shown to be much more homogeneous and dis-

tinctive than that system at first sight suggests. I have accordingly given a revised classification with keys to all the genera known from this area, except *Tarquinius*, Kuwert. This genus is as yet only known from one imperfectly described specimen from New Guinea which I have not seen,[1] and it does not appear to be closely related to any of the genera found in the Oriental Region.[2] If it should prove that I have attempted more than I can successfully carry out in the limited state of my personal knowledge of the family as a whole, I can only say that the attempt appeared to me to be worth making, and that the descriptions and figures of the species I have seen (which will lose none of their value thereby) will, I believe, prove sufficient to prevent my work from adding in any way to the confusion which it is intended in some measure to clear up. References to genera or species that are not known to occur in the Oriental Region (by which is meant here India, Formosa, the Philippines, Borneo, and intermediate localities) or in China or Japan are enclosed in square brackets, both in the keys and in the account of the zoogeography of the Oriental genera of Passalidae.

Although the Indian Museum collection of Asiatic Passalidae, as I found it, was in many ways a remarkably fine one, additional collections that have been sent to me for examination have enabled me to make this paper much fuller than would otherwise have been possible. How far this is so will be sufficiently evident from the notes included in the catalogue of our specimens. I am greatly indebted to Mr. T. Bainbrigge Fletcher and Captain R. B. Seymour Sewell, who have collected valuable series of South Indian species for me; to Mr. S. W. Kemp, who, with the assistance of Captain the Hon. M. de Courcy and the 32nd Sikh Pioneers, made an equally important collection in the Abor country; and to Mr. E. E. Green, Mr. H. E. Andrewes, Mr. H. Stevens, the Sarawak Museum, the Colombo Museum, the Bombay Natural History Society and the Imperial Agricultural and Forest Research Institutes, for the loan of their collections. It must not be supposed that these collections include only the species definitely attributed to them in this paper, in which, as it is primarily a part of the "Annotated List of the Asiatic Beetles in the Collection of the Indian Museum", I have not thought it necessary to refer to other collections when there seemed to be no special reason for doing so.[3]

[1] Also, I have since learnt, from two specimens in the Deutsches Entomologisches Museum, recorded by Zang from New Guinea without any description (1906*b*, p. 23). These show that Kuwert's figure of this species is less trustworthy than his description. In general appearance they closely resemble species of the genus *Leptaulax*, from which they differ chiefly in the absence of scars from the mentum and in the presence of six well-developed lamellae on each antenna. See also Appendix III, pp. 326-330 below.

[2] The locality of *Semicyclus redtenbacheri*, Stoliczka (1873) is probably not Ceylon but Brazil (see Kuwert, 1898, pp. 203 and 279); while that of *Paxilloides schmidtii* and *philippinensis*, Kuwert (Deutsche Ent. Zeitschr., 1890) is probably also Brazil, not the Philippine Islands (see Kuwert, 1891, p. 182 and 1898, p. 181). Consequently the genera *Semicyclus* and *Paxilloides* are not regarded here as belonging to the Oriental Region. Nor have I accepted the record of *Mastochilus politus* from Madras (see Stoliczka, 1873, p. 156).

[3] Since this paper was sent to press I have had access to the collections in Hamburg, Berlin, and

The Indian Museum collection of Passalidae was first arranged by Dr. Stoliczka, who published an account of it in 1873. He himself presented a considerable number of the specimens which it contains. Many of these specimens belonged to undescribed species; and Stoliczka's descriptions of them added considerably to the knowledge of the family. Had he lived to discuss Kaup's classification (published in 1871), as he proposed to do in the monograph he was planning, there can be little doubt that it would have been greatly to our present advantage. Owing to his early death on his way back from Central Asia it happened that Kuwert was the first to attempt a revision of the family. Unfortunately Kuwert appears to have been anxious merely to define briefly and conveniently genera and species, and not to have cared greatly for the problems of phylogeny or distribution; consequently he failed to show some of the close relationships that exist among Indo-Australian forms, giving an undue value to the presence or absence of asymmetry in the head, at the expense of other characters which seem to be really more important.

The value of Kuwert's posthumously published work is further reduced by the fact that it had evidently not received its final revision at the time of his death; so that the text is in parts very difficult to follow, and some of the figures appear to be unfinished, while others are either wrongly numbered or incorrect, unless his descriptions of the genera they represent are wrong. Nevertheless, his paper includes by far the most complete classification in existence.

2. EXTERNAL ANATOMY WITH SPECIAL REFERENCE TO THE TAXONOMIC VALUES OF DIFFERENT PARTS.

As yet no one appears to have made a study of the relative values, for diagnostic purposes, of the various parts of a Passalid beetle. Instead, it has been assumed that all specimens differing markedly from one another in size or in such conspicuous characters as the form of the various ridges of the head, necessarily belong to different species. Zang (1905*a*, pp. 163-4) has, indeed, pointed out how misleading variations in the ridges of the head may be in specimens belonging to the genus *Chilomazus*; but even he failed to notice that this had been a constant source of difficulty in other genera as well. As the views I have been led to adopt by my work on the collections described below have caused me to suggest considerable reductions in the number of recognized species, I propose to state them here in giving an account of the terms used to designate the different parts of the insects.

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the British Museum, and I have to thank Prof. Kraepelin, Prof. Von Brunn, Herr Gebien, Dr. Horn and Mr. Arrow for the help they gave me when studying these collections. I have also, through the kindness of Mr. René Oberthür, and the Directors of the Museums at Darmstadt, Dresden and Stuttgart, received for examination certain of the type specimens preserved in their collections. As a result of this I have been able to complete this paper by the inclusion of keys to all species known from the Oriental Region, and to Australian genera; to examine a number of specimens named by Kuwert; to complete my account of the widely-distributed Oriental genus *Aceraius* by notes on Zang's species, most of which I had not previously seen; and to add to and improve the paper in several other respects.

Size and Proportions.

Arrow's statement (1907, p. 441) that "A rather striking feature in which the *Passalidae* differ from the *Lucanidae*, as from wood-feeding insects in general, is their constancy of size" has proved not to be invariably true; and the fact that it does appear to be true of most species renders exceptions to the rule the more remarkable. These exceptions are of special interest from many points of view and have been discussed as fully as possible below (pp. 262-5). It will be sufficient to point out here, that since the very species which are most variable in size have also proved to be the most variable in structure, the most abundant, and the most widely distributed species in each of the several genera to which they belong, the fact of a great difference in size between two specimens cannot be held to indicate that slight differences in unimportant characters are likely to prove to have a definite taxonomic significance

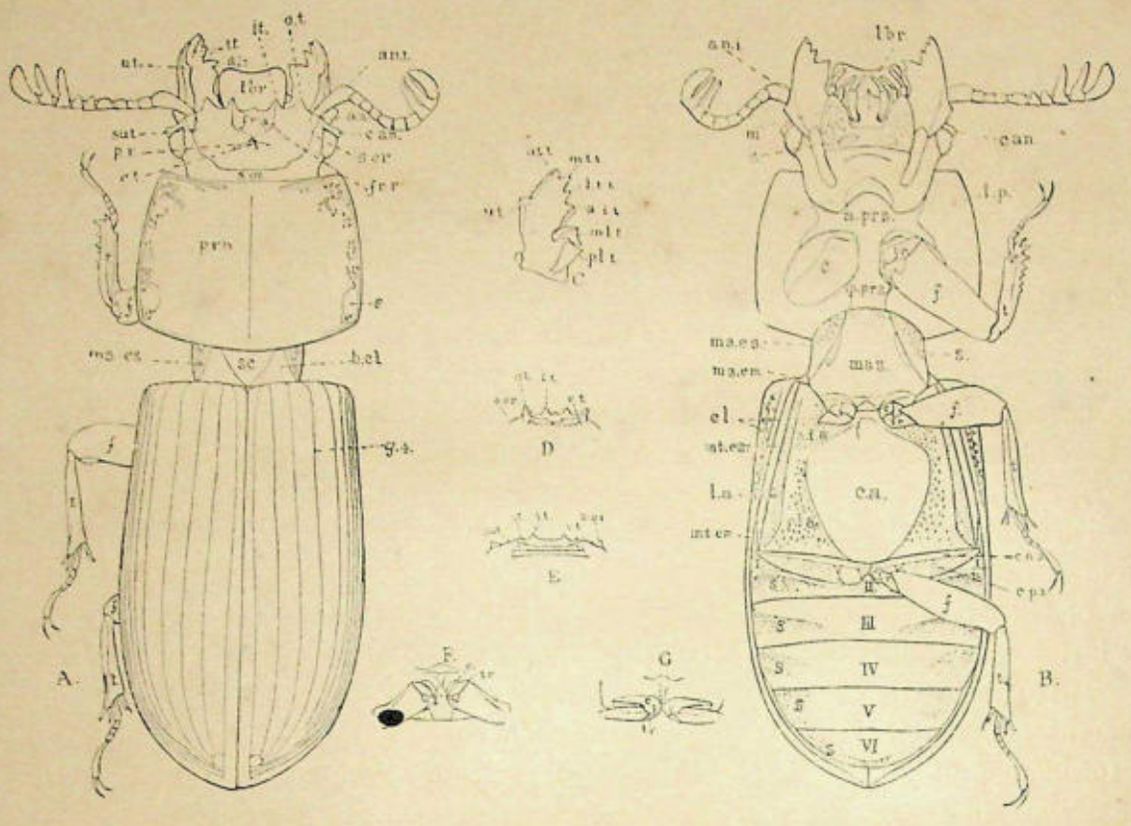
The actual length of a Passalid depends in some degree on the extent to which the head is drawn into the prothorax, and the prothorax over the mesothorax, but it appears to be the most convenient indication of size that can be given. All my measurements of total length have been taken from the front of the labrum (or, in the genus *Ceracupes*, from the tip of the big horn) to the tips of the elytra. As the proportion of length to breadth seems to vary greatly in almost all species, no breadth measurements are given.

Symmetry.

Oriental Passalids may be either symmetrical or asymmetrical. The degree of asymmetry may vary slightly in different specimens of a single species; it seems to be an indication of the degree of specialization attained by different species or genera rather than of the degree of their mutual affinity.

Antennae.

The antennae are always ten-jointed. The basal joint is always long and thick. Joints 2–4 are thinner and only about as long as broad; the fourth occasionally bears a rudimentary lamella. Joints 5–7 always bear at least the rudiments of lamellae, but these are often so constructed that they appear to form only a continuous thickening of the shaft when the antenna is in the least degree curled (see text-figure 1, A and B), as it almost invariably is at this point in dried specimens. The three terminal joints always bear lamellae. The structure of the antennae of any one species is usually constant within very narrow limits. The only exceptions to this that I have met with are in the species *Aceraius laevimargo* the antennae of which are remarkably variable in form, and in a specimen of *Aceraius grandis* subsp. *hirsutus* in which the fifth joint of the antennae is devoid of the well-developed lamella that it normally bears in that species. The lengths of the different lamellae relative to one another are used in distinguisting the species of *Macrolinus* one from another, and in separating the genus *Kaupiolus* from the genus *Labienus*; and I have used the same character in defining the *Gonatas* group of genera. Beyond this I have rarely found either the relative or actual lengths of the lamellae of any practical use; for they do not seem to be *absolutely* constant and they are difficult to compare in the case of insects which



TEXT-FIGURE 1.

FIG. A. *Leptaulax dentatus*, from above.
,, B. ,, from below.
,, C. Left mandible of *Aceraius grandis*, subsp. *hirsutus*, viewed obliquely from the inner side.
,, D. Anterior margin of head of *Leptaulax dentatus*, from below.
,, E. ,, ,, ,, *Macrolinus nicobaricus*, ,,
,, F. Front coxae and prothorax of *Leptaulax dentatus*, viewed obliquely from in front.
,, G. Front coxae and prothorax of *Comacupes cavicornis*, var. *laevicornis*, viewed obliquely from in front.

a.a. anterior angle of head; *a.i.a.* anterior intermediate area of metasternum; *a.l.t.* anterior lower tooth; *an.1.* basal joint of antenna; *a. prs.* anterior plate of prosternum; *b.el.* base of elytron; *c.* coxa; *c.a.* central area of metasternum; *c.a.f.* anterior part of hind coxa; *can.* canthus; *c.p.f.* posterior part of hind coxa; *c.t.* central tubercle; *e.* elytron; *f* femur; *fr.a.* frontal area; *fr.r.* frontal ridge; *g.f.* fourth groove of elytron; *i.t.* inner tubercle; *l.a.* lateral area of metasternum; *lbr.* labrum; *l. p.* fused lateral plates of lower surface of prothorax; *l.l.t.* lowest terminal tooth; *m.* mentum; *m.l.t.* middle lower tooth; *ms.cm* mesothoracic epimeron; *ms.es.* mesothoracic episternum; *mss.* mesosternum; *mt.em.* metathoracic epimeron; *mt.es* metathoracic episternum; *m.t.t.* middle terminal tooth; *o.t.* outer tubercle; *p.i.a.* posterior intermediate area of metasternum; *p.l.t.* posterior lower tooth; *p.prs.* posterior plate of prosternum; *p.r.* parietal ridge; *prn.* pronotum; *s.* scar; *sc.* scutellum; *s.oc.* supra-occipital ridge; *s.or.* supra-orbital ridge; *sut.* suture; *t.* tibia; *tr.* trochanter; *t.t.* terminal teeth; *u.t.* upper tooth; *u.t.t.* uppermost terminal tooth; *v.t.* ventral tubercle; *I-VI* abdominal sterna.

differ from one another in size or in the extent to which their antennae happen to be unfurled. It is so difficult, moreover, to say exactly where the shaft of the antenna ends and the lamella begins, that it often depends entirely on the point of view of the observer whether a specimen appears to agree with a given description.

Mandibles.

The mandibles of a Passalid are triangular in section, and bear teeth on the upper and inner margins as well as at the extremity. There is a striking uniformity of plan in the mandibles of all species, and such deviations as occur appear as a rule to be constant for whole genera rather than for individual species. These deviations take the form of the suppression, bifurcation or duplication of particular teeth, suppression being as a rule most marked in the right mandible and duplication in the left, no matter which side of the head is most developed. These teeth (see text-figure C 1) may be described as follows:—

One *upper tooth*, situated on the upper margin of the mandible.

Three *terminal teeth*. Of these the upper two are always compressed laterally; the lowest one is compressed either laterally or dorso-ventrally according to the section of the family to which the insect in question belongs.[1] It is set further back in the latter case than in the former.

Three *lower teeth*. Of these the anterior one varies considerably in form in different genera; the middle one is always a chisel-shaped lamella which is hinged on to the mandible except in certain genera of Aulacocyclinae; and the posterior one is a strong hollowed cusp so completely hidden between the labrum and maxillae that it cannot be satisfactorily examined unless the mandible is extracted.

Upper surface of head.

The principal features of the upper surface of the head are shown in text-figure 1 A. This surface is usually marked, at least in part, with a number of hair-bearing punctures, which in certain species run together to form grooves. The nature of these markings seems to be of greater importance than their extent.

The head is bounded laterally above by a pair of *supra-orbital ridges*, which extend from the anterior margin above the eyes directly backwards. These ridges are usually of almost uniform height throughout the greater part of their length and obliquely truncate in front. In species in which the ridge is a broad one, its crest commonly forks above the truncation, one branch extending along the outer and the other along the inner margin of the anterior face; but in a few of these species the inner branch is found to be more or less obsolete in certain specimens. The size of

[1] The Oriental Passalidae have been found to belong to two distinct sections of the family, which differ markedly from one another in many ways. One of these sections consists entirely of members of the sub-family Aulacocyclinae, and it is often convenient to refer to this as the first section of the family, as opposed to the remaining subfamilies which together constitute the second section. These subfamilies are considered in the present paper to be four in number, and I have termed them Pleurariinae, Aceraiinae, Gnaphalocneminae and Leptaulacinae. See below, p. 191 and onwards.

the angle at which the upper and anterior surfaces of the supra-orbital ridges meet is moderately constant for each species, and is therefore of some taxonomic importance, especially in the Aulacocyclinae. This angle may conveniently be referred to as the *apical angle* of the ridge. In some species it is peaked, and in others always rounded; but as the peak is very small and particularly liable to be rubbed away, this is not a character on which very much reliance can be placed. In the genera *Cylindrocaulus* and *Auritulus* this angle is developed into a conspicuous horn, which may be termed the supra-orbital tubercle.

The anterior end of the supra-orbital ridge is produced forwards in certain species; the process thus formed is as a rule relatively longer in small specimens than in larger ones of the same species (compare fig. 20 with fig. 20*b*, and fig. 28 with fig. 28*a*). The part of the anterior margin of the head from which this process is developed may be called the *anterior angle* of each side of the head. The size of this angle is often of some taxonomic importance. From it a *canthus* extends outwards and backwards, usually about half-way across the eye. This canthus may be either rounded or truncate distally; in the latter case the size of its external angle appears to be of some slight taxonomic importance at least in the Aulacocyclinae.

In the Aulacocyclinae, the posterior end of each supra-orbital ridge seems usually to curve inwards and then forwards, towards the base of the central tubercle which is present in all genera except *Cylindrocaulus* and *Auritulus*. This part of their course is developed to a particularly striking extent in the genus *Caulifer*. Sometimes, however, even in the Aulacocyclinae, the inward prolongations of the posterior ends of the supra-orbital ridges evince a tendency to coalesce behind the central tubercle. In the second section of the family the posterior ends of these ridges are always united by what may be termed a *supra-occipital ridge*, except in the sub-family Macrolininae in which this supra-occipital ridge extends outwards beyond them on either side, curves forwards, and then disappears[1].

All the Passalids which come within the scope of the present paper, except the genera *Cylindrocaulus* and *Auritulus*, have a more or less prominent median tubercle somewhere near the middle of the head. This is called the *central tubercle*. It is as a rule more strongly developed in the Aulacocyclinae than in the remaining sub-families, and assumes in the former a number of different shapes even the details of which seem to be, as a rule, extremely constant in individual species or their local races. In the second section of the family on the other hand, it is no more than a longitudinal ridge more or less distinct and pointed in front, and such structural variations as it presents are usually small and not absolutely constant, and are very frequently obscured by friction.

In the second section of the family a *parietal ridge* extends outwards on either side of this central tubercle. The angle between these ridges is as a rule moderately constant in any one species, but is less constant than has sometimes been assumed.

In the second section too, there is a pair of *frontal ridges*, which are never

[1] In *Ophrygonius singapurae* the supra-occipital ridge unites the supra-orbital ridges, and is also continued outwards beyond them.

found in the first section. These extend obliquely forwards and outwards from the front of the central tubercle. Close to their origin they are in some species more or less fused, to form a short median keel. The extent of this fusion, as well as the precise course followed by the ridges, has been found to vary greatly in different specimens of a single species (see, for examples, fig. 19, and figs 52 and 52*b*, *c* and *d*). In spite of the great differences in the general appearance of an insect produced by these variations, they have rarely been found to have any taxonomic value at all; and in these rare instances they have always been found in association with more distinctive, though perhaps less striking, characteristics in other parts of the body.

In some forms the frontal ridges are replaced, or defined on the anterior and inner side, by a fine groove which extends almost up to the tubercles in which the ridges normally end, a little behind which it either disappears or bends outwards and a little backwards (see, for examples, figs. 25–39 inclusive). Another groove (which, though easily seen in most specimens of Aulacocyclinae, is more obscure in the other subfamilies, especially after the insect has become hard and black) extends backwards on each side of the head from the anterior margin close to the inner side of the supra-orbital ridge, and curves inwards as though to meet the former groove, when it too disappears. There is usually an abrupt bend in the course of each frontal ridge opposite the place where the lateral grooves disappear even in species in which no trace of a frontal groove is visible. Consequently there can, I think, be little doubt that the lateral grooves, and those which sometimes follow the course of the posterior parts of the frontal ridges, together represent the suture by which the *frons* is separated from the parts of the head that lie on either side of and behind it; and that the posterior parts of the frontal ridges always follow the course of this suture even when the suture itself is no longer developed.[1]

The course of the division between the frons and the *clypeus*, or plate immediately in front of it morphologically, is less evident, and it will be convenient to describe the characters of taxonomic interest in the two plates together before going on to enquire into this.

The pair of tubercles in which the frontal ridges end may be called the *inner tubercles*, as they are always found either on the folded anterior margin of the head between a second pair of tubercles, the *outer tubercles*, or else behind these away from the margin. That the inner tubercles are morphologically the same, no matter which of these positions they occupy, becomes evident as soon as the lower surface of the folded anterior margin of the head is examined.[2]

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[1] In pupae there is often a deep groove running direct from the position of the lateral grooves to the angle between the central tubercle and parietal ridges of the imago; but this appears to me to be no more than a fold in the pupal skin caused by the broad depression beneath it. Even if this fold should prove to appear, in the first instance, along the line of the sutures that bound the frons in the larva, it would not necessarily prove the above conclusion incorrect, as the plates which develop beneath it may well be of a different shape from those which they replace.

[2] Before this can be done the whole of the labrum must be removed.

It is then found that in addition to the inner and outer tubercles visible from above, there is a third pair which may be called the *ventral tubercles*; that the two members of each of the three pairs are normally connected by a more or less distinct ridge; and that similar ridges tend to connect the different pairs together at either end (see text-fig. 1, D and E). None of these tubercles seem to be developed in the Aulacocyclinae; but below the fold which forms the anterior margin of the head there is a ridge which probably corresponds to the one between the ventral tubercles of the remaining subfamilies. From a taxonomic point of view the most important of the ridges found in the second section of the family is that between the inner tubercles. Its absence in the Pleurariinae is one of the characters by which this aberrant sub-family is distinguished from others; and the fact that it forms the anterior margin of the head as seen from above is the principal character by which the Leptaulacinae are distinguished. In most forms in which it is present other than the Leptaulacinae, it is straight or slightly curved inwards towards the central tubercle; but when it follows any different course this is usually found to be extremely constant, and in the genus *Macrolinus* it seems to be a remarkably good character by which to distinguish one species from another. The area enclosed by this ridge and the two frontal ridges is termed the *frontal area*; it is very variable in shape on account of the variability of the frontal ridges. The other ridges are not sufficiently well developed to be of use in the diagnosis either of groups or of species.

The *outer tubercles* are usually of very great importance[1], particularly in the case of asymmetrical forms, though the characters they afford must always be used with considerable caution on account of the frequency with which they are modified by friction, sometimes in what appear in other respects to be remarkably fresh and perfect specimens.

In many species the outer tubercles, when viewed from the outer side, are found to be horizontally grooved, and I am inclined to regard this groove as the dividing line between the clypeus and frons (see text-figs. 1 D and E, and figs. 36*a*, 37*a*, 38*a*, 39*a*, 40*a* and 41*a*). This groove is always situated below all that can be seen of the outer tubercles from above, and in species in which these tubercles are forked or truncate at the end it always crosses the apex of the lower angle—a fact which often enables one to distinguish fresh specimens of such species from worn ones of others in which these tubercles are normally conical. From this it follows that the whole of these tubercles as seen from above belongs in reality to what is here considered to be the frons instead of to the clypeus. The course of the suture between the outer tubercles is very obscure. If it is visible at all (of which I am doubtful) it must follow the ridge direct from one of these tubercles to the other. But the pupae of *Leptaulax dentatus* which I have examined, suggest that the whole of the upper surface of the front of the head of that species is frons, and that everything below the folded margin is clypeus—*i.e.* that the junction of the two is along the ridge joining the outer tubercles together by way of the inner tubercles, and not along the ridge joining them direct.

[1] The genus *Gnaphalocnemis* affords the most important exception I know.

The *labrum*, or upper lip, is attached to the margin of the clypeus, and projects beyond the fold which forms the anterior margin of the head to an extent which often varies considerably in different specimens of a single species. The shape of its anterior margin, too, is only moderately constant, though the minute tooth which it bears in the middle in the genus *Gnaphalocnemis* and its immediate allies appears to be a character of some importance. In asymmetrical forms the left anterior angle is more or less distinctly prolonged beyond the right even when the right side of the clypeus is more highly developed than the left. Its upper surface is always covered with punctures and long hair in specimens which are in really good condition; and in the Aulacocyclinae an indistinct ridge usually crosses it transversely not far from the anterior margin. In certain species of Aulacocyclinae e.g. *Ceracupes fronticornis* and *C. austeni*) this ridge instead of being indistinct is very pronounced.

Lower Surface of Head.

The only plate on the lower surface of the head, that need be considered here is the *mentum*, a broadly U-shaped shield situated immediately behind the mouth-appendages. The structure of this plate is of great importance in the Aulacocyclinae in the definition of genera, and in some cases in the definition of species also. In the remaining sub-families it is convenient to refer to the transverse median part of the plate as the central part, and to the whole of the paired side pieces, right back to the posterior margin, as the lateral parts. The former area is usually smooth or more sparsely punctured than are the latter parts, from which it is often separated by a pair of depressions or *primary scars*. These scars are always more or less round when complete, but more often than not their antero-external margin is imperfectly developed or obsolete, when they appear crescentic, the concavity always facing outwards and forwards. Their presence or absence is a character of importance for the grouping of genera together; but they do not seem to be of any use in separating species one from another. In certain genera the whole anterior margin of the central part of the mentum is apt to be depressed; in others this depression is moved backwards and outwards on to the surface of the mentum, in some genera[1] so far as to replace the primary scars, which are obliterated. The pair of depressions thus formed may be termed *secondary scars*. When so well developed as to obliterate the primary scars these secondary scars are of great importance in classification; when the primary scars are present as well they may be useful but are less constant, are often found to be only of specific value, and sometimes to exhibit a considerable continuous range of variation within the limits of a single species.

Prothorax.

The whole upper surface of the prothorax is covered by the *pronotum*. In most species this bears at least a trace of a *median groove*, which in some species is very pronounced indeed. Differences in the distinctness of this groove are so readily

[1] The scars on the mentum of these genera were unfortunately confused with primary scars in my 1912 preliminary paper.

produced by friction however, that but little reliance can be placed on them in the absence of other distinctive characters. In addition to the median groove there is always a pair of *marginal grooves*, whose structure is often of importance. These grooves are situated close to the lateral margin, and extend upwards along the anterior and posterior margins, beside which, in certain species, they meet in the middle line. Near the posterior angle on either side is a depression or pronotal *scar*, a structure which is rarely of use in taxonomic work. The general surface of the pronotum is either smooth or covered with punctures so small and shallow that they are quickly removed by friction and are of little or no use in taxonomy; but the sides are often strongly punctured especially in the neighbourhood of the scars, and of the anterior angles. The extent of this puncturing is always subject to some variation, and in certain of the species which vary greatly in size (e.g. *Episphenus indicus*) it is much more intense in small than in large specimens; nevertheless it often affords a useful confirmatory character in the diagnosis of a species.

The *prosternum*, or median ventral plate of the prothorax, seems to me to be of but little taxonomic importance. It consists of a median piece, which is slightly expanded, in front of and behind the sockets (*coxal cavities*) in which the front legs are inserted, to form an anterior and posterior plate, from the former of which a pair of large plates (*?episterna*) spread outwards, each in the form of a triangle attached by its apex. The median piece is often keeled in front, especially in the Aulacocyclinae; but in this subfamily the posterior part of the keel is usually hidden by the projecting *coxae*, or basal joints of the legs. The posterior plate is pointed behind in the first section of the family and broadly truncate in the second; in some species it usually bears hair-carrying punctures, but the presence of these has never proved to be constant.

The plates of which the lateral parts of the underside of the prothorax are composed are completely fused, and may be collectively referred to as the *lateral plates*. Differences in the sculpture and pubescence of these plates afford useful confirmatory characters, but they are never of any great taxonomic importance.

Mesothorax.

The *scutellum*, or median dorsal plate of the mesothorax, is partly hidden under the bases of the elytra, and the triangular area exposed between them is all that need be considered here. The base of the triangle forms the anterior margin and is invariably finely striato-punctate and pilose. Whether this punctured pilose area is visible depends partly on the extent to which it is developed, and this differs in different individuals of a single species as much as in individuals belonging to the majority of different species. It also depends on the extent to which the pronotum is drawn back over the mesothorax, and the taxonomic value of this area appears to me to have been greatly overrated by Kuwert. In some species other parts of the scutellum are punctured as well; the position of such punctured areas appears to be of greater importance than their extent.

Below the bases of the elytra, which do not appear to be of any taxonomic

importance, are the *mesothoracic episterna*, which are also triangular. A band of strong punctures often extends obliquely across the polished surface of these plates, from about the middle of the upper margin to the middle of the anterior margin, which it follows down to the lower angle. The upper angle in front of this band is smooth and polished, and the posterior angle behind it matt. This pattern seems to form the basis of the patterns of all species, such variations as occur being confined above to the extension of the punctured band forwards to cover the upper angles, and below to changes in its width and in the extent of the dulled area in the posterior angles. These variations show a considerable degree of constancy in individual species, provided that the pronotum can be pressed forwards sufficiently to ensure that the whole of the episternum is properly exposed; but in rigid specimens they are apt to be misleading.

The *mesothoracic epimera* are small plates which do not appear to be of any taxonomic importance.

The *mesosternum* lies between the two episterna of the mesothorax. It is bounded behind by a transverse groove, which extends right across the ventral surface of the body a little in front of the place at which the middle pair of legs is inserted; it is roughly triangular, but the apex of the triangle is flattened, and forms the short anterior margin, which is finely striato-punctate and pilose to an extent fully as variable as that of the scutellum. The surface in the lateral angles is often matt; that of the middle part of the plate is usually polished. Either or both of these parts of the plate may be punctured, and such puncturing often affords a useful guide to the identification of a specimen. The central part often bears strongly marked grooves, keels or hollows, to which considerable importance has been attached by previous authors. I have never found these characters to be of any taxonomic value, and in some species (e.g. *Macrolinus andamanensis*) the series before me proves conclusively that they have absolutely none. The *mesosternal scars* are a pair of depressions situated close to the lateral margins of the plate. These depressions are also more variable than has been supposed, but they sometimes exhibit unusually well-marked characters of undoubted value (e.g. in *Leptaulax anipunctus*). They are present in nearly all species of the second section of the family, but are not found in the first section

The homologies of the T-shaped or I-shaped structure, situated behind the transverse groove which I have taken to mark the posterior margin of the mesosternum, are somewhat obscure. The antero-lateral parts seem to be as fully divided from the median part as they are from the mesosternum and perhaps represent the *trochantine* or *subcoxa*, though they are more firmly fused to the adjoining thoracic plates than to the base of the leg. They are of no taxonomic importance. The median part is probably a superficial portion of the *mesosternellum* or *medifurca*. In the Aulacocyclinae it usually appears to be I-shaped, with a complete suture across the middle-line behind it and a more or less obscure transverse roughened patch across the narrow piece between the bases of the legs. In the genus *Ceracupes*, however, the transverse piece behind this patch is usually found to be more or less completely fused to the

metasternum. This is also the case in all genera of the second section of the family, in almost all members of which the indistinct transverse band between the coxae is replaced by a distinct suture. This plate is therefore of some interest in connection with the classification of the family; but I have not found it possible to utilize it for differentiating species.

Metathorax.

The *metathoracic episterna* and *epimera* do not appear to present any characters of taxonomic importance; but the *metasternum*, which covers the whole of the ventral surface of this segment of the body, must be considered in some detail. Four different regions can easily be recognized in this plate. Firstly, there is a large flattened circular *central area*, whose boundaries are as a rule less clearly defined in the Aulacocyclinae than in the remaining sub-families. This area is almost always smooth; but in a few species of Leptaulacinae it is rough and may bear strong punctures, very variable in number, whose presence is apparently a constant feature of all the species in which they are found except one, that one being the most variable species of Passalid known to me. The central area is also marked, not infrequently, with ill-defined but symmetrically arranged grooves and depressions, to which taxonomic importance has sometimes been attached. But I have found these much too variable to be of any use. There is, however, in many species of the genera *Tiberioides*, *Episphenus* and *Leptaulax*, a very persistent and strongly marked roughened depression in the middle-line, just behind the anterior margin, to which special attention may be drawn. It s rarely entirely absent in species in which it is ever distinct, and never very distinct in species in which it is normally absent.

The metasternum is usually bordered on either side by a pair of depressed *lateral areas*. These may either be of equal width throughout or broader behind than in front, and differences both in width and in shape are usually found to be extremely constant within the limits of each species. The surface of these areas is always roughened or punctured. Between the central and lateral areas are the *intermediate areas*, which are divided into an anterior and posterior part, more or less completely according to the size of the areas on either side of them. Differences in the extent and nature of the puncturing of the posterior, and to a less extent also of the anterior, intermediate areas, afford useful confirmatory characters, but usually vary too much within the limits of a single species to be diagnostic by themselves.

Abdominal sterna.

On either side of each abdominal sternum a more or less distinctly triangular depression is often found. These depressions, which we may term *scars*, are less persistently found in the posterior sterna than in the anterior ones, and in the Aulacocylinae than in the other subfamilies. They are too variable in shape and distinctness to be of use in the differentiation of one species from another; and I have been unable to find anything connected with the abdominal sterna, except puncturing, which has any taxonomic value—such other characters as have been made use of have proved either to be variable in themselves, or to be dependent on the extent

to which the abdominal segments have telescoped and sunk in beneath the ends of the elytra. Even the puncturing is variable as a rule. It occurs with distinctness chiefly in the Leptaulacinae and in one or two genera of Aulacocyclinae. In the former subfamily two types of puncturing can be recognized. One, which occurs in a single species only (*Leptaulacides planus*) and is the principal character by which that species can be recognized, is a uniform, close, shallow and moderately fine puncturing which occurs over the whole lower surface of the abdomen. The other, which occurs to some extent in other subfamilies also, is a close, but finer and stronger puncturing, centred in the scars, beyond which it extends to an extent which is apt to be extremely variable even within the limits of a single species; this at best affords evidence for the separation of species into somewhat vaguely characterized varieties. The puncturing found on the abdominal sterna of certain Aulacocyclinae (e.g. species of the genus *Comacupes*) is of yet a third kind, being coarse and sparse, with a hair (of which all trace may have disappeared in a worn specimen) rising in fresh specimens out of each puncture. The presence or absence of this type of puncturing appears to be a useful confirmatory generic character, and its extent, when present, a confirmatory specific one.

Legs.

The *coxae*, or basal joints, of the first pair of legs present one of the chief characters by which species belonging to the subfamily Aulacocyclinae can be distinguished from those belonging to the subfamilies of the second section of the family; for although they are always transverse and embedded in the prothorax over the greater part of their length, they project downwards distally to a greater extent in the Aulacocyclinae than in the other subfamilies (compare text-figures 1 F and 1 G). No other joint of the first leg has proved to have any taxonomic value in any of the species I have seen, except the tibiae which are occasionally important, at least in the genus *Taeniocerus*.

The coxa of the second leg is very small and need not be considered here, but that of the third leg resembles that of the first in size. Its exposed face is divided longitudinally into a raised anterior and depressed posterior part; and the presence or absence of punctures on the latter affords a useful confirmatory specific character.

Neither the small *trochanters* nor the longer *femora* of the second and third legs are of any taxonomic importance; but in the Aulacocyclinae there is often, about two-thirds of the way down the outer side of the *tibia* of each of these legs, a small spine, the presence or absence of which can frequently be utilized in checking a specific identification. Of these spines, those on the hind tibiae are the more useful, as the extent to which they are developed differs more in different species.

Elytra.

The elytra of all Oriental Passalids are marked each with ten *grooves*, with *ribs* between them. On the dorsal surface the ribs are always flat, and much broader than the grooves, but laterally the grooves may be as broad as, or broader than, the ribs. Each groove contains, as a rule, a row of more or less distinct punctures, which are

usually stronger at the sides than above; and when the side-grooves are broad the punctures are drawn out laterally so that they come to form a series of short transverse secondary grooves within the primary grooves. These secondary grooves are not of absolutely constant form in all specimens of a single species; but they are sufficiently constant to be of great taxonomic value. I have rarely, however, found the slight variations that occur in the distinctness of the punctures of the dorsal grooves of any value whatever, though Kuwert seems to have placed great faith in them. Another character to which Kuwert attached greater importance than it deserved, was the puncturing of the sides of the elytra of different species of the genus *Aceraius*. This puncturing, unless it occurs on the eighth rib (counting the innermost rib as the first), as well as on the seventh and ninth, is by no means constant in extent in each species; and although it is often most useful (especially in worn specimens) as a confirmatory character, as a primary character it is apt to prove misleading. The presence of hair on the sides of the elytra seems to be a satisfactory character by which to distinguish two genera, *Aceraius* and *Trichostigmus*, from their respective allies.

3. THE CLASSIFICATION OF INDO-AUSTRALIAN PASSALIDAE.

The preceding account of the external morphology of Oriental Passalidae has already indicated that all species which come within the scope of the present paper fall into one or other of two widely different sections of the family. The first of these sections includes the Aulacocyclinae of Kuwert, together with the genera *Auritulus* and *Cylindrocaulus*, whose affinities with the Aulacocycline genus *Ceracupes* have been established by Arrow (1907, p. 446). Kuwert, who overlooked the only known species of the genus *Auritulus*, defined the Aulacocyclinae only according to the apparent structure of the prosternum relative to the coxae of the first pair of legs, excluding the genus *Cylindrocaulus* which he placed next to a Mexican form. The part of the prosternum between the coxae of members of the second section of Oriental Passalidae does not, unless the coxae are dug out from their sockets, appear as a lamina. Consequently it may be concluded that the "strongly elevated lamina", that Arrow mentions as separating the front coxae of *Cylindrocaulus bucerus* from one another, is an exaggerated form of the keel which always extends along the middle-line of the central part of the prosternum of the Aulacocyclinae. Assuming this to be the case, the two sections into which the Oriental Passalidae are primarily divided may be distinguished by the following characteristics[1]:—

[1] Although the present paper does not deal with internal structure, reference must be made here to Sharp and Muir's works on "The Comparative Anatomy of the Male Genital Tube in Coleoptera" (Trans. Ent. Soc. London, 1912, pp. 477-642, pl. xlii-lxxviii, Passalidae, pp 579-580, pl. xliv, figs. 11-13*a*). These investigators found that in representatives of the genus *Aulacocyclus*, the only genus of Aulacocyclinae they examined, "the basal-piece and the lateral lobes form one piece, either by consolidation or the supression of the basal-piece," whereas in representatives of the genera *Gnaphalocnemis* (=*Eriocnemis*), *Labienus* and *Protomocoelus* (Gnaphalocnemiinae), *Leptaulax* (Leptaulacinae), and of the American genera *Proculus* and *Neleus* "the tegmen consists of two distinct pieces, the basal piece and the lateral lobes."

Part.	Section I.	Section II.
Mandibles.	Plane of the lowest terminal tooth vertical, the tooth itself not situated well behind the two upper ones, directed forwards when the mandibles are open.	Plane of the lowest terminal tooth horizontal the tooth itself situated well behind the two upper ones, directed inwards when the mandibles are open.
Upper surface of head.	Parietal and frontal ridges, and the inner and outer tubercles with the ridges associated with them, all absent.	Parietal and frontal ridges, and the inner and outer tubercles with the ridges associated with them, present
Prothorax and its appendages	Middle part of prosternum with distinct median keel which is usually hidden behind by the coxae, as the distal ends of these project vertically from their cavities, their vertical inner faces touching one another in almost all species. Posterior plate of prosternum more or less pointed behind.	Middle part of prosternum flat or with median groove or less distinct keel, the whole surface between the coxae exposed, as the coxae do not project sufficiently from their cavities to meet above it. Posterior plate of prosternum broadly truncate behind.
Second and third pairs of legs.	Tibiae each armed with a spine about two-thirds of the way down the outer side, except in a few species in which the posterior tibiae are not so armed.	Tibiae always unarmed except at the tip.

Mention of other, but less distinctive, differences between the two sections of the family, which are referred to in the preceding part of this paper, need not be repeated here.

Three genera of the first section (*Ceracupes*, *Auritulus* and *Cylindrocaulus*) differ markedly from all the rest; but although they are evidently related to one another more closely than to any other genus, they differ from one another so greatly that no single character not found in other genera of the section has yet been described as common to all three of them. I have therefore included these genera with all the rest in the single subfamily Aulacocyclinae, although I think that a further examination of them may yet afford grounds for their separation. My principal reason for thinking this is that all known species of *Ceracupes* and *Auritulus* differ from all species I have examined of the genera *Tristorthus*, *Taeniocerus*, *Comacupes* and *Aulacocyclus*, in having the middle lower tooth jointed on to the basal part of the mandible, as it appears to be in all genera of the second section of the family, instead of fused with it. Unfortunately I have not seen any specimens of the genera *Caulifer* and *Cylindrocaulus*.

The genera of the single subfamily Aulacocyclinae, of the first section of the family, may be distinguished from one another thus:—

1. Central tubercle not produced forwards to fuse with anterior margin of head; upper tooth of mandibles not unusually long .. .. 2.
   Central tubercle very strongly developed, its apex fused with anterior margin of head; upper tooth of both mandibles very long and slender; middle lower tooth moveable .. .. .. *Ceracupes*, Kaup: pp. 212 & 277.

2.	Central tubercle present; supra-orbital tubercles and anterior prolongations of supra-orbital ridges absent; pronotum not drawn out into a bifid protuberance in front; middle lower tooth of mandible (? always) immoveable .. .. 3.	
	Central tubercle absent, head smooth and concave; supra-orbital tubercles and anterior prolongations of supra-orbital ridges present; pronotum drawn out into a bifid protuberance in front .. .. 7.	
3.	Supra-orbital ridges not united to form a median tooth behind central tubercle .. .. 4.	
	Posterior ends of supra-orbital ridges curved inwards to form together a median tooth situated immediately behind central tubercle; central tubercle elongated dorsally; mesothorax smooth ..	[*Caulifer*, Kaup.]
4.	Mentum with strong median keel; mesosternum strongly punctured; abdominal sterna with at least a few hair-bearing punctures ..	*Comacupes*,[1] Kaup; pp. 204 & 267.
	Mentum not keeled; mesosternum at most feebly punctured; abdominal sterna unpunctured .. .. 5.	
5.	Central tubercle unidentate or tridentate above	[*Tristorthus*,[1] Kuwert.]
	Central tubercle bidentate above .. .. 6.	
6.[2]	Central tubercle never pedunculate, often without any posterior face, anterior face never longer than dorsal, anterior end less highly elevated	*Taeniocerus*, Kaup; pp. 208 & 270.
	Central tubercle usually pedunculate; otherwise always with distinct posterior face, anterior face never shorter than dorsal, anterior end much more highly elevated than posterior	*Aulacocyclus*, Kaup; pp. 211 & 272.
7.	Front coxae almost contiguous; canthus extending about half way across the eye; supra-orbital tubercles flattened, expanded at the apex, truncate	*Auritulus*, Zang, p. 279.
	Front coxae widely separated; canthus extending all the way across the eye; supra-orbital tubercles slender and pointed	*Cylindrocaulus*, Fairmaire; p. 279.

The second section of the family appears to me to contain four Oriental subfamilies (in addition to the Tarquiniinae, see below, pp. 326–330) which may be distinguished thus:—

1.	Mentum without primary scars; secondary scars absent, or present only as depressions or small grooves close to anterior margin[3]; outer tubercles of head always simple .. .. 2.	
	Mentum with primary scars, except when these are replaced by more or less strongly developed secondary scars[3]; outer tubercles of head often complex .. .. 3.	

[1] Since preparing this key I have examined the type of *Comacupes minor*, Heller, and specimens of *C. foveicollis*, Kuw., from Borneo. These have proved to be, in several important characters, transitional between the genera *Comacupes* and *Tristorthus* (see below, p. 267).

[2] I know of no really sharp distinction between these genera. The definition given here involves the transference of *Taeniocerus deyrollei*, and with it I presume *T. mastersi* (I have seen specimens of the latter determined by Zang, but not the original description), to the genus *Aulacocyclus*. These species appear to me to resemble *A. rosenbergii* more closely than they do any species of *Taeniocerus*.

[3] This distinction taken by itself is not altogether a satisfactory one, for in one race of *Ophrygon-*

2.	Only three antennal lamellae recognizable when antenna is furled; ridge joining inner tubercles absent	Pleurariinae; pp. 213 & 279.
	More than three antennal lamellae recognizable when antenna is furled; ridge joining inner tubercles present	Aceraiinae; pp. 215 & 280.
3.	Supra-orbital and supra-occipital ridges discontinuous	Macrolininae; pp. 240 & 293.
	Supra-orbital and supra-occipital ridges continuous[1]	4.
4.	Inner tubercles situated behind outer tubercles; ridge joining them not forming anterior margin of head; more than three antennal lamellae recognizable when antenna is furled	Gnaphalocneminae; pp. 246 & 297.
	Inner tubercles situated between outer tubercles on anterior margin of head, the middle part of which is formed by the ridge joining them; only three antennal lamellae recognizable when antenna is furled	Leptaulacinae; pp. 251 & 302.

The first of these subfamilies, the Pleurariinae, contains only one Oriental genus, *Pleurarius*. This genus has been grouped by Kuwert with the genera *Ninoides*, *Pertinacides* and *Epipertinax*, all of which are confined to the New World. I have not seen specimens of any of these genera, so am not in a position to criticize his opinion.

The next three subfamilies comprise between them the Macrolininae of Kuwert, together with all the groups which fall under the second number "*9a*" of his table (1896, p. 219), which is trichotomous at this point.

The definition of the Macrolininae given in the above key necessitates the removal, from the group to which Kuwert applied this name, of the genus *Episphenus* and one oriental[2] species of the genus *Tiberius*, since these have no scars on the men-

ius cantori the mentum bears ridges which somewhat resemble the margins of primary scars and are perhaps homologous with the margins of secondary scars. The form of these ridges is, however, quite unlike that of the secondary scars of any species of Gnaphalocneminae; and the form of the anterior margin of the head is in itself sufficient to show that the insect does not belong to any genus of that subfamily. On the other hand, the primary scars are sometimes so feebly impressed in the genera *Cetejus* and *Analaches*, that it is possible they may sometimes be absent, in which case it would be almost impossible to separate certain species from the genus *Episphenus*. The fact is that these three genera are none of them, probably, very remote from the common ancestor of both subfamilies, although the countries inhabited by the last are so widely separated from those inhabited by the first two (see below pp. 313-5). The mentum of the genus *Hyperplesthenus*, Kuwert, which has only secondary scars and these not of very large size, closely resembles that of the genus *Episphenus*. The lateral and intermediate areas of the metasternum are, however, fused as in all other genera of the *Hyperplesthenus* group, a fusion which is not known to occur in any genus of Aceraiinae. See also appendix III, p. 326, below.

[1] See also p. 183, footnote.

[2] The so-called African species, *Tiberius caffer*, must also go. M. Oberthür has shown me the type, which proves to belong to an Australian species, identified by comparison with the British Museum collection as *Pharochilus dilatatus*, Dalm.

tum and have the supra-orbital ridges continuous with the supra-occipital ridge. The *Tiberius* here referred to is *T. kuwerti*, Arrow (=*cancrus*, auct.) and I have had to create a new genus *Tiberioides* for the reception of this species, of *Chilomazus borealis*, Arrow, and of a new species (*T. austeni*) in the Indian Museum collection which combines some of the characters distinguishing the first two from one another.

Kuwert's reason for including "*Tiberius cancrus*" and the genus *Episphenus* in the Macrolininae instead of among his "second 9*a*" groups, was that they were neither asymmetrical nor possessed of a mentum marked by grooves cutting off a small area ("furchenbegrenztes Schild") from the rest. Either of these characters occurring without the other would have been sufficient to place them among the "second 9*a*" groups, and they appear to me to be of much less importance than the two characters referred to above, in each of which they differ from the rest of the group in which Kuwert placed them. Moreover, the genus *Episphenus* closely resembles the genera *Chilomazus* (=*Laches*) and *Basilianus* in the texture of the upper surface of the head, and forms with them a series ranging from complete symmetry to a high degree of asymmetry, but otherwise remarkably alike. [See also below, p. 316].

Turning now to Kuwert's "second 9*a*" groups, it is clear that of the grooves and depressions found in the mentum of different genera of his Lachinae, only the lateral depressions, found nowhere except in the Far Eastern genera *Mastochilus*[1] and *Analaches*,[2] are primary scars. Consequently these two genera may be separated from the Oriental *Chilomazus* and partly Oriental *Epilaches*.[2] On the same grounds the Oriental genus *Heterochilus*, which is without primary scars, can be separated from the remaining genera—none of them found in the Oriental Region—of the group in which Kuwert placed it, and placed near the Oriental genus *Aceraius*, a procedure which Zang has already advocated (1905*a*, p. 167) on different grounds.

The new classification resulting from this rearrangement of genera, and necessitated by the definitions of the subfamilies Aceraiinae, Macrolininae and Gnaphalocneminae given above, appears to me to be more natural than the old; and all the changes advocated have the effect of bringing classification more nearly into line with distribution.

The subfamily Aceraiinae is almost entirely confined to the Oriental Region, and its distribution, as will be seen later (pp. 311–313), follows such definite lines that the one striking case of discontinuous distribution which it appears to show—that of the genus *Epilaches*—will probably prove to be a mistake. *E. filius*, Kuwert, from the

[1] Kuwert omits the scars in his figure of the type of mentum found in this genus. They are mentioned, however, in Percheron's description of *Passalus sexdentatus* (=*Mastochilus polyphyllus* according to Kuwert); they are well developed in the specimens in the Hamburg Museum determined by Zang *M. polyphyllus*; and Kuwert himself mentions in his descriptions of both species of the genus the presence of scars, which he describes in terms that seem unlikely to refer to the small grooves he figures close to the middle of the anterior margin. Concerning the correct form of the name of the genus (whether *Mastochilus* or *Mastachilus*, see Zang, 1903*b*, p. 418.

[2] Concerning Kuwert's confusion of the names *Analaches* and *Epilaches*, see below p. 283.

Nilgiris, is almost certainly a synonym of *Basilianus neelgherriensis*[1]; and, as the genus *Basilianus* is most unlikely to occur in the St. Cruz islands, the probability is either that there has been some mistake about the locality from which the only other species—*E. infantilis*—comes[1], or else that this species has true scars on the mentum which have not yet been described. Consequently the genus *Epilaches* is not included in the following key. The genus *Heterochilus*, for which Zang (1905*b*, p. 154) has suggested the new name *Rhipsaspis*, does not appear to me to be sufficiently distinct for recognition, especially in view of Zang's notes upon it (1905*a*, p. 167). The genus *Ophrygonius*, Zang, is very close to *Basilianus*, Kaup; but as the characters by which the two are separated do undoubtedly distinguish all the Indian forms on the one hand from the only Malaysian form with which they could be confounded on the other, I have found it convenient to retain it.[2]

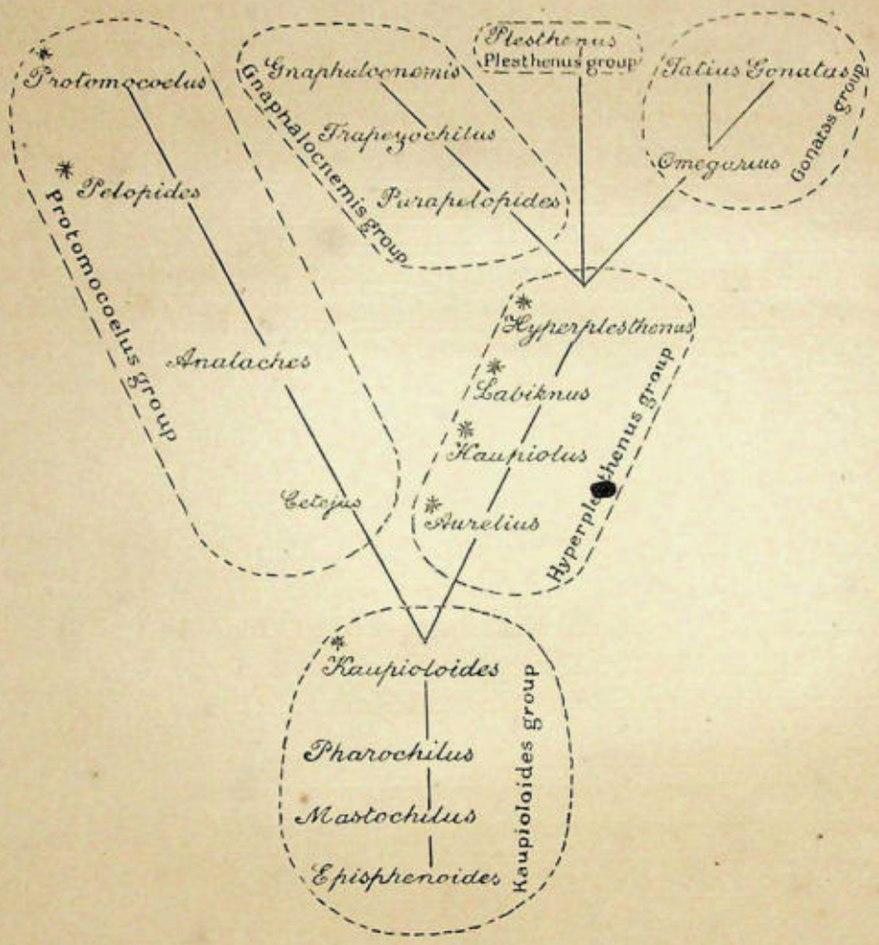
The genera which I recognize in the subfamily Aceraiinae may be distinguished from one another, thus[2]:—

1.	Inner tubercles separated by a space $\frac{1}{3}$-$\frac{1}{2}$ as long as that separating outer tubercles	*Tiberioides*, Gravely; pp. 215 & 280.
	Inner tubercles separated by a space $\frac{2}{3}$-1 times as long as that separating outer tubercles	2.
2.	Anterior margin of head symmetrical or but slightly asymmetrical, both right and left outer tubercles simply pointed	3.
	Anterior margin of head markedly asymmetrical, left external tubercle longer than right, rounded or more or less obliquely truncate at apex	4.
3.	Central area of mentum smooth, neither grooved nor depressed near middle of anterior margin; anterior margin of head quite symmetrical	*Episphenus*, Kaup; pp. 217 & 281.
	Central area of mentum grooved or depressed round a median (rarely paired) process close to anterior margin; anterior margin of head more or less asymmetrical	*Chilomazus*, Zang; pp. 218 & 281.
4.	Frontal ridges represented by fine grooves (which in certain specimens are somewhat obscured by their posterior margins being developed into ridges); antennae with five or six pubescent lamellae; lateral grooves of elytra narrow, their punctures never linear	5.
	Frontal ridges neither represented nor accompanied by grooves; antennae with only four pubescent lamellae; lateral grooves of elytra broad, their punctures transversely linear	*Ophrygonius*, Zang; pp 227 & 285.

[1] I have since been able to confirm these two suggestions by reference to the type of *E. infantilis* and cotypes of *E. filius*; see below, p. 283.

[2] For a modification of the views expressed here see Appendix I, pp. 316-318. The page-references given in this key refer to the pages of the present paper on which are described the first species of each of the genera as here defined. The shifting of the points of division between the genera has not necessitated any change in the order in which the species would have been described.

mandibles. In the case of the Aceraiinae it was useless to introduce any reference to this character into the key to the genera, as these were found to be well defined and to form a linear series of increasing specialization.[1] But in the Gnaphalocneminae it is more useful; for the genera, besides being less sharply defined by other characters, form a branching series with one or more genera in which the dentition is reduced at the end of each branch; and the nature of the reduction, which is the



same in all genera in which it occurs in any one branch, is different in different branches.

Zang has attached great importance to the fusion of the (anterior) intermediate and lateral areas of the metasternum in certain genera of Gnaphalocneminae, and here we have another character, usually very sharply defined, which is most useful for the determination of these genera. But it does not appear to me to be of such primary importance as the sculpturing of the mentum and of the anterior margin of the head; and Zang's "*Kaupiolus* Group," which includes all genera so characterised, does not

[1] I have had to modify my views on these points, see Appendix I, p. 316.

appear to me to be much more natural than a group containing all the genera with reduced dentition would be. In the accompanying diagrammatic representation of the grouping of the genera of Gnaphalocneminae that appears to me to be most natural (see previous page), the names of the genera so characterised are marked with an asterisk ; and it will be seen that they appear in two different places.[1]

When thus arranged the genera fall into six groups (each enclosed, in the diagram, by a dotted line), and it will be convenient to refer to these groups respectively as the *Kaupioloides*, *Protomocoelus*, *Hyperplesthenus*, *Gnaphalocnemis*, *Plesthenus* and *Gonatas* groups. The diagram indicates only the general course of the evolution of asymmetrical forms with reduced dentition, from symmetrical ones with complete dentition, as this is illustrated by the genera now in existence. Many of the genera in the lower parts of the diagram are distinguished from those above, as well as from those below them, by characteristics peculiar to themselves ; and the diagram must not be taken to imply the actual descent of one genus from another now existing, but only from one the general characteristics of whose head and mandibles were very similar.[2]

The *Kaupioloides* group appears to be the most primitive, and as its members closely resemble those of the subfamily Macrolininae, it may be supposed that the two originated from a common stock, and have not departed very widely therefrom in general appearance. The *Protomocoelus* group, in spite of its possession of primary scars, appears to be related more closely than any other to the sub-family Aceraiinae. The affinities of the two remaining subfamilies of the second section of Oriental Passalidae, the Pleurariinae and Leptaulacinae, are more obscure; but it seems likely that the former is related to the Aceraiinae.

The genera of Gnaphalocneminae may be defined thus :—

1. Primary scars almost always present[3] ; when absent, area between anterior part of left supra orbital ridge, and ridge joining left inner and outer tubercles, deeply excavate, the excavation bounded behind by a sharply defined ridge ; dentition of right mandible never more reduced than that of left .. .. 2.

   Primary scars never present ; surface of head without deep or sharply defined anterior depressions, or dentition of right mandible more reduced than that of left .. .. 9.

[1] I follow Zang (1905*b*, p. 227) in supposing the lateral and intermediate areas of the metasternum to be fused in the genus *Pelopides* ; but Zang himself had not seen a specimen (1905*a*, p. 316). See also following footnote.

[2] It is, for instance, very possible that *Protomocoelus* and *Pelopides* have sprung more directly than is here indicated from *Kaupiolides*, which they resemble in the structure of the metasternum more than they do *Analaches-Cetejus*.

[3] Perhaps always; but in the most highly specialized forms they are often very small and obscure. In all the more highly specialized forms, and also in some less highly specialized, the excavation behind the anterior margin of the head is present on the left and often on both sides; and in these forms it supplies an excellent mark of recognition; it faces more upwards and less forwards, and when well developed is much deeper than the somewhat similar hollow often found in the genus *Gnaphalocnemis*,

2.[1]	Outer tubercles at least as far from one another as from anterior angles of head; never asymmetrical, except when lateral and intermediate areas of metasternum are fused; surface of head usually rough; dentition always complete	(*Kaupioloides* Group) 3.
	Outer tubercles at most as far from one another as from anterior angles of head; often asymmetrical, always so when lateral and intermediate areas of metasternum are fused; surface of head smoother, polished; dentition complete or reduced	(*Protomocoelus* Group) 6.
3.	Anterior intermediate and lateral areas of metasternum distinct from one another	4.
	Anterior intermediate and lateral areas of metasternum fused ..	[*Kaupioloides*, Gravely[2]].
4.	Secondary scars feebly developed (sometimes absent), transverse, never extending back as much as half way to posterior margin of mentum	[*Episphenoides*, Kuwert[3]].
	Secondary scars distinct, variable	5.
5.	Secondary scars represented by a pair of very small grooves, meeting in an acute angle	[*Mastochilus*, Kaup].
	Secondary scars represented by a single long transverse crescentic or semicircular groove, crossing middle-line about halfway between anterior and posterior margins of mentum	[*Pharochilus*, Kuwert[3]].
6.	Anterior intermediate and lateral areas of metasternum distinct from one another[4]; dentition complete, normal	7.
	Anterior intermediate and lateral areas of metasternum fused; dentition of mandibles reduced on both sides, but especially on the left, anterior lower tooth (when present) widely separated from middle lower tooth, and partially fused with lowest terminal tooth	8.

in which genus moreover, the dentition of the right mandible is always much more reduced than that of the left.

[1] These two groups are not very sharply separated. The asymmetrical species of the *Protomocoelus* group can easily be recognized by the form of the anterior margin of the head (see Kuwert, 1896, pl. vii, figs. 70, 71, 77 and 82). Some of the symmetrical forms, however, come very near certain members of the *Kaupioloides* group, but are smaller, with the upper surface of the head smoother and the middle part of its anterior margin usually somewhat more prominent and never very broad. The genus *Kaupioloides* seems to be almost exactly intermediate between the two groups in these characters, but, being itself very slightly asymmetrical, it is distinguished from all their symmetrical forms and many of their asymmetrical ones by the fusion of the lateral and intermediate areas of its metasternum and from the rest of their asymmetrical ones by the complete dentition of its mandibles. The lateral and intermediate areas of the metasternum are also fused in all genera of the *Hyperplesthenus* group; in this respect the genus *Kaupioloides* connects the archaic group in which I have placed it with this group, which must in any case be supposed to have originated from some such archaic forms; and in the structure of the head it connects it with the members of the *Protomocoelus* group.

[2] Mitt. Naturhist. Mus. Hamburg XXX, 1913, p. 103.

[3] Concerning the genera *Episphenoides* and *Pharochilus* see also Heller, 1910, p. 17. The general shape of the scars of the former is correctly shown in Kuwert's figure, but they appear somewhat too sharply defined and at too great a distance from the anterior margin of the mentum; so that the effect is that of the form of mentum found in certain species of the genus *Mastochilus*, rather than of that characteristic of the genus *Episphenoides*.

[4] The dividing line is less pronounced than usual in *Analaches schenklingi*, Heller, but it is there;

7[1].	Upper margin of left mandible, between upper tooth and base, straight or lightly curved so as to contain not less than 120°; ridge joining inner tubercles usually straight and not strongly crested; pronotum usually very strongly punctured in anterior angles; posterior angles of lower side of prothorax usually not very hairy..	[*Cetejus*, Kaup].
	Upper margin of left mandible, between upper tooth and base, abruptly bent making a distinct angle of at most 120°; ridge joining inner tubercles usually concave and sharply crested, the crest projecting forwards; anterior angles of pronotum almost or quite unpunctured; posterior angles of lower side of prothorax usually very hairy	[*Analaches*, Kuwert].
8[2].	Left outer tubercle broader, but little longer than right; when a ridge is present between left inner tubercle and supra-orbital ridge, it is directed towards anterior end of latter	[*Pelopides*, Kuwert].
	Left outer tubercle much longer than right; a ridge extending behind deep excavation from left inner tubercle towards middle of supra-orbital ridge	[*Protomocoelus*, Zang (= *Pelops*, Kaup)].
9.	Lamellae of antennae usually all rather short and stout, never more than four very long and slender; mandibles normal or with dentition reduced on right side; secondary scars almost always longitudinally linear and widely separated	10.
	All six lamellae of antennae long and rather slender; mandibles sometimes normal, more often with anterior lower tooth absent or fused at base with lowest terminal tooth, especially on left side; secondary scars semi-circular or V-shaped, more or less transverse, often more or less distinctly continuous with one another across middle line	(*Gonatas* Group) 17.
10.	Lateral and intermediate areas of metasternum fused; mandibles normal on both sides	(*Hyperplesthenus* Group) 11.
	Lateral and intermediate areas of metasternum distinct; anterior lower tooth of right mandible smaller than that of left, usually absent	14.

and the dentition is clearly complete and normal, though the anterior lower and lowest terminal teeth are broken on the right side in the type.

[1] See Heller, 1910, p. 14. These two genera cannot be sharply separated from one another, and should perhaps be regarded as sub-genera only.

[2] Kuwert separates these two genera thus, but his figure scarcely bears out his statement that the left outer tubercle is much longer than the right in *Protomocoelus*; and the material before me seems to indicate that his figure is better than his description. I am inclined to think that *Pelopides* will ultimately have to fall as a synonym either of *Analaches* or of *Protomocoelus*; but which cannot be determined before the mandibles and metasternum are described after examination and not, as in the above key, by inference. So I prefer to retain the name for the present. Zang (1905*b*, p. 227) who had also not seen a specimen (1905*a*, p. 316) regards *P. schraderi*, Kuwert, from New Guinea, as the type of the genus, which he considers distinct; and suggests that the remaining species, *P. gravidus*, Kuwert, from Mindanao, ought probably to be transferred to some genus of the *Gnaphalocnemis* group on account of its toothed labrum.

11.	Central tubercle of head free, directed forwards	[*Aurelius*, Kuwert [1]].
	Central tubercle of head normal	12.
12.	Secondary scars widely separated	13.
	Secondary scars not widely separated, directed inwards so that their posterior ends nearly meet in middle-line without reaching posterior margin of mentum; antennae normal; left outer tubercle truncate or complex, right similar or simple and bluntly pointed; pronotal scars with or without hair	[*Hyperplesthenus*, Kuwert [2]].
13.	Antennae normal; outer tubercles variable, simple or complex, not markedly asymmetrical [3]; pronotal scars hairless	[*Kaupiolus*, Zang [4] (= *Vellejus*, Kaup)].
	Antennae with lamellae of last four joints abnormally long and slender; left outer tubercle broadly truncate, right more or less pointed but no longer than left; pronotal scars hairy	[*Labienus*, Kaup].
14.	Outer tubercles simple, very variable, acute or truncate, highly asymmetrical (that of the right side being always the larger) or almost (? sometimes quite) symmetrical	[*Plesthenus*, Kaup (= *Embryulcus*, Zang [5])].
	At least one of the outer tubercles complex, or truncate with an additional tubercle between itself and anterior angle of same side of head	(*Gnaphalocnemis* Group) 15.
15.	Secondary scars united in middle-line behind, together forming an ω-shaped depression much as in *Omegarius*; anterior lower tooth of right mandible small but distinct	*Parapelopides*, Zang; pp. 246 & 297.
	Secondary scars completely separated as a rule, anterior lower tooth of right mandible absent	16.
16.	Outer tubercles equal [6]	*Trapezochilus*, Zang; pp. 247 & 297.
	Outer tubercles unequal, that of right side always larger than that of left	*Gnaphalocnemis*, [7] Heller; pp. 248 & 298.

[1] The genus *Aurelius*, specimens of which I have myself examined, possesses all the characteristics of the *Hyperplesthenus* group.

[2] The genus *Hyperplesthenus* does not appear in Kuwert's table for the determination of genera (1896), being described, apparently for the first time, in 1898 (p. 318) in the description of *H. impar*, Kuwert, without any separate generic definition. An examination of the type specimen has enabled me to define the genus more precisely, and to find that *Labienus gracilis*, Heller (Abh. Mus. Dresden xiii, 3, p. 16), of which I have also seen the type, is really a *Hyperplesthenus*. See Mitt. Naturhist. Mus. Hamburg XXX, 1913, p. 105.

[3] Kuwert says always asymmetrical, but they are symmetrical in his figure and in the majority of specimens before me.

[4] *Kaupiolus trigonophorus*, Zang, as Zang himself suspected, is not a true *Kaupiolus*, and I have made it the type of a new genus *Kaupioloides* (see above, p. 200).

[5] Zang considers the name *Plesthenus* to be preoccupied by *Plesthenes*, Stål.

[6] Not always quite symmetrical in structure however: so it is possible that the genus *Trapezochilus* will eventually have to be merged in *Gnaphalocnemis*.

[7] Kuwert (1896, p. 229) states that there is always a depression between the left outer tubercle

17.	Secondary scars curved	18
	Secondary scars V-shaped, forming together a W-shaped depression	*Gonatas*, Kaup, pp. 250 & 299.
18.	Secondary scars approximate, forming together an ω shaped depression	[*Omegarius*, Kuwert[1].]
	Secondary scars widely separated	[*Tatius*, Kuwert[1].]

The last Oriental subfamily, Leptaulacinae, contains only two of Kuwert's Oriental genera, these being *Leptaulax* and *Trichostigmus*. Of these the former is by far the larger, and Zang (1905*a*, p. 106) has split it up into two. The species belonging to it seem capable of arrangement in quite a definite linear series. At one end of this series we have forms in which the intermediate areas of the metasternum, and as a rule the sides of the pronotum, are thickly and extensively punctured, the lateral grooves of the elytra being very broad with transversely linear punctures; while at the other end come forms in which the lateral grooves of the elytra are narrow with small round punctures, the sides of the pronotum bearing a few punctures only, while the punctures on the intermediate areas of the metasternum are absent, or obsolete and confined to the inner posterior angles. All species belonging to the first-mentioned end of this series apparently belong to the genus *Leptaulax* as restricted by Zang, and those belonging to the last-mentioned apparently belong to his new genus *Leptaulacides*; but as the character on which these genera are separated—the form of the parietal ridges of the head—is only once referred to by Kuwert, it is impossible to be quite certain whereabouts in the series the restricted genus *Leptaulax* ends and the new genus *Leptaulacides* begins. I have, therefore, recognized the genera as distinct, only when describing the species before me,[2] and have dealt with both under the old name *Leptaulax* (as defined by Kaup and Kuwert) in the subsequent synonymmic revision of the Oriental Passalidae as a whole. The three accepted genera of Leptaulacinae may be distinguished as follows: —

1.	Sides of elytra hairless	2.
	Sides of elytra hairy	*Trichostigmus*, Kaup, pp. 261 & 310.

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and supra-orbital ridge in this genus. This character is not found in any other accepted genus of the group but it is shared by "*Pelopides*" *gravidus*, Kuwert, which must be transferred, in all probability, to this group (see Zang, 1905*a*, p. 316 and 1905*b*, p. 227). "*Pelopides*" *gravidus* differs, however, from all known species of *Gnaphalocnemis*, in that the left outer tubercle is larger and not smaller than the right. One species of *Gnaphalocnemis* is known to me in which there is no depression between the left outer tubercle and supra-orbital ridge. This is described below under the name *G. simplex*. It further differs from other species of *Gnaphalocnemis* in the form of the outer tubercles, and in having the anterior intermediate and lateral areas of the metasternum very imperfectly separated. A new genus may ultimately be required for its reception.

[1] I very much doubt the distinctness of these two genera one from another.

[2] An examination of further material has shown that this distinction does not always hold good, for *L. himalayae* and certain species immediately succeeding it in my list may have parietal ridges of the kind found in either genus, the two kinds being sometimes found on opposite side of a single specimen. The two genera have therfore been united in the following pages.

2.[1]	Parietal ridges of head short and laterally truncate, being separated from supra-orbital ridge by a deep hollow: insects strongly and more extensively punctured	*Leptaulax*, Kaup, pp. 251 & 302.
	Parietal ridges long, laterally continuous with supra-orbital ridges; insects sparsely and less extensively punctured	*Leptaulacides*, Zang.

4. LIST OF SPECIMENS IN THE INDIAN MUSEUM COLLECTION, WITH NOTES ON THOSE IN CERTAIN OTHER COLLECTIONS.[2]

Localities are recorded as briefly as possible in this list. For further geographical information regarding them, and also for all information regarding the synonymy adopted here, the sixth part of this paper should be referred to. I have thought it best to retain, for the present, all names already in use which can be applied to forms satisfactorily distinguishable from their allies in the collection before me, even when (as in the case of *Ephisphenus comptoni* and its varieties) there is evidence to show that a larger series of specimens is almost certain to prove that the characters, which now seem to be distinctive, are of no real taxonomic importance[3]. But as full species I have only recognized forms differing in at least one constant and definite character, or combination of characters, from every other form known to me.

The descriptions refer only to the specimens before me, and the measurements given for each species do not always show the total range in size indicated in the descriptions of previous authors.

Subfamily *AULACOCYCLINAE*.

Genus **COMACUPES**, Kaup.

Comacupes cavicornis, Kaup.

1. C. CAVICORNIS, Kaup, s. str.

Regd. No. $\frac{6376}{14}$ $\frac{6378-80}{14}$ Sinkep Island Moti Ram.

Description.—Length 23–25 mm. *Labrum* about twice as wide as long, anterior margin slightly concave, angles rounded, sides slightly convergent behind. Upper tooth of *mandibles* weak, obtuse; anterior lower tooth conical, usually truncate or bifid at apex, that of left side partially fused to lower margin of lamelliform middle lower tooth. *Mentum* hairy and coarsely punctured, with a strong median keel, which is obliquely truncate behind and extends into a slight prominence in middle of anterior margin. *Head* hairy and strongly punctured, except on supra-orbital ridges and anterior margin; central tubercle narrow (usually more so in front than behind), pointed before and behind, hollowed out above, the upper margins of its raised sides straight and usually somewhat elevated behind and dipping at an angle of about 120° above the somewhat elongated anterior overhanging portion; anterior margin of head thickened, approximately straight except close to lateral sutures of frons on inner side

[1] See footnote 2 on preceding page.

[2] A list of these collections will be found above p. 178.

[3] This has since been confirmed; see p. 282.

of which it is a little convex; lateral sutures of frons meeting anterior margin of head in an angle of about 60°, and crest of supra-orbital ridge in an angle of about 30°; crest of supra-orbital ridge meeting canthus in an angle of about 30°; external angle of canthus acute, usually little more than 60°; supra-orbital ridge unpunctured, apical angle about 120°, crest defined by a groove on inner side; a more or less distinct transverse groove present between supra-orbital ridge and central tubercle. *Pronotum* without strong punctures except in the marginal groove, which is not interrupted before or behind in the middle-line, and is broader on the inner side of each rounded and slightly prominent anterior angle than elsewhere; sides parallel; posterior margin rounded; scars curved (the concave face anterior), slightly oblique, with a single smaller round depression immediately in front of them. *Lateral plates* of lower side of prothorax with hair-bearing punctures behind, and a few along outer margin in front. *Mesothoracic plates* punctured throughout with the exception of the posterior angles of the episterna; sternum covered with long hair; the rest of the mesothorax hairless. *Metasternum* with the central area moderately distinct, this and the posterior intermediate areas smooth and hairless; lateral and anterior intermediate areas punctured and more or less hairy; lateral areas much broader behind than in front. Second and third *abdominal sterna* covered with hair-bearing punctures all over, fourth to sixth at the sides. Anterior margin of front *coxae*, and posterior part of hind coxae, punctured. *Tibiae* of middle and hind legs each armed about two-thirds of the way down outer side with one spine. Elytra somewhat punctured and very hairy (in perfect specimens) at the shoulders; all the grooves strongly punctured; the rest smooth.

2. C. CAVICORNIS, var. BORNEENSIS, n. var.

Pl. xi, figs. 1–1*a*.

Regd. No. $\frac{2669}{19}$ Kuching, Sarawak Sarawak Museum.

I have examined three specimens of this form. Of these one has been kept in the Indian Museum, one has been returned to Sarawak, and one (the type) has gone to the British Museum.

Description.—Length 26·5–28·5 mm. Differs from *C. cavicornis, s. str.*, only in that the head is smooth as in the following variety and has all its angles more or less produced, while the puncturing of the metasternum is intermediate in extent between that found in *C. cavicornis, s. str.*. and that found in the following variety.

3. C. CAVICORNIS, var. LAEVICORNIS, Kaup.

Pl. xi, figs. 2–2*a*.

Regd. No. $\frac{9478}{1}$ Malacca ?

" $\left\{\begin{array}{cccc} \frac{9244}{1} & \frac{9410\cdot5}{1} & \frac{9417\cdot20}{1} & \\ \frac{9423\cdot8}{1} & \frac{9439}{1} & \frac{9432\cdot3}{1} & \frac{9437\cdot8}{1} \\ & \frac{9443\cdot5}{1} & \frac{9480}{1} & \frac{6381\cdot2}{14} \end{array}\right\}$ Johore { Stoliczka bequest, J. Wood-Mason, etc.

" $\frac{9440\cdot2}{1}$? J. Wood-Mason.

Description.—Length 23–27 mm. Differs from *C. cavicornis, s. str.*, only in having the upper surface of the *head* entirely smooth, hairless, and unpunctured except right at the back behind the supra-orbital ridges; in having the central tubercle of the head shorter and more abruptly truncate in front; in having somewhat wider enlargements of the anterior part of the marginal furrow of the *pronotum*; and in having the lateral and anterior intermediate areas of the *metasternum* more sparsely and less extensively punctured behind.

Comacupes stoliczkae, n. sp.

Pl. xi, figs. 3–3*a*.

Regd. No.	$\frac{9418}{1}$ $\frac{9183}{1}$ (*type*)	Johore, Malay Peninsula	J. Wood-Mason, etc.
,,	$\frac{8783}{18}$	Sinkep Island	Moti Ram.

This species is intermediate between *C. cavicornis* and *C. masoni*; but it closely resembles *C. cylindraceus* also, agreeing with it in every detail referred to by Kaup in his monograph. Kaup notes, however, that he includes under the one name *cylindraceus* two forms differing considerably in the shape of the central tubercle, both of which forms he figures; and I have little doubt that his "2nd form" was in reality the present species. Perty's original description and figure of *C. cylindraceus* would perhaps do almost equally well for either form; but I think that these, and also those subsequently given by Percheron, apply best to the form referred to by Kaup as the typical one. As the present form differs considerably from this "typical" *C. cylindraceus* in the shape of the central tubercle, I have no hesitation in regarding it as a distinct species; and I name it after Dr. Stoliczka in recognition of his valuable work on the Oriental species of Passalidae.

Description.—Length 25–27 mm. *Labrum* often nearly as long as it is wide, punctured, hairy, anterior margin approximately straight, angles strongly rounded, sides straight and parallel. *Mandibles* as in *C. cavicornis*, the upper tooth even more reduced. *Head* above and below also as in *C. cavicornis* in general shape, but with the central tubercle more elevated (especially in front), much narrower, thickened behind the apex, and simply rounded, not excavate, above; there is, moreover, a pair of transverse ridges at the base of the central tubercle much as in *Taeniocerus bicanthatus*, but more pronounced and covered like the rest of the head with a coarse punctuation slightly finer and closer than that of *Comacupes cavicornis*. *Prothorax* as in *C. cavicornis*, but with somewhat smaller scars, and still more hairy sternum. *Mesothorax* also as in *C. cavicornis*. *Metasternum* differing from that of *C. cavicornis* in that the punctuation is somewhat finer and closer, and extends over the whole surface outside the central area. *Abdominal sterna* (? always) less hairy than in that species. Posterior part of hind *coxae* punctured; middle *tibiae* armed with one spine about two-thirds of the way down; hind tibiae similarly armed, but with the spine usually very slightly smaller. *Elytra* sometimes with some small punctures along the lower side of the anterior half of the tenth rib; otherwise as in *C. cavicornis*.

Comacupes masoni, Stoliczka.

Pl. xi, figs 4–4*a*.

Regd. No. $\frac{8786}{14}$ (*type*[1])	Johore, Malay Peninsula	J. Wood-Mason.

Description.—*Length* 30 mm. *Labrum* as in *C. stoliczkae*, but with anterior margin slightly concave. *Mandibles* also as in *C. stoliczkae*. *Mentum* perhaps differing from that of that species in that the median keel is scarcely as high. *Head* somewhat more finely punctured, otherwise similar; central tubercle quite as prominent, not depressed at tip as in both *C. stoliczkae* and *C. cavicornis*, scarcely excavate along middle-line, outline in side view straight (perhaps very faintly convex) and horizontal above, oblique beneath. *Pronotum* with anterior angles a little more prominent, sides slightly divergent behind; enlarged areas of anterior marginal groove rather abruptly terminated at their outer ends. *Prothorax ventrally* as in *C. stoliczkae*. *Mesothorax*, *metasternum*, *elytra* and *legs* also as in *C. stoliczkae*. Second *abdominal sternum* strongly punctured throughout; third with a few punctures at each end; rest of lower surface of abdomen smooth and highly polished.

Comacupes cylindraceus (Perty).

Pl. xi, figs. 5–6*a*; text-fig. 2.

Regd. No. $\frac{6377}{11}$ $\frac{6384}{11}$	Sinkep Island	Moti Ram.
,, $\frac{2813}{19}$	Klingkang, Borneo	Sarawak Museum.

Also specimens from the Larut Hills in the British Museum, from Deli (Sumatra) in the Hamburg Museum, and from Padang and St. Rambe (Sumatra) in the Deutsches Entomologishes Museum.

Under this name, as explained above (p. 206), I include, of the two forms included under it by Kaup, only the "typical" one. But I also include everything referred by Zang to *C. masoni* and *C. cormocerus*; and the series of specimens before me shows the species to be so variable that I am inclined to think it possible that *C. masoni*, Stoliczka, may ultimately have to be referred to it also.

TEXT FIGURE 2.
Head of a form of *C. cylindraceus*, from the left side. × 4.

Description.—*Length* 24–28 mm. Differs from *C. stoliczkae* and *C. masoni* only in the form of the central tubercle of the *head*; this is somewhat less prominent in front as seen from the side, and more or less vertically truncate; its anterior margin may be straight or markedly concave, and either the upper or the lower angle may project somewhat—but never very much—beyond the other (see pl. xi, figs. 5*a* and 6*a*, and text-

[1] This specimen appears to have been entered in our register originally under the No. $\frac{9419}{1}$, to have lost the label bearing this number, and then to have been entered again under another number.

fig. 2[1]. The form of the anterior parts of the marginal groove of the *pronotum* and the puncturing of the *abdominal sterna* are both extremely variable.

Genus TAENIOCERUS, Kaup.

Taeniocerus bicanthatus (Percheron).

Pl. xi, figs. 7–7*b*.

Regd. No. $\frac{9447}{1}$? J. Wood-Mason.

" $\frac{9477}{1}$ $\frac{6362\text{-}3}{14}$ $\frac{6383}{14}$ Johore, Malay Peninsula ?

No. $\frac{9447}{1}$ is markedly smaller than any of the others, but in structure it agrees with them perfectly. In all the specimens I have seen the external angle of the canthus is more or less obtuse, scarcely rectangular as it is shown in Percheron's figure, and certainly not acute as in Kaup's figure.

Description.—Length 24–29 mm. *Labrum* about twice as broad as long; anterior angles rounded, laterally prominent; anterior margin concave. Upper tooth of *mandibles* somewhat obtuse and not very prominent; uppermost terminal tooth obsolete; anterior lower tooth of left mandible wider than that of right; the former, and often the latter also, more or less bifid, the upper denticle being longer than the lower. *Mentum* with a considerable angular prominence in middle of anterior margin; this prominence continued backwards to posterior margin as a hairless, and usually smooth and more or less hollowed, triangular area; lateral portions of mentum flattened, hairy and coarsely punctured. *Head* smooth and polished as a whole, but punctured behind supra-orbital ridge, beside central tubercle, and in area enclosed by the U-shaped ridge with which this tubercle is crowned; arms of this ridge parallel or slightly divergent,[2] their extremities somewhat prominent. Anterior margin of head slightly concave, with a slightly convex transverse groove immediately behind it, meeting crest of supra-orbital ridge at an angle of not more than 90°, and margin of canthus at an angle of about 120°; external angle of canthus about 120°; apical angle of supra-orbital ridge somewhat more obtuse than this; crest of supra-orbital ridge defined on inner side by distinct groove; a pair of more or less distinct ridges extending outwards and very slightly forwards from base of anterior angles of central tubercle. *Pronotum* smooth, polished; anterior margin almost straight, anterior angles rectangular, pointed but not prominent; sides parallel, posterior angles much rounded, posterior margin somewhat convex; marginal groove punctured, incomplete in the middle-line in front,

[1] The type specimen of *C. cormocerus*, Zang, has the central tubercle of the form shown in the last-mentioned figure, which is from a specimen from the Larut Hills, but the upper angle does not project upwards, and occupies a much smaller part of the front of the tubercle than does the lower.

[2] The width of this horn is very variable in proportion to its length even in our few specimens, all of them probably from Johore. So Zang's suggestion (195*a*, p. 105) that Bornean specimens are distinguished by a broad horn such as is figured by Kaup, and Malayan ones by a longer horn, can no longer be maintained.

widest a little more than half way from this point to the angles; median groove strongly developed; scars obliquely **S**-shaped, punctured in lower two-thirds of their length. Lateral ventral plates of prothorax sparsely and obscurely punctured in front, closely and distinctly punctured and hairy behind. *Scutellum* more or less sparsely punctured in antero-lateral angles; oblique punctured band of *mesothoracic episterna* very broad, covering almost the whole of the plate, posterior angles polished; anterior parts of lateral angles of *mesosternum* punctured, the rest smooth, middle-line marked by a broad and somewhat **Y**-shaped groove whose fork is directed forwards. *Metasternum* unpunctured except in anterior angles, lateral areas not very broad behind. *Abdominal sterna* smooth and polished, unpunctured. *Posterior coxae* matt behind, not distinctly punctured. *Tibiae* of middle legs with one spur situated externally slightly beyond the middle; those of hind legs without these spurs. *Elytra* unpunctured except in the grooves.

Taeniocerus pygmæus, Kaup.

Pl. xi, figs. 8–8*a*.

Regd. No. $\frac{9175}{1}$ "Malacca" ♀

I have also examined two specimens from Kuching in the Sarawak Museum collection.

Description.—Length 15–16 mm. *Labrum* twice as broad as long behind, but three times as broad as long in front, the rounded anterior angles being much more prominent than in the preceding species. Upper tooth and uppermost terminal tooth of *mandibles* obsolete; anterior lower tooth conical, that of left side united by a ridge to middle lower tooth. Smooth central part of *mentum* broader in front than in preceding species, being distinctly pentagonal; mentum otherwise as in that species. *Head* more or less finely roughened, except around central tubercle where it is smooth, and further back where it is punctured; central tubercle almost completely divided by a longitudinal groove into a pair of conical crests apically rectangular in profile; these crests obscurely joined together behind into a single horse-shoe shaped structure. Anterior margin of head slightly concave, sometimes bordered by an obscure marginal furrow, meeting supra-orbital ridge in a much rounded angle of about 60° and side margin of the head at about 90°; side margin of head making a somewhat rounded re-entrant angle of about 120° with canthus; external angle of canthus and apical angle of supra-orbital ridge also about 120°, the latter situated at about the middle of the ridge. A slight hollow present on each side of central tubercle. *Pronotum* polished, anterior margin wavy or almost straight, anterior angles acute and often very slightly prominent; sides convex, divergent; posterior angles rounded, posterior margin convex, marginal groove well developed across middle-line in front, otherwise as in preceding species; median groove strongly developed; scars *l*- or *y*-shaped, punctured. Prothorax ventrally as in the preceding species. *Scutellum* entirely smooth except for usual finely punctured patch in middle of anterior margin, or faintly grooved in middle-line immediately

behind this patch; *mesothoracic episterna* crossed by oblique band of punctures or with their upper angles punctured throughout; *mesosternum* finely striatopunctate at sides in extreme front, otherwise smooth and polished, sometimes more or less clearly grooved or keeled in the middle behind; metasternum as in the preceding species except that an obscure median longitudinal keel is present and the lateral areas are even smoother. *Abdominal sterna* and hind *coxae* polished, unpunctured. *Tibiae* of middle legs with one blunt tooth slightly below the middle; those of hind legs without any such tooth. Lateral grooves of *elytra* distinctly punctured.

Taeniocerus bicuspis, Kaup.

Pl. xi, figs. 9–9*a*.

Regd. No.	9246-8/1, 9401/1, 9405/1; 9408/1, 6475/14	Sikkim	Stoliczka bequest, Asiatic Society, etc.
,,	8429/19	Gopaldhara, Rungbong Valley, Darjeeling District	H. Stevens (coll. W. K. Webb).
,,	9469/1	Chongtang, Darjeeling District	J. Wood-Mason.
,,	9476/1	Upper Tista, 4000 ft.	?
,,	8801-2/14	Sureil, Darjeeling District	A. Alcock.
,,	2667/5	N. E. Frontier	?
,,	6369/14, 6371/14	Dafla Expedition	H. H. Godwin-Austen.
,,	6376/14	Dafla, Camp 9	
,,	6373-4/14, 8416/18	Dikrang Valley	
,,	6372/14	Harmutti, base of Dafla Hills	
,,	3121-8/19, 3131-9/19	Kobo, Abor Country, 400 ft.	Nov. 1911—Feb. 1912. S. W. Kemp.
,,	3261/19	Rotung, Abor Country, 1400 ft.	
,,	3129-30/19	Upper Rotung, Abor Country, 2000 ft.	
,,	3104-29/19	Upper Renging, Abor Country	
,,	6464-8/14, 8412-5/18	Cachar	J. Wood-Mason.

Mr. Stevens' collection includes a specimen from Silonibari at the base of the North Lakhimpur Hills in Assam.

Description.—Length 20–22 mm. *Labrum* as in *T. bicanthatus*. *Mandibles* as in *T. pygmaeus* but with anterior lower tooth slightly more compressed. Mentum not unlike that of *T. pygmaeus*, but with median prominence of anterior margin almost absent or entirely so, the central area being consequently quadrangular; distinctness of central area from adjoining parts somewhat variable as (in specimens from the Darjeeling District especially) it is apt to be punctured, and in extreme cases (e.g. 9246/1 and 9401/1) the whole surface of the mentum appears uniformly punctured and hairy. *Head* smooth, with a transverse patch of strong punctures at the back on each side behind supra-orbital ridges. Anterior margin bordered by a strong groove, slightly convex in the middle and slightly concave on each side; meeting crest of supra-orbital ridge

in an angle of 90° and canthus in an angle of about 120°; external angle of canthus about 90° (sometimes, especially in Cachar specimens, this angle is reduced by an intensification of the concavity in the anterior margin of the canthus); apical angle of supra-orbital ridge about 100°, situated above and a little in front of anterior margin of eye; crest of supra-orbital ridge defined on inner side by a strong groove; central tubercle distinct, divided by a longitudinal concavity above into a pair of parallel or slightly divergent crests whose front margins are vertical and straight or slightly convex, their upper ones meeting these at an angle of about 90° (usually somewhat less) and being straight or more frequently slightly concave; hollows at sides of the central tubercle somewhat as in *T. bicanthatus* but more extended. *Prothorax* as in *T. pygmaeus*, but with anterior angles of pronotum a little more prominent and sides approximately parallel. *Scutellum* without (or with very few) punctures other than those usually found on anterior margin; *mesothoracic episternum* with broad band of punctures extending obliquely across it; *mesosternum* more or less smooth, punctured close to lateral margin near the front, usually more or less obscurely grooved or keeled in the middle-line behind, the extent of all these markings being apparently variable and in no way characteristic of specimens from particular localities. *Metasternum* as in *T. bicanthatus*. Second and third *abdominal sterna* finely roughened throughout. Posterior *coxae* finely roughened behind; middle *tibiae* armed with one more or less strongly developed tooth or spine; hind tibiae with a very rudimentary tooth or unarmed. *Elytra* with all grooves punctured, the ribs smooth.

Habits.—Mr. Kemp informs me that this species lives under the bark of moderately hard logs in very wet jungle.

Genus AULACOCYCLUS, Kaup.

Aulacocyclus andrewesi, n. sp.

Pl. xi, figs 10–10*a*.

Described from a single specimen, collected by Mr. H. L. Andrewes in June from rotten timber in the Anamalai Hills at an altitude of 3500-4000 feet; now in the collection of Mr. H. E. Andrewes.

Description.—Length 23 mm. *Labrum* about twice as broad as long, anterior margin strongly concave, sides convergent behind, angles rounded and prominent. Right *mandible* missing, the left with upper tooth small but distinct, uppermost of three terminal teeth still smaller, remaining two terminal teeth larger, anterior lower tooth somewhat L-shaped in section, but fused with middle lower tooth to form with it a ⌊⌋-shaped structure with a minute denticle on the connecting ridge. *Mentum* punctured and hairy, with a smooth anterior prominence in middle which is medially grooved in front. *Antennae* with first two lamelliform lobes about four times as long as broad. *Head* above smooth and polished; anterior margin smooth above and hairy beneath, strongly concave in middle, slightly convex and very finely granular laterally, bordered by a strongly marked groove, meeting crest of supra-orbital ridge

at an angle of about 120°, and canthus in a straight line; external angle of canthus about 120°; apical angle of supra-orbital ridge also about 120°, but somewhat rounded; central tubercle with proximal vertical part about twice as thick as distal horizontal part when seen from the side, but only about two-thirds as thick when seen from above, extremity concave. *Pronotum* polished with small deep circular scars; anterior margin slightly undulating, distinctly concave as a whole; sides parallel; marginal groove complete, rather indistinctly punctured in front; median groove complete and deep. *Prothorax beneath* much as in the following species. *Scutellum* smooth; *mesothoracic episterna* punctured above (rather sparsely except close to upper margin), smooth below and behind; mesosternum smooth and polished throughout. *Metasternum* faintly ridged in middle line, lateral areas somewhat broader behind than in front; lateral and anterior intermediate areas finely (but not very closely) punctured and hairy, the rest smooth and polished. Second *abdominal sternum* somewhat rugose between posterior coxae and along middle of extreme posterior margin; succeeding abdominal sterna polished throughout. *Elytra* unpunctured except in the grooves. *Tibiae* of second legs armed with a small spine on the outer side about two-thirds down, those of the third pair with this spine obsolete.

Genus CERACUPES, Kaup.

Ceracupes fronticornis (Westwood).

Pl. xi, fig 12.

Regd. No. $\frac{6129}{20}$ Gopaldhara, Rungbong Valley, Darjeeling District. H. Stevens (coll. W. K. Webb).

Description.—Length 22·5 mm. Differs from *C. austeni* in the following respects only. Anterior margin of *mentum* not prominent in middle line, without marginal groove. Central tubercle of *head* broader above, broadly bifid at apex; external angle of canthus less acute, containing slightly more than 90°.

Ceracupes austeni, Stoliczka.

Pl. xi, figs 11–11*a*.

Regd. No. $\frac{6358}{14}$ $\frac{8417}{18}$	Dafla, Camp 9	}	H. H. Godwin-Austen.
,, $\frac{6356\text{-}7}{14}$ $\frac{8418}{18}$	Dikrang Valley		
,, $\frac{6361}{14}$ (*type*) [1]	Naga Hills		
,, $\frac{6352\text{-}60}{14}$	Manipur		

Description.—Length 20–25 mm. *Labrum* approximately rectangular, transversely ridged behind a concave anterior portion which faces forwards and upwards and is fringed, but not itself covered, with long brown hair. Upper tooth of *mandibles* very long, straight, slender, bluntly pointed distally, flattened and rugosely striate above and on inner side, at least twice as long as terminal part of mandible, and often

[1] This specimen seems to have been entered in our register originally under the No. $\frac{3482}{1}$, and subsequently to have been entered again under a fresh number.

three or four times as long; terminal portion of mandible curved inwards; middle tooth somewhat the largest, and lowest somewhat the smallest, of the three terminal teeth; anterior lower tooth of right mandible slenderer than that of left, both L-shaped in section with the short limb in front and the long one below. *Mentum* thick in front, with vertical or bilaterally excavate anterior face slightly prominent in middle line; anterior margin as seen from below bordered by a distinct groove. *Head* above smooth and polished; central tubercle very large, directed forwards, confluent with anterior margin, about equal to upper teeth of mandibles in length, flattened on either side and above, upper margin S-shaped in profile, being convex (and usually very obtusely angular) behind and concave in front, long narrow postero-dorsal surface granular, antero-ventral surface flat and very strongly granular except immediately below the tip which is smooth. Supra-orbital ridges tooth-like, apical angle 60°-90°, ridges not extending forwards as far as anterior angles of head which contain about 120° each. External angle of canthus prominent, rounded, somewhat less than 90°. *Pronotum* polished; anterior margin slightly sinuate in the middle; lateral angles prominent; sides straight, slightly divergent; posterior angles strongly rounded; posterior margin somewhat convex; marginal groove punctured throughout, more or less incomplete in middle-line, anterior transverse portion broader than the rest; median groove present, very pronounced; lateral scars usually ⁹-shaped, but somewhat variable, usually punctured, a few additional punctures present a little above and in front of them. *Lateral plates* of lower surface of prothorax punctured and more or less hairy in front of the coxal cavities, smooth and hairless behind. *Scutellum* more or less finely and sparsely punctured in front, otherwise smooth and polished. *Mesothoracic episterna* punctured throughout. *Mesosternum* with strong median concavity behind, whose sides may be raised into ridges further forwards; punctured in front on either side of middle-line and beside lateral sutures, the rest of the surface being polished and smooth, or slightly rough in parts. *Metasternum* with central area not defined except near posterior margin, and there but vaguely; anterior intermediate areas closely punctured; lateral areas rough, narrow throughout; central area and posterior intermediate areas smooth and polished. Posterior parts of hind *coxae* and scars of *abdominal sterna* (including almost the whole of the second sternum) roughened or indistinctly punctured. *Tibiae* of middle legs with 1–3 spines on the outer side before the apex, those of the hind legs with at most one such spine. All furrows of *elytra* distinctly punctured, ribs unpunctured.

Subfamily *PLEURARIINAE*.

Genus **PLEURARIUS**, Kaup.

Pleurarius brachyphyllus, Stoliczka.

Pl. xi, figs. 13–13*a*.

Reg. No. $\left\{\frac{1917.\ 6585}{1\text{–}14}\ (paralypes)^1\right\}$ S. India { Beddome. Stoliczka. ? Madras Museum.

[1] Here again it is evident that the original numbers have been lost at some time and replaced b

Regd. No. $\frac{1903\text{-}7}{19}$	Puddutottam, Anamalais, 4200 ft.	In rotten wood.	T. Bainbrigge Fletcher.
,, $\frac{1909}{19}$	Anamalais, 4000 ft. ..		
,, $\frac{1910}{19}$	Anamalais, *a.* 5500 ft.		
,, $\frac{1908}{19}$	Kalyana, Pandal, Anamalais, 3000 ft.		
,, $\frac{6386}{14}$ (*paratype*) [1]	Nilgiri Hills		Madras Museum.
,, $\frac{8819}{18}$	Kulattupuzha, W. base of W. Ghats, Travancore		N. Annandale.

This species is represented in the collection of the Madras Museum by two specimens from the timber forest, Cochin State; and in that of the Bombay Natural History Society by a specimen from Palur presented by G. Lund. Whether the latter record refers to the town of that name situated in Arcot or in Chingalpat it appears to be the most easterly yet made.

Description.—Length 35·5–45 mm. *Labrum* transverse; usually asymmetrical, the left angle being slightly more prominent than the right; anterior margin slightly concave. *Mandibles* with upper tooth obsolete; anterior lower tooth longitudinally constricted before and behind, and bifid at the tip, that of the left mandible being larger and that of the right mandible smaller than the tooth in front of it. *Mentum* finely punctured in posterior angles and beside posterior end of broad median groove; the rest coarsely punctured. Anterior margin of *head* usually almost imperceptibly asymmetrical, the left outer tubercle being more or less distinctly longer than the right; apex of both these tubercles simple in profile; marginal groove only present between the tubercles; supra-orbital ridges strongly peaked, broadly rounded behind the peaks, and slightly hollowed in front of them, the outer margin of the hollow extending on to the slightly prominent anterior angle of each side of the head; anterior angles situated about as far from outer tubercles as these are from one another, each containing about 120°; external angle of canthus containing about 90°; parietal ridges broad, extending straight outwards or slightly forwards. *Pronotum* rectangular or with sides slightly diverging behind; median and marginal grooves incomplete in front, latter not quite meeting former behind; scars small and unpunctured. *Lateral plates* of lower surface of prothorax smooth and hairless in front and behind, closely punctured and very hairy between. *Scutellum* smooth, with a few fine

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new ones, for the numbers under which specimens seen by Stoliczka are entered in the register are $\frac{9316\text{-}7}{1}$ ("named by Dr. Stoliczka and Mr. J. Wood-Mason"), $\frac{9453}{1}$ and $\frac{9457}{1}$ (both from "Dr. Stoliczka's Type collection"). Of these four numbers only one has been found. No. $\frac{8818}{18}$ bears a locality label in Stoliczka's writing which probably indicates its identity with No. $\frac{9316}{1}$ which was presented by Stoliczka. No. $\frac{6386}{14}$ bears an identification label written by Stoliczka with a record that it was presented by the Madras Museum, and is presumably the specimen originally numbered $\frac{9457}{1}$. And No. $\frac{6385}{14}$, which bears Stoliczka's identification label but no record of the donor, is presumably the same as No. $\frac{9453}{1}$. This last specimen has been listed in the new register with the preceding specimen, and both have been entered as presents from the Madras Museum.

[1] See footnote on previous page.

scattered punctures; *mesothoracic episterna* punctured above and along anterior margin; *mesosternum* without scars, finely and more or less extensively striato-punctate and sometimes hairy in front, punctured and hairy in lateral angles, otherwise smooth or transversely (more rarely longitudinally) wrinkled. *Metasternum* with central area more or less well, lateral areas ill, defined; latter very broad, often almost touching former; central and posterior intermediate areas smooth and polished; anterior intermediate and lateral areas punctured and hairy. Anterior margin of posterior part of hind *coxae* depressed and roughened, *abdominal sterna* and rest of hind coxae smooth. *Elytra* hairless, innermost groove of each almost entirely smooth, remaining grooves strongly punctured.

Habits.—Dr. Annandale informs me that this species is probably not gregarious. Mr. Bainbrigge Fletcher sent me specimens apparently obtained together with colonies of *Basilianus*, but he did not get many so probably they were living singly or in pairs with the other species.

Subfamily *ACERAIINAE.*

For the classification of this subfamily which is adopted here see Appendix I (below, p. 316).

Genus TIBERIOIDES, Gravely.

Tiberioides kuwerti (Arrow).

Pl. xi, fig 14.

Regd. No.	$\left(\frac{9163}{1}\ \frac{9302\text{-}3}{1}\right)$ $\left(\frac{9164}{1}\ \frac{6143}{14}\ \frac{9475}{18}\right)$	"Sikkim"	Stoliczka bequest, J. Wood Mason, etc.
,,	$\frac{1702}{19}$	Peshoke, Darjeeling District, *a.* 3000 ft.	F. Hannyngton.
,,	$\frac{6133\text{-}4}{14}\ \frac{6147}{14}$	Manipur	H. H. Godwin-Austen.

Description.—*Length* 36–44 mm. *Labrum* as long as or somewhat longer than broad; sides straight, parallel; anterior margin concave; angles rounded, left one frequently somewhat sharper and a little further removed from deepest point of concavity than right one. *Mandibles* with upper tooth very feebly developed, anterior lower tooth consisting of a small anterior conical portion (that of the left side being truncate and that of the right pointed) and a still less prominent posterior portion. Anterior margin of median part of *mentum* with slight (often almost imperceptible) hollow in middle; lateral parts punctured evenly all over as a rule. Upper surface of *head* roughened, central tubercle extending back as a low mound between, and sometimes not clearly separated from, low rounded parietal ridges which extend outwards and are scarcely if at all crested. Inner tubercles almost equidistant from each other, from outer tubercles, and from central tubercle; ridge joining inner tubercles to each other and to outer tubercles forming single continuous curve when viewed from above. Outer tubercles with two widely separated rectangular apices one above the other. Supra-orbital ridges very broad and smoothly rounded behind, not peaked, hollowed out in front so that each forms two narrower divergent ridges of which the outer one extends to the anterior angle of the head. Anterior

angles of head each of about 120°; canthus rounded at its extremity. *Pronotum* with a fine marginal groove on each side which does not extend upwards much beyond the angles either before or behind; median groove obsolete or absent; scars usually small, almost or entirely unpunctured, other depressions sometimes present above, both in front of, and behind them. *Lateral plates* of under side of prothorax as in preceding species. *Mesothorax* polished above, but dull below; scutellum smooth; episternum with normal oblique band of punctures. Mesosternum with or without very indistinct scars. *Metasternum* with central area distinct, vaguely grooved in the middle line, more or less distinctly in contact with smooth, strongly defined, oblique ridges bounding lateral areas; lateral and anterior intermediate areas rugosely punctured and hairy; posterior intermediate areas polished, more or less scarred by large punctures in places especially on the inner side in front Posterior margin of hind *coxae* finely, often indistinctly, punctured and hairy. Second *abdominal sternum* irregularly marked with indistinct coarse punctures; succeeding sterna smooth. *Elytra* flattened above, hairless; lateral grooves much wider than ridges between them, their regularly arranged punctures drawn out into transverse furrows; dorsal grooves normal, two or three innermost on each side unpunctured at least in front.

Tiberioides austeni, n. sp.

Pl. xi, figs. 15–15*a*.

Regd. No. $\frac{6445}{14}$ $\frac{6446}{14}$ (*type*)	Dafla Expedition	H. H. Godwin-Austen.
,, $\frac{6448}{14}$	Dikrang Valley[1]	H. H. Godwin-Austen.
,, $\frac{3170\text{-}1}{19}$	Kalek, Abor Country, 3800 ft., 29-xii-11	S. W. Kemp.

Description.—Length 41–47 mm. This species differs from the last in the following characters only. *Antennae* more massive. Upper tooth of *mandibles* more strongly developed, especially that of the left side. *Mentum* with anterior margin of median area evenly convex or a little prominent[2] (never excavate) in the middle, extreme anterior angles of lateral areas smooth and unpunctured. *Head* with inner tubercles larger and thicker and directed more definitely forwards; ridge joining them to outer turbercles also stouter, not forming so continuous a curve with ridge joining them to one another; distal margin of outer tubercles of Abor specimens slightly convex as seen from side instead of concave. Punctures of *mesothoracic episternum* extending further into upper front angle as in *Pleurarius brachyphyllus*; *mesosternum* with very distinct scars which are broad in front and taper out behind. Hind *coxae* unpunctured; second *abdominal sternum* somewhat smoother; *elytra* with grooves uniformly narrow and punctured both above and at the sides.

Habits.—Mr. Kemp informs me that the two specimens of this species that he

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[1] This label bears also the word "Nanang's."

[2] This prominence may be indistinctly marked off by a vague groove behind (No. $\frac{6445}{14}$ shows this best among our specimens) and such specimens form a natural transition to the aberrant "*Chilomazus*" *borealis*, Arrow (1907, pp. 467-8), from the Naga Hills.

found, were living deep down in a very hard dry log on a steep hill-face that had been cleared by the Abors for cultivation.

Genus EPISPHENUS, Kaup.

Episphenus moorei, Kaup.

Pl. xi, fig. 16–16*a*.

Regd. No. $\frac{8847}{18}$ Ceylon H. Nevill.

A specimen in the collection of the Bombay Natural History Society is labelled "Nitre Cave," but the whereabouts of the cave is not recorded.[1] This and No. $\frac{8847}{18}$ are the only two specimens of this species I have seen.

Description.—Length 31–32 mm. *Labrum* broader than long, anterior margin straight or faintly concave, very slightly oblique, sides straight or slightly curved, angles rounded, the left one being somewhat sharper than the right. *Mandibles* with upper tooth distinct but very small; anterior lower tooth conical, simple on both sides, that of the left side a little larger than that of the right. *Lower* anterior margin of central part of *mentum* strongly convex, whole surface elevated in front in middle line, but not separated by groove from surrounding surface. *Head* smooth or with extremely fine microscopic punctures, except between outer tubercles, where it is marked with large, but somewhat indistinct punctures. Apex of outer tubercles as seen from side vertically truncate, but scarcely forked; ridges connecting inner and outer tubercles defined on outer side by strong groove. Central tubercle extending backwards between parietal ridges, which extend outwards and, like the supra-orbital ridges, are more distinctly crested than in the preceding species though less so than in *E. comptoni*, apical angles of supra-orbital ridges about 120°, ridges hollowed in front as in preceding genus, but less distinctly so, the inner wall of the hollow being almost obsolete though somewhat more distinct than in the following genus. Anterior angles of head slightly more than 120°; canthus rounded at its extremity. *Pronotum* smooth, polished, marginal groove fine, incomplete across middle-line both before and behind, median groove complete or obsolete in front; scars small, linear, indistinctly punctured, nearly vertical. *Prothorax beneath* as in preceding species *Scutellum* smooth and polished. *Mesothoracic episterna* punctured beside anterior margin below, and beside oblique dorsal margin, these two patches of punctures sometimes joined by an oblique sparsely punctured band. *Mesosternum* with anterior angle finely striatopunctate and clothed with short decumbent hair, except on a wider or narrower area in the middle-line which is hairless, smooth and polished; this smooth median area continuous behind with a highly polished keel, which in the Indian Museum specimen is surmounted by a fine Y-shaped crest, but in the specimen belonging to the Bombay Natural History Society is broader, flatter, and very faintly hollowed in the middle line; keel (in both specimens) bordered on either side by the anterior extremities of a pair of broad, shallow, finely

[1] Presumably the specimen is from Ceylon where, Mr. Green informs me, "the Nitre Cave district is away beyond Dumbara and varies in altitude from about 1800 to 3000 ft."

roughened scars; surface of mesosternum bordering these scars on inner side very highly polished, remaining triangular portion behind and between them finely roughened. *Metasternum* with central area clearly defined, widely separated from lateral areas, which are almost parallel-sided and rather narrow; lateral and anterior intermediate areas closely punctured and hairy; posterior intermediate areas divided diagonally into an inner posterior very coarsely punctured part and an outer anterior smooth or very sparsely and more finely punctured part, hairless except along the closely but more finely punctured posterior margin. Posterior parts of *hind coxae* and scars of *abdominal sterna* closely and finely punctured. *Elytra* hairless, entirely smooth with exception of grooves, which are all of equal width and of which the outer ones are clearly punctured.

Episphenus pearsoni, n. sp.

Pl. xi, fig 17.

Regd. No. $\frac{1911}{19}$ (*type*) Bulutota,[1] Ceylon (May 1907) Colombo Museum.

I have also examined two specimens from the same locality which remain in the Colombo Museum collection.

Description.—Length 31·5–33 mm. Differs from *E. moorei* in the following respects only: profile of outer tubercles rounded at apex; ridges on *head* between inner and outer tubercles very fine, not bordered by definite grooves, while a pair of transverse grooves lying between the inner tubercles and the more distinctly peaked angles of the supra-orbital ridges are very distinct; lateral areas of *metasternum* distinctly broader behind than in front; outer part of posterior intermediate areas less sparsely punctured; posterior parts of *hind coxae* and scars of *abdominal sterna* scarcely punctured.

Episphenus comptoni, Kuwert.

Pl. xi, figs. 18–19*a*.

1. E. comptoni, Kuwert, s. str.

Regd. No. $\frac{9478}{18}$ Hakgala,[2] Cent. Prov., Ceylon E. E. Green.

,, $\frac{3307\text{-}8}{16}$ Ceylon British Museum.

The Bombay Natural History Society's collection includes a specimen from Haputale, Ceylon.

Description.—Length 39–42 mm. Anterior margin of *labrum* strongly concave, sides parallel or slightly convergent behind, angles round, left one usually somewhat more prominent and sharper than right. *Mandibles* with upper tooth obsolete; anterior lower tooth much reduced, consisting of a small conical projection on left

[1] Mr. Green has obtained for me from the Surveyor-General the following information as to the whereabouts of this locality: "Bulutota is situated on the Pelmadulla Road, 10 miles beyond the Rakwana Rest House in Kolonna Korale, Ratnapura District, Province of Sabaragamuava. The altitude is not recorded, but is I believe about 4000 ft."

[2] Mr. Green informs me that the altitude of the Hakgala Botanical Gardens is 5500 ft.

side and a larger blunter projection on right, from each of which a low ridge extends backwards toward middle lower tooth, this ridge elevated in about the middle of its length to form an additional very blunt tooth on left side but not on right. *Mentum* as described in definition of *Chilomazus* (p. 196). *Head* polished, punctured in front of and behind parietal ridges. Left outer tubercle slightly more prominent than right; profile of former obliquely, of latter almost vertically truncate at apex; ridge connecting outer and inner tubercles not defined by a groove parallel to it. Parietal ridges sharply crested, their crests more or less distinctly continued on to sides of central horn; supra-orbital ridges also very sharply crested, crest continued along outer limb of anterior fork which descends abruptly at angle of somewhat over 120°, inner limb of fork rudimentary or absent. Anterior angles of head approximating to 120°, but not altogether constant; canthus rounded at its extremity. Frontal area somewhat variable in form, the frontal ridges being to a variable extent oblique and S-shaped, while the transverse ridge between the inner tubercles is either concave, straight or prominent in the middle. *Prothorax* as in *Episphenus moorei*, but frequently with a group of strong punctures at upper end of scar on each side of pronotum; lateral plates of lower surface not quite so perfectly smooth in front. *Scutellum* indistinctly punctured in anterior angles, often obscurely grooved in middle line in front, posterior angle smooth. *Mesothoracic episterna* punctured above and along extreme anterior margin; below smooth, or obscurely punctured in posterior angles. Scars of *mesosternum* small, the rest of this plate more or less polished, and as a rule finely punctured either in lateral angles, in middle or throughout; other variable markings sometimes present. *Metasternum* as in *Episphenus pearsoni*, but with lateral areas as a rule still further enlarged behind. *Hind coxae* and scars of *abdominal sterna* almost smooth. Grooves of *elytra* normal, punctured; shoulders slightly hairy.

2. E. COMPTONI var. FLACHI (Kuwert).

Regd. No. $\frac{1912}{19}$ (13 spirit specimens).	Patipolla, *a.* 6000 ft., Cent. Prov., Ceylon, in rotten wood (13-15-x-1911)	N. Annandale.
,, $\frac{1913\text{-}14}{19}$ $\frac{3737\text{-}38}{19}$ (pinned).		
,, $\frac{9479\text{-}80}{18}$ $\frac{9483}{18}$	Patipolla, *a.* 6000 ft., Cent. Prov., Ceylon; in rotten wood (first week in July, 1910)	F. H. Gravely.
,, $\frac{9481\text{-}2}{18}$	Ceylon	H. Nevill.

Mr. Green's collection contains specimens from Hakgalla and Namunakuli Hill.

Description.—Length 32–37 mm. Not otherwise different from the typical form. In No. $\frac{9483}{18}$ the process of the lower lip by which the genus is distinguished is paired instead of single. In the absence of any other distinguishing characters, however, I feel unable to regard this as more than an abnormality.

Habits.—These insects live in galleries under the bark of fallen and decaying tree-trunks. Dr. Annandale tells me that the natives at Patipolla say that they live in pairs; but, as they are gregarious, satisfactory proof of this is not very easily

obtained. He noticed that no larvae or pupae were to be seen at the time of year in which he was at Patipolla (middle of October), but that some of the adults were brown in colour and had apparently not been long hatched.

3. E. COMPTONI, var.

In a series of three specimens from Bulutota which are preserved in the Colombo Museum collection only one agrees in size with either of the preceding forms. This is equal to the largest specimen I have seen of *E. comptoni* var. *flachi* from Patipolla. The other two are very unequal in size, and the larger of them is much smaller than the smallest specimen of the series from Patipolla. Until a larger series is available it is impossible to be certain how these Bulutota specimens ought to be regarded, but it is probable, I think, that the species *E. comptoni* will eventually be found to vary in size in the same manner as *Episphenus indicus* and certain other species (see below, p. 262), and that even var. *flachi* will prove to be unworthy of a distinct name[1].

Episphenus indicus, Stoliczka.

Pl. xi, figs. 20–20*b*.

Regd. No.	9349/1 9465/1 9472/1 (*all paratypes*)	S. India.	F. Stoliczka, etc.
,,	8802-3/4	Trichinopoly	Father Honoré.
,,	2809-1/19	N. Kanara	H. L. Andrewes[2].
,,	5767-5770/15 2812-5/19	Nilgiris	Director, Forest School, Dehra Dun; H. L. Andrewes
,,	1573-5/5	Ootacamund	Col. Beddome.
,,	1929/19	Anamalais, S. India, *ca.* 5000 ft., 21-i-12	T. Bainbrigge Fletcher.
,,	1930/19 1932-5/19 1940/19 1945/19 1947/9	Anamalais, 4000 ft., 23-i-12	In rotten logs. T. Bainbrigge Fletcher.
,,	7498/19	Anamalais, *ca.* 5000 ft., 21-i-12	
,,	1938/19	Anamalais, *ca.* 5500 ft., 21-i-12	
,,	1931/19 1936-7/19 1939/19 1941/19 1944/19 1945/19 1949-50/19	Puddutottam, Anamalais, 4200 ft., 22-i-12	
,,	1942/19 1948/19	Kalyana, Pandal, 3000 ft., 25-i-12	T. Bainbrigge Fletcher.
,,	1943/19	Monica Estate, Anamalais, 4000 ft., 24-i-12	T. Bainbrigge Fletcher.
,,	7497[3]/19	Bababudin Hills, Mysore, 4000–5000 ft., 2-12-x-12	T. Bainbrigge Fletcher.
,,	9658/18	High Range, Travancore, May, 1891	Pusa Institute.

[1] Collected by T. R. Bell.

[2] This has since been confirmed: see below, p. 281.

[3] Adults and larvae in spirit.

There are two specimens from Cuddapah (Madras Presidency), and two from Gudalur (Nilgiris), as well as several from the Anamalais, in the collection of the Bombay Natural History Society; one from Naduvatum (Nilgiris), 7000 ft., in the collection at Dehra-Dun; and Mr. H. F. Andrewes' splendid series of this species includes specimens from the Nilgiris, the Anamalais, Madura, and N. Canara. I have examined altogether 119 specimens in drawing up the following description of this variable species.

Description.—Length 25–41 mm. *Labrum* hairy, about as long as broad, sides parallel or slightly convergent behind, angles rounded, the left usually somewhat narrower and more prominent than the right, anterior margin concave. *Mandibles* with anterior margin of upper tooth (which tooth is usually more or less distinctly bifid at its apex) distinct, vertical, more strongly developed on left side than on right; two upper terminal teeth strongly developed on both sides, the lowest of the three set further back, smaller than the other two especially on the right side, on left side often fused at base with anterior lower tooth; right anterior lower tooth somewhat variable in size, always much smaller than anterior lower tooth of opposite side, sometimes absent, this variation not clearly correlated with size of specimen, and apparently inherent to some extent and not due entirely to friction. *Mentum* with anterior margin sunk, very variable; hind wall of depression very sharply defined, occasionally straight or almost straight, more usually produced in the middle-line to form an angular prominence which is often joined by a median ridge to the anterior margin which may or may not be raised up to form a low rounded transverse ridge. *Head* more or less smooth and polished, sometimes punctured in front of outer ends of parietal ridges; parietal ridges crested, more or less arcuate, directed outwards; frontal area somewhat variable in form, more or less semi-lunar; inner tubercles distinct, but short and stout. Left outer tubercle directed inwards, outer margin straight or very slightly convex; ridge from left inner tubercle directed forwards or slightly outwards at base, but quickly curving inwards to run parallel to inner margin, distinct throughout whole or almost whole length of tubercle; apex of tubercle bluntly rounded or truncate. Right outer tubercle acute as seen from above (in fresh specimens) and directed forwards, vertically truncate or imperfectly forked as seen from the side; supra-orbital ridges more or less crested behind, slightly peaked, outer wall of anterior excavation making with posterior part an angle of not less than 120°, often nearer 180°; inner wall well-developed, indistinct, or absent. Anterior angles of head prominent, especially in small specimens, varying in size from about 60° in the smallest to over 90° in the largest specimens, apt to be worn down to an angle of about 120° which is scarcely if at all prominent. Hollow between inner tubercles and supra-orbital ridges crossed by a transverse groove of variable depth and distinctness. *Pronotum* with marginal grooves incomplete across middle before and behind, more or less punctured especially in small specimens; scars small, inconspicuous and little if at all punctured in large specimens, strongly punctured in small ones; sides of pronotum free from conspicuous punctures in large specimens, more or less punctured in anterior angles and in front of scars in smaller ones, more exten-

sively punctured in the smallest of all; median groove often stronger in middle than at either end, probably always complete in unworn specimens. *Prothorax beneath* as in *Episphenus comptoni*; posterior area of prosternum very rarely bearing long erect hairs. *Scutellum* either smooth or finely and indistinctly punctured laterally, pubescent striato-punctate area beside middle of anterior margin usually prolonged backwards as a more or less distinct double band of sparcer puncturing and pubescence. *Mesothoracic episterna* polished and punctured above and in front, finely roughened across posterior angles. Surface of *mesosternum* of somewhat variable texture; scars finely roughened, occasionally with a few large indistinct punctures, narrow or broad, well or ill defined. Central area of *metasternum* large and as a rule very clearly defined, with or without one or more depressions (varying in arrangement and distinctness) near hinder margin, and a large median circular depression in front; lateral areas narrow, either parallel-sided or very nearly so, not in contact with central area, closely punctured and hairy (usually very hairy especially in front, occasionally almost hairless); anterior intermediate areas very hairy, more coarsely punctured; posterior intermediate areas strongly and coarsely punctured at least on inner side, hairless except along posterior margin where the surface resembles that of lateral areas. Posterior parts of *hind coxae* as a rule finely, scars of *abdominal sterna* more coarsely, rugose or punctured, especially in small specimens. All grooves of *elytra* of normal width; lateral grooves much more strongly punctured than dorsal ones.

Habits.—Mr. Bainbrigge Fletcher writes of the series of this and the following species that he collected in the Anamalai Hills: "They were found in small colonies in rotten logs, stridulated loudly when disturbed and seemed to congregate together under dead wood, etc. on the ground when they were dislodged from their nidus. My impression was that the stridulation served as a means for rallying them together. In many cases, but not invariably, larvae were found in the logs together with the beetles." In another letter he says, "I have not noticed any particular differences in the state of decay of logs inhabited by various Passalids. I should class them all as 'rotten.' Sometimes, whether owing to the sort of wood or exposure to sun or drought in the dry season, a log may be more or less tough, but I doubt whether you can draw any hard and fast line between tough and soft. Most of the *E. neelgherriensis* from Ootacamund were found in logs which were more or less tough (perhaps owing partly to its being then very dry weather), but specimens of the same species from the Bababudins were from rotten logs so soft that we broke them up with our hands. In the Anamalais also, where I got *E. indicus* and *Pleurarius brachyphyllus*, the logs were usually soft and quite rotten."

Episphenus neelgherriensis (Percheron).

Pl. xi, figs. 21–21*a*.

Regd No. $\frac{5515\cdot6}{16}$ $\frac{9079\cdot9680}{18}$ S. India { Col. Beddome, British Museum.

Regd. No.	$\frac{7501\text{-}8^1}{18}$	Bababudin Hills	T. Bainbrigge Fletcher.
,,	$\frac{6194}{19}$	Coorg	
,,	$\frac{9179}{1}$	Malabar	?
,,	$\frac{9882}{18}$	High Range, Travancore	Trivandrum Museum.
,,	$\frac{3469\text{-}70}{19}$	Coonoor, *ca.* 6000 ft. (Sims Park, Jungle, and Stillbrook Garden)	R. B. Seymour Sewell.
,,	$\frac{1571}{5}$	Ootacamund	Col. Beddome.
,,	$\frac{6500^1\ 6959\ 7500^1}{19\ \ 19\ \ 19}$	Ootacamund, 7500 ft. and 7800 ft., December, 1912	T. Bainbrigge Fletcher.
,,	$\frac{1915\text{-}28}{19}$	Anamalais (Kalyana, Pandal, 3000 ft.; Paralai Estate, 3600 ft.; Monica Estate, 4000 ft.; Puddutottam, 4200 ft.; *ca.* 5500 ft., in rotten wood; all January 1912)	T. Bainbrigge Fletcher.
,,	$\frac{9881}{18}$	?	?

Description.—*Length* 24–29 mm. Differs from specimens of *E. indicus* of same size in following characters only: lowest terminal and anterior lower teeth of left *mandible* always distinct at base; median keel of marginal depression of *mentum* when present usually broad and flat, wider in front than behind, not sharply defined; anterior angles of *head* of about 120°, [illegible]ver prominent; apical angle of supra-orbital ridges more pronounced; *lateral plates* of lower side of prothorax somewhat smoother and more highly polished towards the front; posterior plate of *prosternum* usually hairy, often punctured. Puncturing of *scutellum* variable in extent, but on a somewhat different plan from that usually found in *E. indicus*, the strongest punctures being found in the posterior half of the plate which is often punctured almost all over *metasternum* less markedly hairy than is usual in *E. indicus*. Posterior part of *hind coxae* smoother.

Habits.—Mr. T. Bainbrigge Fletcher tells me that "Most [specimens found at Ootacamund in December, 1912] seemed to be adult beetles *paired off* (at least, two individuals together, presumably of opposite sexes) as if just ready to start new colonies. I only got one lot of larvae. The nights up there are frosty from December to March and the weather dry, and perhaps that has some influence on the breeding season. Specimens found at lower elevations (4000–5000 ft.) where the conditions are more uniform as regards temperature and humidity do not seem to be seasonal, but apparently breed at any time, all stages being found." This species does not seem to form colonies to the same extent as the preceding, judging from what Mr. Fletcher has sent me. Capt. Sewell obtained this species from under stones in Stillbrook Garden, Coonoor; those that he obtained from wood were all in extremely rotten wood from which the bark was easily removed. For further notes on this species see above (p. 221) under *E. indicus*.

[1] A series of small colonies (adults and larvae) each in a separate tube of spirit.

Genus OPHRYGONIUS, Zang.

Ophrygonius cantori (Percheron), s. str.

1. O. CANTORI (Percheron), s. str.

Pl. xi, figs. 22–22*a*.

Regd. No.	$\frac{3742}{19}$	Lambatach, Jaunsar	Forest Research Institute.
,,	$\frac{9105\text{-}9111}{1}$ $\frac{9113}{1}$ $\frac{9115\text{-}7}{1}$ $\frac{9307\text{-}8}{1}$, $\frac{9471}{1}$, $\frac{9404}{1}$, $\frac{7072}{3}$	"Sikkim"	Stoliczka bequest, Asiatic Society's collection, etc.
,,	$\frac{7480\text{-}6}{13}$	Tista, Darjeeling District	E. P. Stebbing.
,,	$\frac{8797\text{-}8800}{14}$	Sureil, Darjeeling District	A. Alcock.
,,	$\frac{1543}{16}$ $\frac{9083}{18}$	Kurseong, Darjeeling District	E. A. D'Abreu. Museum Collector.
,,	$\frac{8130\text{-}1}{19}$	Gopaldhara, Rungbong Valley, Darjeeling District	H. Stevens (coll. W. K. Webb).
,,	$\frac{6137}{14}$	Dikrang Valley, Dafla Hills	H. H. Godwin-Austen.
,,	$\frac{7078}{3}$ $\frac{7080}{3}$ $\frac{6114}{14}$	?	E. I. Company's Museum, etc.

I have also seen specimens from the British Museum collection from Gantok, Bhutan, and Manipur.

The collection of the Imperial Forest Research Institute at Dehra Dun includes a specimen found boring in Sauer wood in the Teesta forest, and several from Lambatach in Jaunsar, Dehra Dun, the latter being the most western Himalayan record I know for any Passalid, except one of the same species in the same collection from Tehri-Garhwal—a record which, I think, may be incorrect, as this has been proved to be the case for all other Passalids recorded from the same place that I have seen.

Description.—Length 30–34 mm. Resembles both specimens of *Episphenus indicus* of similar size and *E. neelgherriensis* except in the following particulars. Anterior margin of *labrum* straighter, sometimes with suggestion of slight median convexity such as is found in *Ophrygonius inaequalis*. *Mandibles* with upper tooth somewhat less strongly developed, anterior lower tooth variable but more strongly developed on an average than in *Episphenus indicus* or *E. neelgherriensis*, never entirely absent, left lowest terminal and anterior lower teeth distinct at base as in *E. neelgherriensis*. Depression of anterior margin of *mentum* consisting of a pair of more or less separate concavities whose posterior wall is usually oblique, not vertical, the angle at which it meets the general upper surface being in consequence blunter than in either of the two preceding species. *Head* punctured and somewhat hairy between central tubercle and supro-orbital ridges, both in front of parietal ridges and behind them; parietal ridges straighter, their outer extremities usually more or less strongly directed backwards; left outer tubercle obliquely truncate, its ridge from left inner tubercle strongly marked and extending straight forwards to the acute anterior (*i.e.* outer) angle, thus giving the

whole tubercle an appearance of being pointed and directed more or less straight forwards; right outer tubercle of more or less similar (sometimes the same) shape, but shorter (although longer than in the two preceding species), apex simply pointed in profile, its ridge from inner tubercle directed slightly outwards; no transverse groove between inner tubercles and supra-orbital ridges; supra-orbital ridges with more or less peaked apical angle of about 120°, inner wall of anterior excavation very rarely suppressed; anterior angles of head containing about 120°, not prominent. *Pronotum* almost invariably punctured and hairy to some extent in the posterior angles and on the sides, *prothorax* beneath much as in *Episphenus neelgherriensis*. *Scutellum* entirely smooth, hairless, unpunctured, and highly polished with exception of usual patch in middle of anterior margin; *mesothoracic episterna* polished throughout, punctured above and close to anterior margin; *mesosternum* smooth and highly polished throughout or matt in the lateral angles[1], scars entirely absent or (rarely) indicated by a pair of slight depressions of the usual shape in the usual position *Metasternum* with central area very vaguely defined; posterior intermediate areas unpunctured except along posterior margin; lateral areas broadened behind by the curvature of their inner borders. *Abdominal sterna* and posterior parts of *hind coxae* as in *Episphenus neelgherriensis*, often still smoother. *Elytra* with small tuft of hair at shoulders, grooves more weakly punctured throughout.

2. O. CANTORI, subsp. CONVEXIFRONS, Zang.

Regd. No.	$\frac{98.88-90}{18}$	Khasi Hills, Assam	H. H. Godwin-Austen.
,,	$\frac{98.81-7}{18}$	Teriaghat, Khasi Hills	H. H. Godwin-Austen.
,,	$\frac{98.1}{18}$	?	?

In the British Museum collection there are two specimens from the Ruby Mines District of Burma.

Description.—Length 27–29 mm., otherwise as in *O. cantori*, s. str. The difference in size is an extremely small one, but appears to be constant in specimens from the Khasi Hills and Burma. One of the specimens from the Ruby Mines has the mentum sculptured almost as in the following sub-species.

3. O. CANTORI, subsp. DUNSIRIENSIS, n. var.

Pl. xi, fig. 23.

Regd. No.	$\frac{98.92}{18}$ (*type*) $\frac{98.93-5}{18}$	Dunsiri Valley, Assam	H. H. Godwin-Austen.

Description.—Length 28–31 mm. Resembles the two preceding forms in all respects except the following: posterior wall of depression of anterior margin of central part of *mentum* continued straight outwards for a short distance on to surface of lateral areas, then turned suddenly backwards, extending more or less distinctly to posterior lateral angles, this final portion of the wall being occasionally so formed as to produce a false superficial semblance of the scars found in the genus *Macrolinus*.

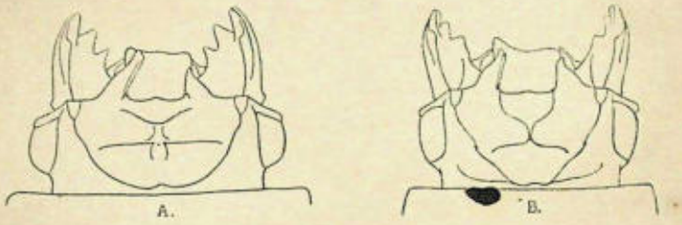
[1] Apparently always polished throughout in Darjeeling specimens.

Ophrygonius birmanicus, n. sp.

Text-fig. 3A.

Described from a single specimen from the Ruby Mines District of Burma, preserved in the British Museum collection.

Description.—Length 35 mm. Differs from *O. cantori* in the following characters only. Lamellae of *antennae* somewhat longer (but the first two not as long as the last four). Anterior lower tooth of both *mandibles* rather small but very sharply pointed. Left outer tubercle of *head* very slender, almost parallel-sided, simply truncate distally, directed very distinctly inwards. Scars and lateral angles of *mesosternum* matt. Posterior intermediate and lateral areas of *metasternum* less distinct from one another behind, the puncturing of the latter extending a little distance over on to the surface of the former; posterior parts of *hind coxae*, and scars of *abdominal sterna*, scarcely as smooth.



Text-figure 3.

A. *Ophrygonius birmanicus*, head × 4.
B. *Ophrygonius singapurae*, head × 4.

Ophrygonius singapurae, n. sp.

Text-fig. 3B.

Described from a single specimen from Singapore in the collection of the Königliches Zoologisches Museum in Berlin.

Description.—Length 31 mm. This interesting species is closely allied to the preceding, with whose characters it combines some of those of *Ophrygonius inaequalis* on the one hand, and of *Aceraius wallacei* on the other. The lamellae of the *antennae* are all very long and slender as in *A. wallacei*. The lowest terminal tooth of the *mandibles* is probably well-developed on both sides in fresh specimens, as is usual in this genus; but that of the right side is very obtuse (probably through friction) in the specimen before me; the anterior lower tooth of both mandibles is very broad, and flattened dorso-ventrally, resembling that of the left mandible of most species of *Aceraius*, though the horizonal margin is scarcely grooved. The *mentum* resembles that of *Ophrygonius inaequalis*. The *head* bears distinct, finely keeled, frontal ridges (not grooves) as in *O. inaequalis;* the left outer tubercle is intermediate in form between that of *O. cantori* and *O. birmanicus*; the parietal ridges are somewhat short; the supra-occipital ridge is united to the supraorbital

ridges as usual, but is also continued outwards behind them as in specimens of the sub-family Macrolininae—I know of no other species of Passalid in which this occurs. The sides of the *pronotum* are closely punctured below the scars throughout their whole length; the *lateral plates* of the ventral side of the prothorax are somewhat rougher and more punctured in front than in *O. birmanicus*, which this species resembles in all other respects.

Ophrygonius inaequalis (Burmeister).

Pl. xii, fig. 24–24*a*.

Regd. No.	9120 1; 9122-4 1; 9311-3 1; 9519 1; 9750 19	Malacca	Stoliczka bequest.
,,	4486 10	Perak	Moti Ram.
,,	6441 14	Johore	?
,,	6439-40 14; 9672-6 18; 9861 18	Sinkep Island	Moti Ram.

Description.—Length 24–27 mm. Lamellae of *antennae* (very short: only four of them pubescent. *Labrum* hairy, but very sparsely punctured; sides slightly convergent behind; angles rounded, left one sometimes very much drawn out; anterior margin concave on both sides, convex in middle. *Mandibles* with upper tooth obsolete on both sides; anterior lower tooth acutely conical (very sharp when unworn), that of left side larger than that of right. Depression of anterior margin of median part of *mentum* extensive, middle part of its posterior wall bent forwards to form an angular prominence dividing depression into two more or less completely separated halves. *Head* polished, but somewhat roughened or punctured in front and at sides of (more rarely within) frontal area, and sometimes about the middle-line behind central tubercle; parietal ridges directed outwards, straight or somewhat S-shaped, usually defined in front by a groove; keels of parietal and frontal ridges (latter sometimes coalescent behind) strongly developed, continued to meet one another at apex of central tubercle; frontal ridges so widely arched (even angular in some specimens) as to be parallel or convergent in front; inner tubercles indistinct, situated at base of inner side of outer tubercles; margin of head between outer tubercles vertical, slightly (often very indistinctly) convex in middle; left outer tubercle very broad and more or less inwardly directed at base, then abruptly narrowed from the outer side and turned more forwards, bluntly rounded at the tip; ridge from left inner tubercle straight and directed vertically forwards at the base, curving inwards distally only where it has become faint; right outer tubercle somewhat long, pointed as seen both from above and in profile, apex directed forwards and a little outwards; supra-orbital ridges broadly rounded, not keeled behind, in front excavate, descending abruptly at an angle of about 120° which is slightly peaked, the two walls of the excavation keeled, outer one somewhat concave above forming with anterior angle of head, an upwardly-directed tooth; anterior angle of head containing somewhat more than 120°, canthus vertically truncate at its extremity. *Pronotum* polished,

marginal groove incomplete across the middle both before and behind, its anterior extremities merged in a pair of somewhat triangular strongly punctured areas, behind each of which a more or less definite band of punctures extends back parallel to the sides, crossing in their course the upper parts of the two scars, which are also thickly punctured. Median groove very distinct, almost invariably complete. Punctures and hair on *lateral plates* of lower side of prothorax somewhat sparser than in *O. cantori*; posterior plate of *prosternum* with a few hair-bearing punctures, anterior plate unusually hairy. *Scutellum* striato-punctate and pubescent beside greater part of anterior margin, punctures continued backwards on either side of middle line about half way to posterior margin; otherwise smooth and polished. *Mesosthoracic episterna* polished and punctured above and along anterior margin, dull and unpunctured in posterior angles. *Mesosternum* striato-punctate in extreme anterior angle; scars dull, small, but continuous behind and on the inner side with a dull and finely punctured area occupying the whole of the lateral angles; the rest highly polished. *Metasternum* with lateral areas rough, slightly hairy in front, very narrow, parallel-sided or nearly so; central area extensive, badly defined; anterior intermediate areas somewhat hairy, but rather indistinctly punctured; posterior intermediate areas completely or very incompletely covered with sparsely or rather thickly scattered strong punctures, which are thickest close to the posterior margin. Posterior parts of *hind coxae* somewhat, scars of *abdominal sterna* strongly and extensively, roughened or finely punctured. Lateral grooves of *elytra* wide, with more or less transversely linear punctures[1], dorsal grooves normal; shoulders slightly hairy.

Genus ACERAIUS, Kaup.

Aceraius wallacei (Kuwert).

Pl. xii, figs. 26–26*b*.

Regd. No. $\frac{2826}{19}$ Kuching, Sarawak Sarawak Museum.

The Berlin collections include specimens from the Malay Peninsula and from Mt. Kina Balu; and the Hamburg collection specimens from Somgei Lalah.

Description.—Length 32–37 mm. *Labrum* hairy, punctured, sides parallel, angles rounded, left angle more pointed but hardly more prominent than right. *Antennae* with all six lamellae pilose and very long and slender. Upper margin of *mandibles* behind upper tooth straight or slightly concave; apex of right upper tooth acute; left upper tooth acute or truncate, bent over inwards a little; horizontal groove of left anterior lower teeth very pronounced, dividing tooth into two parts of which the upper is often somewhat larger and blunter than the lower; lowest terminal and anterior lower teeth of right side very small, both dorsal and ventral portions of right anterior lower tooth distinct. Median part of *mentum* usually with sunken semi-circular area along anterior margin and three or four large punctures behind,

[1] See also below, p. 285, footnote.

the sunken area sometimes indistinct or absent. *Head* above with frontal area more or less semi-circular, more rarely triangular; ridge joining inner tubercles usually slightly convex in middle, sometimes very strongly so; left outer tubercle obliquely truncate, truncation straight or very slightly concave, both angles somewhat produced as a rule in fresh specimens; right outer tubercle not much shorter than left, but more nearly triangular, apex single in profile and very acute. *Prothorax* and *mesothorax* as in *A. borneanus* except that the pronotum is less punctured at the sides while its median groove is obsolete, and that the mesosternum is polished, throughout or nearly so, except in the long narrow scars. *Metasternum* also as in *A. borneanus* except the posterior lateral areas in which a variable number of very coarse and often somewhat elongated punctures are more or less extensively developed from in front along the inner margin. *Hind coxae* and *abdominal sterna* as in *A. borneanus*. *Elytra* not very hairy, the hair all short; tenth rib finely punctured and hairy close to shoulders, ninth rib with a few punctures scattered very sparsely along its whole length, seventh rib with or without even more sparsely scattered punctures.

Aceraius perakensis, Kuwert.

Described from three specimens from Taiping, 4000–4500 ft, and one from Mt. Singaleng; all in the collections in Berlin.

Description.—Length 38·5–42 mm. *Labrum* as in preceding species; *antennae* as in following one; left upper tooth very variable, left anterior lower tooth not so strongly divided as in preceding. *mandibles* otherwise similar; *mentum* without any anterior depression, but punctured very sparsely or not at all in middle, not so closely as in following species. Upper surface of *head* somewhat as in preceding species, but with left outer tubercle stouter, ridge joining inner tubercles concave, inner side of right outer tubercle straighter and more oblique, apex of same tubercle truncate or faintly bifid in profile, canthus usually a little swollen at base; anterior angles obtuse as in preceding species, not prominent. *Thorax*, *abdomen* and *legs* as in preceding species; *elytra* as in following.

Aceraius möschleri Kuwert.

Pl. xii, fig. 33.

Regd. No. $\frac{28.6.8.8}{19}$ Sinkep Island Moti Ram.

I have also seen a specimen in the British Museum collection from the Malay Peninsula, and one from Lingga and another from Java in the Berlin collections.

Description.—*Length* 36–42 mm. Differs from the following species only in having the anterior angles of the *head* scarcely prominent on either side[1]; and in having the apex of the right outer tubercle less bent outwards as in *A. perakensis*.

---

[1] This difference is noted by Kuwert in his brief diagnosis of 1891, but is omitted from the longer one of 1898, in which the two species are separated by the shape of the anterior margin of the labrum—a character which is always apt to vary somewhat in different specimens of a single species.

Aceraius illegalis, Kuwert, s. str.

Pl. xii, figs. 32-32*a*.

Regd. No. $\frac{9522}{1}$ $\frac{3931}{19}$ Johore J. Meldrum; ? (purchased).

I have also examined other specimens, including one from Kuching and one from between Ulu Madahit and Limbang which are preserved in the Sarawak Museum.

Description.—Length 39–43 mm. *Labrum* as in *A. wallacei*. Lamellae of *antennae* somewhat short and thick, first one pilose only round margin of anterior face. *Mandibles* as in *A. wallacei*. *Mentum* also as in that species but more closely punctured in middle. Anterior angles of *head* prominent, that of left side very slightly more so than that of right; truncation of left outer tubercle straight or only slightly concave, vertical to the two parallel sides of the process, the outer side often with a thickening which is more or less rectangular; right outer tubercle rather long, with acute undivided apex bent slightly outwards. *Prothorax* as in *A. wallacei*. *Scutellum* with the punctured area of its anterior margin apt to be carried unusually far back along the middle line; *mesothoracic episterna* and *sternum* as in *A. wallacei*, except for presence of indistinct hair-bearing punctures in posterior angles of mesothoracic episterna. Greater part of posterior intermediate areas of *metasternum* smooth and unpunctured, but with a few both of the coarse inner and fine posterior punctures always more or less distinctly present. Posterior parts of *hind coxae* dull, *abdominal sterna* polished, both smooth or very nearly so. *Elytra* somewhat sparsely covered with longer or shorter hair, seventh rib often, ninth almost always, rather sparsely punctured.

Aceraius laevicollis (Illiger).

Pl. xii, figs. 27–27*a*.

Regd. No.	$\frac{9268\text{-}70}{1}$ $\frac{3942}{19}$	Johore	J. Wood-Mason, etc.
,,	$\frac{6455\text{-}6}{14}$ $\frac{3946\text{-}59}{19}$	Sinkep Island	Moti Ram.
,,	$\frac{3269\text{-}71}{19}$	Kuching, Sarawak, Borneo	Sarawak Museum.
,,	$\frac{3268}{19}$	Limbong, Borneo	Sarawak Museum.
,,	$\frac{3951\text{-}2}{19}$	?	?

The Sarawak Museum collection includes specimens from Busa and Serai; the Berlin collections include specimens from Perak, Deli, Solok, Peinan, Nias, Lingga, Billiton, Java, Bandjermasin, Luzon and S. Palawan; and the Hamburg collection specimens from Deli, Serdang, Somgei Lalah, Tandjong and Banguey Island.

Description.—*Length* 29–34 mm. Lamella of fifth joint of *antennae* long and pilose, the fourth joint sometimes furnished with a short lamella devoid of pilosity. *Labrum* as in preceding species. *Mandibles* also as in that species except that the upper margin of the left mandible behind the upper tooth is more or less convex and usually distinctly turned over inwards. *Mentum* more or less punctured, its anterior margin often sunk on each side of a median prominence which may be more or less distinctly grooved in front in the middle line. *Head* above remarkably variable.

Anterior angles always distinctly prominent to greater or less extent, left one projecting more or less markedly further than right. Angles of truncation of left outer tubercle less produced than in *A. wallacei*; the tubercle as a whole very variable, usually much broader than in that species, though not always, and as a rule thickened near base on outer side, this thickening when unworn and very well developed rectangular as in fig. 27, but more often blunter and occasionally absent. Right outer tubercle normally short; very broadly and more or less obliquely truncate as seen from above, the truncation being sometimes slightly convex, sometimes straighter, and sometimes even sufficiently concave to produce a bidentate form, the outer and still more rarely the inner of the two denticles so formed, being occasionally produced into an acute, forwardly directed tooth. Frontal area more or less triangular. Parietal ridges perhaps inclined a little more backwards as a rule than in *A. wallacei*. Supra-orbital and supra-occipital ridges forming together an open semi-circle, the former approximately parallel to one another in front, rarely or never in the least degree convergent. *Prothorax* and *scutellum* as in *A. wallacei*; *mesothoracic episterna* with a patch of fine hair-carrying punctures in posterior angles as in *A. illegalis*; surface of *mesosternum* very variable in texture, being sometimes extensively roughened and in one specimen[1] even coarsely granular in parts; scars variable in form and definition. Posterior intermediate areas of *metasternum* as a rule more completely and evenly punctured than is usual in the genus. Posterior parts of *hind coxae* finely granular throughout; *abdominal sterna* as in preceding species. Sides of *elytra* pilose, densely near shoulders, more spacely further back where the pile is almost confined to the grooves, the ribs (except the anterior part of the tenth) being more or less completely devoid of punctures; the ninth rib more persistently punctured than any other.

Aceraius grandis (Burmeister).

1. A. GRANDIS subsp. HIRSUTUS, Kuwert.

Pl. xii, figs. 28–29.

Regd. No.	$\frac{9127\text{-}8}{1}$ $\frac{9154}{1}$	.. Darjeeling	Stoliczka bequest, J. Wood-Mason.
,,	$\frac{9259\text{-}64}{1}$ $\frac{8545}{7}$ $\frac{3277\text{-}81}{19}$	Sikkim	Dr. J. Anderson, E. T. Atkinson. L. Mandelli.
,,	$\frac{9156}{1}$ $\frac{9161}{1}$	Bhutan	?
,,	$\frac{3283}{19}$	Harmutti, Base of Dafla Hills	H. H. Godwin-Austen.
,,	$\frac{3062}{19}$ $\frac{3282}{19}$	Dikrang Valley	
,,	$\frac{9455}{1}$ $\frac{3284}{19}$	Dunsiri Valley	
,,	$\frac{3285\text{-}7}{19}$	Duffla Expedition	
,,	$\frac{2641}{5}$	N.-E. Frontier	?

[1] That from Serai in the Sarawak Museum Collection.

Regd. No.	$\frac{3210\text{-}4}{9}$	Kobo, Abor Country, 400 ft.	
,,	$\frac{3223\text{-}60}{19}$	Janakmukh, Abor Country, 600 ft.	
,,	$\frac{3263\text{-}5}{19}$ (Spirit specimens)	Rotung, Abor Country, 1400 ft.	S. W. Kemp.
,,	$\frac{3268\text{-}9}{19}$ $\frac{3274}{19}$	Upper Rotung, Abor Country, 2000 ft.	
,,	$\frac{3215\text{-}22}{19}$	Kalek, Abor Country, 3800 ft.	
,,	$\frac{1892}{5}$	Cachar	J. Wood-Mason.
,,	$\frac{9129}{1}$, $\frac{9131}{1}$, $\frac{9133}{1}$, $\frac{9249\text{-}51}{1}$, $\frac{9253\text{-}8}{1}$, $\frac{9265\text{-}6}{1}$, $\frac{3288\text{-}91}{19}$	Sibsagar	Stoliczka bequest, S. E. Peal, Moti Ram.
,,	$\frac{4144\text{-}7}{13}$, $\frac{670}{14}$, $\frac{704}{14}$, $\frac{709}{14}$, $\frac{711}{14}$, $\frac{3275\text{-}6}{19}$	Khasi Hills	Shillong Museum.
,,	$\frac{8758}{5}$ ..	.. Tavoy	Museum Collector.
,,	$\frac{3040\text{-}1}{19}$ ..	.. Between Thingannyinaung and Sukli, Dawna Hills, 960–2100 ft.	F. H. Gravely.
,,	$\frac{3039\text{-}1}{19}$, $\frac{3041\text{-}3}{19}$	.. Sukli, Dawna Hills, c. 2100 ft. ..	F. H. Gravely.

Mr. Steven's collection includes a specimen collected by Mr. W. H. Webb at Gopaldhara in the Rungbong Valley, Darjeeling District, and several from Silonbari at the base of the N. Lakhimpur Hills. The Berlin collections include specimens from Formosa (numerous localities), Hainan, S. Palawan, Tonkin, and Catchin Court. The British Museum collection includes also specimens from Sin Lum, and Cambodia.

Description.—Length 33–49 mm. *Labrum* as in *A. leavicollis*. Lamellae of *antennae* much as in *A. leavicollis* in small specimens,[1] often proportionally shorter and thicker in large ones. *Mandibles* also much as in *A. leavicollis* in small specimens, the recurved upper edge behind the left upper tooth often broader, especially in front in larger specimens, sometimes forming a stout secondary tooth in the largest of all, its outer margin concave rather than convex. *Mentum* as in *A. leavicollis*. Anterior angles of *head* much more prominent than in *A. leavicollis* in most small, but very little more prominent in most of the largest specimens, almost always directed more or less inwards in the former, in which, consequently, the supra-orbital and supra-occipital ridges together appear to enclose more than half a circle; in the latter, the area enclosed by the supra-orbital and supra-occipital ridges usually resembles almost and often quite as perfect a semi-circle as in *A. leavicollis*; left outer tubercle somewhat less variable, usually rather long and slender, parallel sided, and scarcely forked; sometimes broader and shorter; rarely with even the faintest trace of an external enlargement; right outer tubercle variable as in *A. leavicollis*, usually more pronouncedly bidentate with the two teeth somewhat nearer together; frontal area often very short and broad, especially

[1] Of these specimens only the head and prothorax, in one case together with a single elytron, were found.

[2] In one specimen from Sikkim (No. $\frac{3241}{19}$) there are only five lamellae altogether, that of the sixth segment being suppressed or possibly reduced and fused with that of the fifth. I have seen no trace of a lamella on the fourth segment of any specimen.

in large specimens. *Prothorax* and *mesothorax* as in *A. laevicollis*, but patch of fine punctures in posterior angles of mesothoracic episterna very variable and sometimes absent especially in small specimens. Posterior intermediate areas of *metasternum* marked on same plan as in rest of genus, but very variable; lateral areas very broad behind as in all the preceding species. Posterior parts of *hind coxae* often less densely granular than in *A. laevicollis*. *Abdominal sterna* as in that species. Seventh and ninth ribs of *elytra* almost always punctured throughout, usually densely in large and more sparsely in small specimens—in the smallest specimen I have seen there are very few punctures indeed on the ninth rib and even fewer on the seventh[1]; sides of elytra clothed with a more or less short[2] pile which is dense near the shoulders and sparse behind.

Habits.—Mr. Kemp tells me that this form is gregarious. It was found to be very common in the Abor country, boring in tough wood under moderately thin bark.

2. A. GRANDIS (Burmeister, s. str.).[3]

The Berlin collections include specimens from the Malay Peninsula, Bintang, Deli, Tengger Mountain, Bankalan, Bandjermasin, and N. Borneo.

Description.—Length 39–52 mm. This form and the following variety are the representatives in the Sunda Islands and Malay Peninsula, of the preceding sub-species. They cannot be very sharply distinguished either from one another or from the northern race, as all three are highly variable. In the two southern forms, however, the length of the hair on the *elytra* is more variable, and usually much longer; the seventh rib of each elytron is always unpunctured, whereas in the northern race it is almost invariably punctured, at least sparsely and often closely; and the shape of the prolongation of the left anterior angle of the *head* seems to be more constant. In the present form this angle is always at least moderately long, in large as well as in small specimens, and is always curved inwards, as in the specimen of the northern race shown in fig. 28.

3. A. GRANDIS var. RECTIDENS, Kuwert.[3]

Pl. xii, fig. 30.

The Sarawak Museum collection includes one specimen from Sarawak; and the Berlin collections specimens from the Malay Peninsula, Solok, Tebing tinggi and Java.

Description.—Length 47–54 mm. Resembles the preceding in all points except the following: upper tooth of left *mandible* always simple and acute, never bifid or with the upper margin convex and bent over inwards as it usually is in *A. grandis*, s. str. and sub-sp. *hirsutus*; prolongation of left anterior angle of *head* often moderately long, but as a rule shorter than in *A. grandis* s. str., directed forwards or slightly outwards, never curved inwards.

[1] The seventh rib is unpunctured in most of the Hainan specimens, and in occasional ones from other localities; the density of the puncturing is very variable even in specimens all of the same size.

[2] The hair is very short and close in all the Chinese, Himalayan and Assamese specimens I have seen, but is more variable in those from Tonkin and Burma.

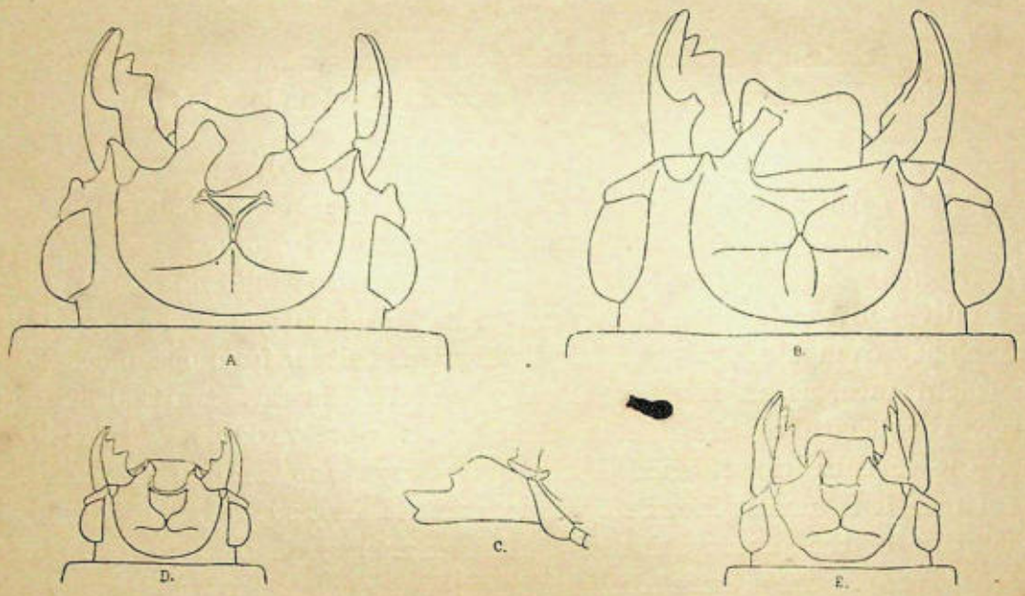
[3] See below, p. 322, last paragraph of footnote 2.

Aceraius occulidens, Zang.

Text-fig. 4A.

I have examined two specimens, both preserved in the Deutsches Entomologisches Museum. One (the type) is from Mt. Kina Balu (c. 5000 ft.) in Borneo, the other is from Deli, Sumatra.

Description.—Length 48 mm. This species differs from *A. grandis* var. *rectidens* only in the presence of a stout upwardly directed tubercle on the canthus, just in front of the eye.



Text-figure 4.

A. *Aceraius occulidens*, head × 4.
B. *Aceraius tricornis*, head × 4.
C. *Aceraius alutaceosternus*, left mandible from the side × 4.
D. *Aceraius minor*, head × 4.
E. *Aceraius acquidens*, head × 4.

Aceraius laniger, Zang.

Two specimens of this species, both from Mt. Kina Balu, c. 5000 ft., are preserved in the collection of the Deutsches Entomologisches Museum.

Description.—Length 47–52 mm. Differs from *A. kuwerti* in the following characters only: right outer tubercle of *head* inclined to be more acute, apical angle of supra-orbital ridge inclined to be less so; ridge separating lateral and intermediate areas of *metasternum* obtuse, rough; tenth rib of *elytra* closely punctured and hairy at shoulders as in *A. occulidens* and all preceding species, the hair on the elytra all shorter and closer. All these characters are apt to be variable in other species, and I doubt whether this form is really as distinct from the next as at present it seems to be.

Aceraius kuwerti, Zang.

Pl. xii, fig. 31.

The Berlin collections include a number of specimens from Mt. Kina Balu, c. 5000 ft.

Description.—Length 43–49 mm. This species resembles large specimens of *A. grandis* sub-sp. *hirsutus* in all characters except the following: upper tooth of left *mandible* somewhat more prominent, always bidentate in unworn specimens; anterior angles of *head* not prominent, symmetrical; apical angles of supra-orbital ridges inclined to be more prominent; right outer tubercle usually more or less obsolete; ridge separating lateral and intermediate areas always sharp, smooth and polished; posterior parts of hind coxae apt to be less extensively punctured than is usual in *A. grandis*, sometimes finely rugulose or entirely smooth; anterior part of tenth rib of elytra hairless and unpunctured.

Aceraius tricornis, Zang.

Text-fig. 4B, p. 234.

There are examples of this species both in the British Museum and in the Deutches Entomologisches Museum; all of them are from Mt. Kina Balu (c. 5000 ft.)

Description.—Length 49–53 mm. Differs from the preceding species in the following characters only: right outer tubercle of *head* absent; inner tubercles minute, that of left side situated on inner margin of left outer tubercle, that of right side situated further back; apical angle of supra-orbital ridge still more prominent, and situated further forwards along inner wall of anterior truncation, where it forms a conspicuous tubercle directed upwards and a little inwards.

Aceraius laevimargo, Zang.

Described from specimens from Mt. Kina Balu, c. 5000 ft. in the collections of the British Museum and Deutsches Entomologisches Museum, and two from Sumatra in the latter collection.

Description.—Length 34–39 mm. Differs from *A. laniger* and *A. kuwerti* chiefly in its smaller size and much greater variability.[1] Lamellae of *antennae* remarkably variable, the whole range of variation found in the genus being found in this single species; right outer tubercle of *head* quite as well developed as in *A. laniger*, simply pointed in profile.[2] *Metasternum* and *elytra* variable, resembling those of *A. laniger* or *A. kuwerti*, or intermediate between the two; the seventh rib of the elytra sometimes almost unpunctured. In all other characters this species resembles the two preceding. The scars on the *mesosternum* are almost always distinct.

Aceraius pilifer (Percheron).

Pl. xii, fig 35.

The specimens I have seen include insects from Sumatra in the British Museum collection; from Tjibodas, c. 5000 ft., and Preanger, 4–6000 ft. in Java, in the

[1] The apex of the left upper tooth is probably always bifid in fresh specimens.

[2] But for size and this characteristic the species might easily be confused with *A. perakensis*.

Hamburg and Berlin collections; and from Borneo in Mr. H. E. Andrews' collection and the Berlin collections.

Description.—Length 28–32 mm. This species is very closely allied to the preceding, from which it differs chiefly in its smaller size. It also differs, however, in a few other characters; and, although some of these are very variable in the preceding species, I prefer to keep the two distinct for the present as I have seen no true intermediates. Lamellae of *Antennae* never very long and slender; right outer tubercle of *head* somewhat more truncate in profile than in *laevimargo* in fresh specimens, the suture distinctly bent downwards; scars obsolete on *mesosternum*; anterior part of tenth rib of *elytra* always punctured and hairy.

A. alutaceosternus, Kuwert.

Pl. xii, figs. 34–34*a*; text-fig. 4C, p. 234.

Regd. No. $\frac{2855}{19}$ Penang F. Stoliczka?

This specimen has been labelled *Aceraius emarginatus* by Stoliczka, and I have little doubt that it is the specimen which he says he caught on Penang Hill (1871, p. 158). I have also seen a specimen from Taiping 4000–5000 ft., in the collection of the Deutches Entomologisches Museum.

Description.—Length 35·5–36·5 mm. *Labrum* as in *A. laevicollis*. *Mandibles* also as in that species, but with convexity behind left upper tooth exceptionally large. Lamella of fifth joint of antenna short and devoid of the close pubescence with which the five succeeding lamellae are clothed. *Mentum* slightly prominent and more or less indistinctly grooved in the middle line in front. Anterior angles of head not prominent. Left outer tubercle rather long and slender, bifid at the end, the anterior angle somewhat longer than the inner one, the former directed somewhat upwards and the latter downwards; right outer tubercle longer than in *A. borneanus*, but shorter than in *A. wallacei*, triangular as seen from above, imperfectly forked at apex in profile. *Prothorax* much as in *A. wallacei*. *Mesothorax* as in *A. illegalis* except for the presence of a very small closely punctured area in the lateral angles of the scutellum, and the absence of punctures from the posterior angles of the episterna. *Metasternum*, *hind coxae* and *abdominal sterna* also much as in *A. illegalis*. *Elytra* with seventh rib sparsely, ninth somewhat more thickly punctured[1]; tenth rib with hair-bearing punctures in front; hair long and not very thick.

Aceraius himalayensis, n. sp.

Pl. xii, figs. 36–36*a*.

Regd. No. $\frac{9125\text{-}6}{1}$ $\frac{9272}{1}$ Sikkim — Stoliczka bequest, J. Wood-Mason.

,, $\frac{2880\text{-}1}{19}$ $\frac{2882}{19}$ (*type*) Dikrang Valley — H. H. Godwin-Austen.

,, $\frac{3262}{19}$ Sirpo River, Nr. Renging. Abor Country — M. de Courcy.

,, $\frac{9273}{1}$ Naga Hills — Robert, through J. Wood-Mason.

[1] This, however, is no doubt a variable character as it has proved to be in other species; in Kuwert's type only the ninth rib was punctured.

I have also examined specimens from Pedong in the British Museum collection.

Description.—Length 31–36 mm. *Labrum*, *antennae* and *mandibles* as in *A. alutaceosternus*, but convexity behind left upper tooth not unusually large. *Mentum* punctured in middle, a very short and more or less indistinct median groove sometimes discernible on anterior margin. Anterior angles of *head* not prominent. Left outer tubercle broad, its external margin sinuous but without distinctly rectangular enlargement; extremity truncate and somewhat concave, its anterior angle a little more produced than the inner one. Right outer tubercle rather short, apex simple or very imperfectly divided in profile. Frontal area very variable. *Prothorax* as in *A. wallacei* except that the imperfect median groove is more distinct. *Scutellum* polished, but more or less marked with indistinct punctures; *mesothoracic episterna* and *sternum* as in *A. alutaceosternus*; posterior intermediate areas of *metasternum* with same scheme of markings as in other members of the genus,[1] the extent and distinctness of these markings very variable. *Hind coxae* and *abdominal sterna* much as in *A. wallacei*, the latter perhaps a little more distinctly punctured laterally. Sides of *elytra* clothed with short hair, seventh rib usually more or less thickly, ninth always thickly punctured throughout, tenth with hair-bearing punctures in front.

Aceraius assamensis, Kuwert.

Pl. xii, figs. 37-37*a*.

Regd. No. $\frac{9271}{1}$		Cherra Punji	H. H. Godwin-Austen.
,, $\frac{2879}{19}$		Manipur	,,
,, $\frac{5309\text{-}10}{16}$		Assam	British Museum.
,, $\frac{7079}{3}, \frac{7082}{3}, \frac{2859}{19}$		?	MacClelland, E. I. Company's Museum, etc.

Description.—Length 31–36 mm. Differs from *A. himalayensis* in the following respects only: *mentum* sparsely or not at all punctured in middle; inner process of left outer tubercle somewhat less acute, but usually larger in proportion to anterior process, in consequence of which the tubercle as a whole seems even broader; apex of right outer tubercle more or less distinctly bifid in profile, apex of upper portion always less than half as far from apex of lower portion as from right inner tubercle; *scutellum* as in *A. grandis*; posterior parts of *hind coxae*, and scars of *abdominal sterna* less smooth; seventh rib of *elytra* with or without punctures at anterior or posterior end only.

Aceraius tavoyanus, n. nom.

Pl. xii, figs. 38–38*a*.

This species is undoubtedly the same as that from Burma, erroneously described by Kuwert in 1898 under the name *pilifer*, Percheron.

Regd. No. $\frac{82}{5}, \frac{84}{5}, \frac{664}{6}$	Tavoy	Museum Collector.

There is a specimen from Siam in the British Museum.

[1] i.e. coarsely punctured along inner, more finely along posterior margin.

Description.—Length 30–33 mm. Differs from *A. assamensis* in the following characters only: left outer tubercle slender, its distal angles more produced; median groove of *pronotum* entirely obsolete as in *A. wallacei*; posterior parts of *hind coxae* finely rugose; *abdominal sterna* as in *A. himalayensis*; seventh rib of elytra punctured at posterior end only in the four specimens before me, as it was in Kuwert's specimens also.

Aceraius helferi, Kuwert.

Pl. xii, figs. 30–30*a*.

Regd. No.	3827/19, 3886/19, 3839-47/19	Tenasserim	J. Wood-Mason.
,,	2848-57/19	Upper Tenasserim	J. Wood-Mason.
,,	2828-9/19, 2831/19, 2834/19 (adult and larvae in spirit)	Between Misty Hollow and Sukli, Dawna Hills, 2100–2500 ft.	F. H. Gravely.
,,	2830/19, 2832-3/19	Between Thingannyinaung and Sukli, Dawna Hills, 900–2100 ft.	F. H. Gravely.
,,	3745/19	Rangoon	Bombay Natural History Society.

There are specimens from Rangoon in the collection of the Bombay Natural History Society: and specimens from Carin Ghecù 4000–5000 ft., Carin Asciuii Cheba 3500–4000 ft., Carin Cheba 3000–3500 ft., and [redacted]Mauson 2000–3000 ft. in the Berlin collections.

Description.—Length 31–40 mm. Differs from *A. lavoyanus* in the following characters only: left outer tubercle, though not quite constant either in size or shape, normally with inner process more massive, sometimes itself truncate; right outer tubercle somewhat shorter, distance between apices of upper and lower portions of its extremity greater, always more instead of less than half as great as distance between apices of upper portion and right inner tubercle; posterior parts of hind coxae usually smoother; seventh rib of elytra with or without punctures throughout, or more often at the posterior end only.[1]

Habits.—This species lives in logs that have not decayed to any great extent. It does not appear to be gregarious, adults being found only singly or in pairs, sometimes with larvae.

Aceraius borneanus, Kaup.

Pl. xii, figs. 25–25*b*.

Regd. No.	2827/19	Borneo	Sarawak Museum.

The Berlin collections include specimens from Deli, Tebing tinggi, Peinan, Sipora, Hili Zabobo, Batavia, Bandjermasin, Tandjong, Kina Balu, c. 5000 ft., Sampit

[1] Present throughout in all the three Rangoon specimens, but none of the Tenasserim ones I have seen. The character seems to be so often variable, however, that I do not feel justified in establishing a separate variety for the former. All these punctures are usually, as Kuwert says, absent in the Tenasserim form, but even in specimens found within a few hundred yards of such typical ones they may be present at the posterior end exactly as in *A. lavoyanus*.

Description.—Length 30–33 mm. Differs from *A. assamensis* in the following characters only: left outer tubercle slender, its distal angles more produced; median groove of *pronotum* entirely obsolete as in *A. wallacei*; posterior parts of *hind coxae* finely rugose; *abdominal sterna* as in *A. himalayensis*; seventh rib of elytra punctured at posterior end only in the four specimens before me, as it was in Kuwert's specimens also.

Aceraius helferi, Kuwert.

Pl. xii, figs. 39–39*a*.

Regd. No.	$\frac{3877}{19}$ $\frac{3886}{19}$ $\frac{3879\text{-}47}{19}$	Tenasserim	J. Wood-Mason.
,,	$\frac{2848\text{-}57}{19}$	Upper Tenasserim	J. Wood-Mason.
,,	$\frac{2828\text{-}9}{19}$ $\frac{2831}{19}$ $\frac{2834}{19}$ (adult and larvae in spirit)	Between Misty Hollow and Sukli, Dawna Hills, 2100–2500 ft.	F. H. Gravely.
,,	$\frac{2830}{19}$ $\frac{2832\text{-}3}{19}$	Between Thingannyinaung and Sukli, Dawna Hills, 900–2100 ft.	F. H. Gravely.
,,	$\frac{3745}{19}$	Rangoon	Bombay Natural History Society.

There are specimens from Rangoon in the collection of the Bombay Natural History Society; and specimens from Carin Ghecù 4000–5000 ft., Carin Asciuii Cheba 3500–4000 ft., Carin Cheba 3000–3500 ft., and [redacted]Mauson 2000–3000 ft. in the Berlin collections.

Description.—Length 31–40 mm. Differs from *A. tavoyanus* in the following characters only: left outer tubercle, though not quite constant either in size or shape, normally with inner process more massive, sometimes itself truncate; right outer tubercle somewhat shorter, distance between apices of upper and lower portions of its extremity greater, always more instead of less than half as great as distance between apices of upper portion and right inner tubercle; posterior parts of hind coxae usually smoother; seventh rib of elytra with or without punctures throughout, or more often at the posterior end only.[1]

Habits.—This species lives in logs that have not decayed to any great extent. It does not appear to be gregarious, adults being found only singly or in pairs, sometimes with larvae.

Aceraius borneanus, Kaup.

Pl. xii, figs. 25–25*b*.

Regd. No.	$\frac{2827}{19}$	Borneo	Sarawak Museum.

The Berlin collections include specimens from Deli, Tebing tinggi, Peinan, Sipora, Hili Zabobo, Batavia, Bandjermasin, Tandjong, Kina Balu, c. 5000 ft., Sampit

[1] Present throughout in all the three Rangoon specimens, but none of the Tenasserim ones I have seen. The character seems to be so often variable, however, that I do not feel justified in establishing a separate variety for the former. All these punctures are usually, as Kuwert says, absent in the Tenasserim form, but even in specimens found within a few hundred yards of such typical ones they may be present at the posterior end exactly as in *A. tavoyanus*.

and South Palawan. The Hamburg collection contains also specimens from Indrapura, Langkat, and Banguey. The British Museum collection contains specimens from Perak.

Description.—*Length* 24–28 mm. Anterior margin of *labrum* concave, left angle distinctly more prominent than right, sides parallel. Lamella of fifth joint of *antennae* usually rather long and often pilose. *Mandibles* with upper tooth well developed, defined on upper margin behind by a concavity which is much more marked on the left side than on the right; upper two terminal teeth large, the lowest one small on the left side, minute on the right; left anterior lower tooth rather large, triangular above and below, grooved horizontally between these two parallel surfaces; its counterpart on the right side minute. *Mentum* punctured and hairy laterally; middle portion smooth, with narrow depressed anterior border. *Head* above punctured and hairy in neighbourhood of long keeled parietal ridges, which extend vertically outwards from central tubercle, as is more or less invariably the case in all species of the genus I have seen, such variations as occur being always towards a backward direction; frontal grooves distinct, uniformly curved towards inner tubercles, or straight, or even curved outwards to terminate a little way behind them; frontal area consequently variable in form; ridge joining inner tubercles almost straight, or faintly convex in middle; left outer tubercle long and slender, more or less inwardly directed, often much stouter at base than distally, variable in detail; right outer tubercle moderately long, apex acute in fresh specimens as seen from above, truncate or imperfectly bifid in profile; anterior angles of head not prominent, containing at least 120°; apical angle of supra-orbital ridge almost equally blunt as a whole, but strongly peaked. *Pronotum* almost always with more or less distinct median groove, marginal grooves incomplete in middle before and behind; scars crescentic, they and the whole lateral border in front of them strongly and often closely punctured. *Lateral plates* of under side of prothorax sometimes slightly punctured and hairy in extreme anterior angles; then smooth for a space, behind which the surface is strongly punctured and hairy; hairless behind the coxae. *Scutellum* highly polished; *mesothoracic episterna* punctured above and along anterior margin, somewhat dull in posterior angle; *mesosternum* finely roughened throughout or in part, scars extremely variable, never broad, sometimes long, sometimes rudimentary. Lateral areas of *metasternum* very sharply defined and narrow in front, very broad and indistinctly separated from intermediate areas behind, not in contact with central area; anterior intermediate and lateral areas closely and rather finely punctured throughout, punctures becoming coarser and somewhat striate behind; posterior intermediate areas punctured along posterior border, but as a rule not further forwards; central area smooth and polished, as is also ridge separating lateral from anterior intermediate areas. Posterior parts of *hind coxae* smooth or nearly so. *Abdominal sterna* indistinctly punctured in scars, the second with a few indistinct, but larger, hair-bearing punctures as well in fresh specimens. *Elytra* hairy, closely punctured at sides over whole surface from seventh rib onwards.

Aceraius minor, n. sp.

Text-fig. 4D, p. 234.

Described from five specimens from Taiping, 4000–5000 ft., in the Kgl. Zool. Museum in Berlin.

Description.—23–25·5 mm. Resembles *A. borneanus* except in the following respects. Upper tooth of *mandibles* obsolete, the upper margin practically straight; lowest terminal tooth of left mandible well developed, equal to that of right; anterior lower tooth of left mandible also well developed, but much smaller than that of right which, as is usual in this genus, is very large. Left outer tubercle of *head* shorter and somewhat stouter, inner angle of distal truncation scarcely developed, the tubercle as a whole consequently directed more forwards; right outer tubercle somewhat variable in both species, but as a rule rather better developed in this one than in the preceding. *Abdominal sterna* somewhat more distinctly punctured in the scars; elytra with hair-bearing punctures on the seventh and ninth ribs only, the whole of the eighth and tenth smooth and hairless.

Aceraius aequidens, n. sp.

Text-fig. 4E, p. 234.

Described from one specimen from Kina Balu in the collection of the Deutsches Entomologisches Museum.

Description.—Length 29 mm. Differs from the preceding in the following characters only: anterior lower tooth of left *mandible* not very large, scarcely larger than that of right mandible; *mentum* somewhat as in *A. wallacei*, anterior margin depressed on either side of the middle line only, in the single specimen that I have seen; inner angle of distal truncation of left outer tubercle of *head* better developed; right outer tubercle more as in *A. borneanus*; *abdominal* sterna also as in that species; seventh to tenth ribs (inclusive) of elytra with hair-bearing punctures, but with scarcely as many as in *A. borneanus*.

Subfamily *MACROLININAE*.

Genus MACROLINUS, Kaup.

The form of the frontal area of the head, the lengths of the lamellae of the antennae and the presence or absence of densely punctured areas on the pronotum, all of them characters which have been found apt to be of little value, and often actually misleading, for taxonomic purposes in other genera, have usually proved to be constant throughout each of our extensive series of specimens of different species of this genus, and to provide the best means of distinguishing one species from another.

Macrolinus nicobaricus, n. sp.

Pl. xiii, figs. 40–40*a*.

Regd. No. $\frac{9092\cdot9}{1}$ $\frac{9161}{1}$ $\frac{9277}{1}$ $\frac{9279\cdot81}{1}$ $\frac{516\cdot7}{6}$ $\frac{6430\cdot2}{14}$ $\frac{6451\cdot2}{14}$ $\frac{9846}{18}$ (*type*); $\frac{9847\cdot50}{18}$	Nicobar Islands	F. Stoliczka, F. A. de Roepstorff.
,, $\frac{6981\cdot2}{7}$	Rangoon[1]	?

Description.—*Length* 30–36 mm. *Labrum* transverse; symmetrical or with left angle slightly more prominent than right; sides approximately parallel, angles rounded, anterior margin straight or slightly excavate. Lamellae of *antennae* of moderate length, the three proximal ones distinctly shorter and stouter than the three distal ones. *Mandibles* with upper tooth distinct; ventral terminal tooth smaller and set further back than the other two; anterior lower tooth simple, conical, acute, that on the right side very little smaller than that on the left. *Mentum* punctured and sparsely hairy along posterior border between inner limits of scars, but not behind their posterior limits (i.e. not between either scar and posterior margin); this puncturing rarely extended forwards on to remaining part of surface of median area to any extent. *Head* closely and somewhat rugosely punctured, clothed with fine hair; parietal ridges extending straight outwards or very slightly backwards from central tubercle, from which they are usually separated; frontal ridges enclosing an acute angle, then curving rapidly outwards and then again forwards; inner tubercles joined to one another by a curved ridge whose concave side faces forwards; these tubercles joined to outer tubercles by ridges enclosing a smooth and unpunctured area; outer tubercles truncate or imperfectly forked at apex in profile; anterior angles of head containing more than 120°; canthus rounded externally; posterior rounded portion of supra-orbital ridge meeting outer wall of hollow anterior portion in angle of not more than 120°, inner wall of anterior portion usually as distinct as outer wall. *Pronotum* with marginal grooves incomplete across the middle before and behind; median groove absent or scarcely distinguishable; a small depression present as a rule near anterior angles, usually containing (sometimes replaced by) two punctures (very seldom a small cluster) which often coalesce to form a short oblique groove; scars rounded, or linear and oblique, punctured, hairy; surface between scars and marginal grooves likewise punctured and hairy. *Lateral* plates of lower side of prothorax smooth towards inner side both in front of and behind coxae; outer border punctured and hairy, especially behind. An indistinct median groove sometimes present on *scutellum*; *mesothoracic episterna* punctured except in posterior angle and along ventral border, punctured area bordered by a roughened band, the rest polished. *Mesosternum* with usual anterior marginal striato-punctate area often followed by a few coarse punctures; scars strongly impressed, their surface finely roughened, this roughness being continued more or less over the outer angles of the plate; central area more or less polished with exception of a

[1] I find by looking up the register that this record is of doubtful authenticity; it appears to be the only record of the species outside the Nicobars and is probably incorrect.

pair of circular areas which are finely rugose or punctured. *Metasternum* with lateral areas narrow, finely punctured and hairy throughout, not in contact with central area; anterior intermediate areas punctured and hairy; posterior intermediate areas smooth and hairless. Posterior parts of *hind coxae*, and scars of *abdominal sterna*, finely punctured, either sparsely or closely. *Elytra* slightly hairy at the shoulders; very strongly punctured in the lateral grooves, more weakly in the dorsal ones of which the innermost are scarcely punctured at all.

Macrolinus andamanensis (Stoliczka).

Pl. xiii, figs. 41–41*a*.

Regd. No.	$\frac{9682\text{-}91}{1}$ (*paratypes*); $\frac{9282\text{-}99}{1}$ (*paratypes*); $\frac{9465}{1}$ (*paratype*); $\frac{9467\text{-}8}{1}$ (*paratypes*); $\frac{4069\text{-}70}{5}$ $\frac{4072\text{-}4}{5}$ $\frac{5715\text{-}20}{10}$; $\frac{6002\text{-}8}{13}$ $\frac{6428\text{-}9}{14}$ $\frac{9850}{18}$	Andaman Islands	Stoliczka bequest, J. Wood-Mason, etc.
	$\frac{6450}{14}$	Moulmein[1]	Museum Collector.

$\frac{\text{All Nos.}}{1}$ appear to be paratypes. Nos. $\frac{2\text{-}465}{1}$ and $\frac{2\text{-}467\text{-}8}{1}$ are from "Dr Stoliczka's Type collection," and the rest were "named by Dr. Stoliczka and Mr. J. Wood-Mason"; several of the latter series, including some from Wood-Mason's collection, bear labels written by Stoliczka.

Description.—Length 31–38 mm. Differs from the preceding in the following characters only; lamelliform processes of six distal antenna-joints somewhat longer and slenderer; ridge joining inner tubercles of *head*[2] straight or slightly raised in middle line; frontal area in consequence of this and of a difference, less constant in both species, in the course of the frontal ridges (which in this species are usually curved so that they do not enclose an acute angle in front of the central tubercle), longer in proportion to its width, and semicircular rather than crescentic in form; outer tubercles bifid in profile, upper process longer (often much longer) than lower, and separated from it by a distance nearly as great as that from inner tubercle; anterior and posterior portions of supra-orbital ridges meeting in an angle of not less than 120°; *mesosternum* more extensively polished, circular punctured areas mostly represented by smooth depressions or entirely absent. In the mesosternum of some specimens there is a very strongly marked median groove whose surface is finely roughened, but more usually this is obscure or absent; I have not seen it in *B. nicobaricus*, but it may very likely be found occasionally in that species also.

[1] I find by looking up the register that this record is of doubtful authenticity, so as it appears to be the only record of the species outside the Andamans it is probably incorrect.

[2] No mention is made here of the central tubercle, as this is so very variable in both species, both in form and in the extent of its connection with the posterior ridges, that I can find no constant difference between the two that is sufficiently definite to permit of description. No taxonomic importance is to be attached to the differences that appear in the figures.

Macrolinus sikkimensis (Stoliczka).

1. M. SIKKIMENSIS, Stoliczka, s. str.

Pl. xiii, figs. 42–42*a*.

Regd. No.	$\frac{9169}{1}$ (*type*)	"Sikkim"[1]	F. Stoliczka.
,,	$\frac{692}{14}$ $\frac{706}{14}$ $\frac{6405\text{-}6}{14}$	Khasi Hills	Shillong Museum.
,,	$\frac{6449}{14}$	Cachar	J. Wood-Mason.
,,	$\frac{9889\text{-}90}{18}$ $\frac{9864}{18}$	Harmutti, base of Datla Hills	H. H. Godwin-Austen.
,,	$\frac{6387\text{-}9}{14}$ $\frac{6414}{14}$	Dikrang Valley	
,,	$\frac{6390}{14}$ $\frac{6442}{14}$ $\frac{6453}{14}$ $\frac{9891}{18}$	Datla Expedition	
,,	$\frac{9865\text{-}88}{18}$	Camp 9, Datla Expedition	
,,	$\frac{3148\text{-}69}{19}$	Kobo, Abor Country, 400 ft.	S. W. Kemp.
,,	$\frac{3141}{19}$	Janakmukh, Abor Country, 600 ft.	
,,	$\frac{3142\text{-}5}{19}$	Rotung, Abor Country, 1400 ft.	
,,	$\frac{9892}{18}$	Naga Hills	Moti Ram.

Description.—*Length* 25–31 mm. Resembles the two preceding species except in the following respects. Parietal ridges of *head* on the whole more distinctly connected with central tubercle; frontal ridges as in *M. nicobaricus*; inner tubercles as in *M. nicobaricus*, the ridge between them as in *M. andamanensis*; outer margin of inner tubercles often produced backwards as more or less distinct ridge over anterior part of head; posterior part of supra-orbital ridge meeting anterior part in angle of about 120°. *Pronotum* strongly punctured laterally behind anterior extremities of marginal groove, all along this groove at the sides, and usually near the scars also. *Mesosternum* usually more polished than in *M. nicobaricus*; with or without a single median roughened or finely punctured area of varying extent in place of the paired areas; a more or less obscure groove sometimes present in the middle line. *Metasternum* coarsely punctured in posterior intermediate areas, otherwise as in the preceding species. *Elytra* slightly hairy at shoulders, their dorsal grooves more or less distinctly punctured; lateral grooves very wide, with strong punctures elongated to form a series of transverse grooves.

Habits.—Mr. Kemp did not find any large colonies of this species during the Abor Expedition. This agrees with the results of my own more scanty observations on the sub-species found in the Dawna Hills, and I am led to conclude that the species is not a markedly gregarious one. The sub-species *tavoyanus* seems to live in logs that have reached too advanced a state of decay to be suitable for *Acerains* to inhabit; whether this is true of the northern form also has yet to be determined.

2. M. SIKKIMENSIS, subsp. TAVOYANUS, n. subsp.

Regd. No.	$\frac{5870\text{-}1}{4}$, $\frac{5872}{4}$ (*type*)	Tavoy	Museum Collector.

[1] Stoliczka tells us in his paper (1873, p. 162) that he collected this specimen "at about 1500 feet, some two miles east of Pankabari." Pankabari is many miles south of the Sikkim frontier of to-day.

Regd. No.	2639/19	Between Misty Hollow and Sukli, Dawna Hills, 2100–2500 ft.	F. H Gravely.
,,	2643-58/19	Between Thingannyinaung and Sukli, Dawna Hills, 900–2100 ft.	F. H. Gravely
,,	2660/19	Dawna Hills, Tenasserim	F. H. Gravely.

I have also seen specimens from Carin Cheba, 3000–3500 and 4000–5000 ft., in the collection of the Deutsches Entomologisches Museum.

Description.—Length 29·5–33·5 mm. Differs from *M. sikkimensis, s. str.*, only in having the mesosternal scars coarsely punctured partially or throughout. No trace of these punctures has been found in any Himalayan specimen with the exception of one from Kobo (regd. no. $^{3}/_{19}{}^{6}$) in which, although scarcely perceptible on one side, they are few but distinct on the other. This specimen may be regarded as transitional between the typical Himalayan form, and the form from the Dawna Hills which differs therefrom somewhat less markedly than does that from Tavoy. Probably, therefore, the change from the typical Himalayan form to the Tavoy form is a gradual one and numbers of transitional forms may be expected to occur in the hills of north Burma.

Macrolinus crenatipennis, Kuwert.

Described from two specimens from Ceylon (one of them evidently the type, as it bears Kuwert's label), both in the collection of the Königliches Entomologisches Museum in Berlin.

Description.—Length 21·5 mm.[1] Differs from *M. rotundifrons* only in its smaller size, and in the extremely coarse puncturing of all the grooves of the *elytra*, the dorsal grooves of *M. crenatipennis* being as coarsely punctured as the lateral ones of *M. rotundifrons*.

Macrolinus rotundifrons (Kaup).

Pl. xiii, fig. 43.

Regd. No.	2930-4/18	Kandy, Ceylon	E. E. Green. N. Annandale.
,,	2925-9/18	Peradeniya, Ceylon	E. E. Green. F. H. Gravely.
,,	2935/18	Ceylon	F. H. Gravely.

Mr. Green's collection includes also specimens from Galagedara, Central Province, Ceylon.

Description.—Length 25–31 mm. Differs from *M. sikkimensis* in the following respects only. Median part of *mentum* unpunctured; parietal ridges of *head* extending straight outwards or slightly forwards, still more distinctly connected with central tubercle; ridge between inner tubercles strongly convex, its middle part sometimes almost confluent with ridge between outer tubercles. *Pronotum* with strongly marked median groove; punctures along marginal grooves at sides confined to grooves themselves, although the other punctures are arranged as in *T. sikkimensis*.

[1] Kuwert says 26–27 mm.!

Mesosternum smooth and polished throughout, a few strong punctures sometimes present along inner margin of each scar. *Elytra* with lateral grooves of normal width, strongly punctured, but not transversely grooved.

Habits.—This species is very common in the Royal Botanical Gardens at Peradeniya, where it lives among the piles of dead leaves, etc., that are put to rot away on the river bank.

Macrolinus waterhousei (Kaup).

Pl. xiii, fig. 44.

Regd. No. $\frac{2621}{19}$ Bulutota, Ratnapura Dist., Ceylon Colombo Museum.

Description.—*Length* 33–35 mm. Differs from *M. rotundifrons* in the following characters only. Median part of *mentum* sparsely punctured. Ridge between inner tubercles of *head* scarcely convex, almost straight, so closely approximated to ridge between outer tubercles throughout its length as almost to conceal it (differing in this respect from *M. andamanensis*). *Pronotum* unpunctured but (? always) with a more or less obscure depression in place of the strongly punctured area behind anterior extremities of marginal groove. Scars of *mesosternum* indistinct or absent.

Macrolinus [illegible] Kaup.

Described from a single specimen from the Philippines in the collection of the Königliches Zoologisches Museum, Berlin.

Description.—*Length* 25 mm. Differs from the following species only in having the first two lamellae of the *antennae* somewhat shorter, and the anterior face of the central tubercle of the *head* almost vertical to the general surface. In the former respect, and in its locality, it agrees with Kaup's description of *M. weberi*, but the differences are very minute, and in the absence of other similar specimens I very much doubt whether it is really distinct.

Macrolinus latipennis (Percheron).

Regd. No. $\frac{9520}{1}$ Malacca ?

,, $\frac{9521}{1}$ Johore J. Wood-Mason.

There is one specimen from Borneo in the Sarawak Museum collection; and the Berlin collections include specimens from Deli, Nias (Ombolata), Buitenzorg, S.-E. Borneo, and South Palawan.

Description.—Length 22·5–27·5 mm. *Labrum* punctured and hairy, anterior margin straight, angles rounded. All six lamellae of antennae very long and slender, their extremities arranged in a straight line when the *antennae* are furled. Upper tooth of *mandibles* small or obsolete; lowest terminal tooth smaller than the two upper ones; anterior lower tooth conical, that of the right side slightly smaller and more acute than that of the left. *Mentum* smooth between the scars or with a few punctures near the middle-line. *Head* closely and finely punctured throughout above, or with the anterior half of an area in front of the short parietal ridges and outside the frontal ridges, and a small patch immediately behind the former, more or less

sparsely punctured or smooth; the central tubercle is little or no steeper in front than behind, and the size of its apical angle is variable; from the central tubercle a median keel extends forwards a short distance to the point of origin of the frontal ridges which, with the straight, convex or slightly W-shaped ridge joining the frontal tubercles, enclose a more or less semicircular area. *Pronotum* with scarcely a trace of median groove; marginal groove incomplete in middle before and behind; a patch of punctures in anterior angles, scattered punctures present or absent between this and the curved punctured scars. *Prothorax beneath* punctured and hairy at the sides. *Scutellum* smooth and polished; *mesothoracic episterna* punctured above and along anterior margin; *mesosternum* with a few hair-bearing punctures in front of an anterior polished area between the anterior ends of the scars, this smooth area usually continued backwards as an indistinct keel, or as a smooth and highly polished streak, to about the middle of a finely roughened area extending from the scars near their anterior extremities to the posterior margin; between this area and the posterior part of the scars the mesosternum is smooth and polished; the scars are long and almost always coarsely punctured, the punctures sometimes extending beyond the scars themselves into the [illegible] which they may completely fill. *Metasternum* more or less densely punctured thro[illegible] the lateral and anterior intermediate areas, and often along the outer part of the p[illegible]rgin of the posterior intermediate areas and the ridges separating these from [illegible] areas; anterior and inner part of posterior intermediate areas rarely punctured, [illegible]st smooth and unpunctured; lateral areas much broader behind than in front, but not in contact with central area. *Hind coxae* and *abdominal sterna* as in other members of the genus. *Elytra* slightly hairy at the shoulders; all grooves of equal width; lateral grooves little more coarsely punctured than those nearest the middle line.

Subfamily *GNAPHALOCNEMINAE.*

Genus **PARAPELOPIDES**, Zang.

Parapelopides symmetricus, Zang.

Text-fig. 5, A-B, p. 247.

Described from specimens from Mt. Kina-Balu, c. 5000 ft., in the collections of the British Museum and the Deutsches Entomologisches Museum.

Description.—Length 40–41·5 mm. Differs from *Trapezochilus nobilis* in the following characters only. Anterior lower tooth of right *mandible* small and obtuse, but distinct. Scars of *mentum* united to form a W-shaped figure, whose posterior transverse part is always distinct and deeply impressed; anterior margin of [illegible]tum sometimes with a slight concavity in the middle. Upper surface of *head* less strongly rugose; outer tubercles narrower, their denticles very obtuse, middle denticle rarely distinguishable. Only extreme lateral angles of *scutellum* unpunctured; puncturing of posterior angles of *mesothoracic episterna* also more extensive. Whole of lateral margin of *mesosternum* bordered by a broad band of coarse punctures. *Metasternum* with at least a few punctures in the posterior intermediate areas.

Genus TRAPEZOCHILUS, Zang.

Trap[illegible]s nobilis (Kuwert)[1].

[illegible] text-fig. 5, C-D.

Regd. No. [illegible] Museum Collector.

I have also se[illegible] from Taiping, 4000-5000 ft., in the collection of the K[illegible] Museum in Berlin; and two specimens from Perak in the B[illegible]sh Muse[illegible]

Description.—*Length* 35-41 mm. *Labrum* hairy and punctured; anterior margin straight or slightly concave, with a more or less indistinct denticle in the middle; angles rounded, symmetrical or very nearly so. *Antennae* with a more or less indistinct lamelliform process on the fifth joint, lamellae of subsequent joints of gradually increasing size, all short and stout. Upper tooth of *mandibles* usually rectangular sometimes blunter, minute; terminal teeth large, t[illegible]wo upper ones broadest in the vertical plane, the lowest one horizontal; anterior [illegible]tooth distinct and sharply pointed on the left side, obsolete or mi[illegible] with[illegible]se of lowest terminal tooth, on the right. *Mentum* punctured laterally, smooth between and behind the oblique groove-like scars. *Head* strongly rugose in front, smoother behind, the surface polished throughout. Outer tubercles somewhat variable, approximately symmetrical, each composed of three conical denticles of which the innermost is usually the largest; the outermost is usually slenderer or quite short and blunt; the middle one is small and set a little further back, its position is variable, and may be different on opposite sides of the same specimen, it is sometimes obsolete on the right or on both sides. Anterior angles of head containing a little more than 120°; canthus rounded externally. Parietal ridges curved slightly forwards. [illegible]pra-orbital ridges smoothly convex behind, excavate in front, their upper margin curved (not angular) in front when seen in profile. *Pronotum* smooth and polished, not obviously punctured except in the scars and marginal grooves; marginal grooves widely discontinuous in front, almost continuous behind; median groove rudimentary or absent. *Lateral plates* of lower surface

TEXT-FIGURE 5.

A. *Parapelopides symmetricus*, anterior margin of head × 4.
B. ,, ,, right mandible × 4.
C. *Trapezochilus nobilis*, anterior margin of head × 4.
D ,, ,, right mandible × 4.
E. *Trapezochilus respectabilis*, anterior margin of head × 4.

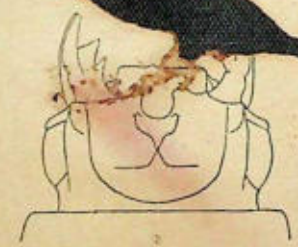
[1] This species has proved not to be distinct from the next; and the names applied to them here must both be discarded in favour of *dorsalis*, Kaup (see below, pp. 297-8)

of prothorax smooth and hairless in front, punctured and very hairy further back, often rugose behind the coxae. *Scutellum* traversed by a pair of broad and closely apposed hairy and finely punctured [illegible] are sometimes fused in the middle line; *mesothoracic episterna* coarse[illegible] and in front, more finely in the posterior angles which are hairy; [illegible] between the two punctured ones. *Mesosternum* often more or [illegible] ually with a patch of hair-bearing punctures in the lateral angl[illegible] bsent. *Metasternum* with lateral areas very broad behind, b[illegible] ontact[illegible] central area; lateral and anterior intermediate areas hairy and rather finely punctured, posterior intermediate and central areas smooth and hairless. Posterior parts of *hind coxae* slightly roughened; scars of abdominal sterna smooth or very nearly so. *Elytra* with lateral grooves broader than dorsal ones, the punctures in the former forming rows of short transverse grooves.

[illegible] Trapezochilus respectabilis (Kuwert)[1].

[illegible] Text-fig. 5 E, p. 247.

[illegible] bed from a seri[illegible] imens from Deli, Sumatra, in the collection of the D[illegible]s Entomologisches Muse[illegible]



Text-fig. 6.

Gnaphalocnemis simplex, n. sp., head × 4.

Description.—Length 33–38 mm. Differs from preceding species in following characters only. Scars of *mentum* sometimes more or less distinctly united behind to form a W-shaped figure as in *Parapelopides*. Upper surface of *head* less strongly rugose; outer tubercles more prominent, their middle denticle usually obsolete, the inner one always broad and distally truncate in unworn specimens. *Mesosternum* rarely punctured in lateral angles. Posterior intermediate areas of *metasternum* sparsely punctured in one specimen.

Genus GNAPHALOCNEMIS, Heller.

Gnaphalocnemis simplex, n. sp.

Text-fig. 6.

Described from a single specimen from Perak in the British Museum collection.

Description.—Length 31 mm. *Head*, with its appendages, as in *G. monticulosus*,

[1] See foot-note on previous page.

except the anterior margin; this is flat or slightly convex on both sides; the left outer tubercle is simple and truncate; the right one is similar but broader, its truncation somewhat concave; two smaller pointed denticles are developed between this tub[illegible] the right anterior angle of the head. *Prothorax*, *mesothorax* and *metathorax* as in *T[illegible]chilus* [illegible]. Posterior parts of *hind coxae* rough. *Abdominal sterna* polished. [illegible] margin of *elytra* scarcely punctured, next pair somewhat [illegible] turing of lateral grooves very strong —quite as [illegible] in *G. burmeisteri*.

Gnaphalocnemis burmeisteri (

Pl. xiii, fig. 49.

Described from specimens from Deli, Pedong, Peinan, Soe[illegible] Plantation (nr. Solok), Battak Mountain, Kepahiang, Redjang-Lebong, and Jav[illegible] type and two other specimens) in the Berlin collections; specimens from Del[illegible] Somgei Lalah in the Hamburg collection; and a specimen from Sarawak in t[illegible]wak Museum collection.

Description.—*Length* 41–51 mm. Differs fro[illegible]ly in having grooves 5–7 of the *elytra* narrower, sim[illegible]ared without [illegible]fined flattened surface, transverse punctures, or [illegible] roughened lines.

Gnaphaloc[illegible]nticulosus (Smith).

Pl. [illegible] fig. [illegible].

I have not seen the specimen which Stoliczka says he received from Sumatra; the specimen which he collected in Penang, though not referred to in his paper, is evidently of this species and appears to have been identified by him.

Regd. No. [illegible] Penang F. Stoliczka.

I have also examined specimens from Kuching and Sadong belonging to the Sarawak Museum; specimens from Tengah Mountain, Deli, Tandjong Morawa, Solok, Medan, Sarawak and Mt. Kina Balu in the collections in Berlin; and a specimen from Lampung in the British Museum.

Description.—*Length* 38–44 mm. Anterior margin of *labrum* slightly concave, sometimes almost straight, usually with a distinct denticle in the middle; angles rounded, the left inclined to be slightly more prominent than the right. Upper margin of *mandibles* usually more or less convex or angular behind upper tooth; upper tooth distinct, more or less rectangular on left side, usually acute on right; no trace of right anterior lower tooth present; left anterior lower tooth and left lowest terminal tooth more or less fused at base, each distinct and well developed at apex. *Mentum* usually somewhat narrower and more convex between the scars than in *Trapezochilus dorsalis* (=*nobilis*). *Head* polished throughout, more or less rugose in front of parietal ridges. Outer tubercles complex, somewhat variable in form (compare figs. 49 and 49*a*[1]). Anterior border excavate between left outer tubercle and front of

[1] Prepared from specimens belonging to two different species; but the structure and range of variation of the outer tubercles appears to be the same in both, and also in the larger *G. tridens* (fig. 50).

left supra-orbital ridge. Anterior angles of head containing about 120°, canthus rounded externally; supra-orbital ridge as in *Trapezochilus dorsalis*; parietal ridges directed slightly forwards. *Prothorax* and *mesothorax* much as in *Trapezochilus dorsalis*, but with the median groove of the pronotum often more distinct, a pair of distinct large oval scars on the mesosternum. *Metasternum* with lateral areas very broad throughout, almost as broad in front as behind, in contact with central area; central area unpunctured; lateral areas hairy; anterior intermediate areas hairy and more coarsely punctured than anterior angles, smooth behind; posterior intermediate areas very coarsely but often irregularly punctured, not hairy. Posterior *coxae* usually smooth. Second *abdominal sternum* usually punctured in front, with scars; abdominal sterna otherwise smooth. *Elytra* with grooves 5–7 more or less broad, their flattened polished surface usually more or less completely bordered on each side by a roughened line, with which the punctures are often confluent, the punctures coarse and as a rule distinctly transverse.

Graphalocnemis tridens (Wied.).

Pl. xiii, figs. 50–50*a*.

Regd. No. $\frac{3314}{1}$ J. Wood-Mason.

I have also seen one specimen from the island of Madura which is the property of Mr. H. E. Andrewes; specimens from Preanger, Tjibodas c. 5000 ft., Tengger Mountain, and Soekaboemi in the Berlin collections; and specimens from Preanger 4–6000 ft., Buitenzorg, and East Java, as well as Wiedemann's types in the Hamburg collection.

Description.—Length 45–56 mm. Differs from the preceding in the following characters only: upper tooth on both sides often more obtuse, the mandibles less (often not at all) convex above behind it; surface of *head* less rugose; parietal ridges usually extending somewhat more directly outwards; all but one or two of the punctures of posterior intermediate areas of *metasternum* usually confluent and concentrated along the inner margin of this area; posterior part of hind *coxae* more or less strongly punctured; grooves 5–7 and posterior part of groove 8 of *elytra* very broad, each with roughened margins and a flat polished surface marked by a single row of punctures.

Genus GONATAS, Kaup.

Gonatas germari, Kaup.

Pl. xiii, figs. 47–47*a*.

Regd. No. $\frac{3819}{15}$ Java W. S. Atk[illegible]

Description.—Length 26·5 mm. *Labrum* hairy and punctured, anterior margin with a deep semi-circular excavation, angles rounded and prominent, sides straight and parallel. *Antennal* lamellae long, six in number. Left *mandible* somewhat larger than right; upper tooth small on both mandibles, rectangular on left, more obtuse on right; two upper terminal teeth partly fused, lower one distinct, meeting them in an angle of about 60°; anterior lower tooth rudimentary on left, large but blu[illegible]n

right mandible. *Mentum* punctured laterally only. *Head* crossed by band of large sparse punctures immediately in front of parietal ridges; parietal ridges extending directly outwards on either side of central tubercle; frontal ridges extending at first [illegible] than forwards from central tubercle, then bent abruptly towards inner tubercles; ridge [illegible] produced forwards in middle line, which is marked in frontal ar[illegible]; left outer tubercle broad, parallel-sided, truncate distally [illegible] as seen from above, straight and perpendicula[illegible] side; right outer tubercle [illegible] ngth but more slender, sides as seen [illegible] ove abruptly converging near end to me[illegible] in a right angle, upper [illegible] ace longer than lower, the process being obliquely t[illegible] seen from the side; anterior angle of head containing about 100°; canthus [illegible] equilaterally quadrangular. *Pronotum* with strong median groove, marginal gro[illegible] complete in middle in front, obsolete in middle behind. *Prothorax* below pol[illegible]; hairy and indistinctly punctured close to margin in front, more distinctly [illegible] red behind. *Scutellum* smooth and polished; *mesothoracic episterna* polished th[illegible]t, punct[illegible]ed above and along anterior margin; *mesosternum* smooth[illegible] [illegible] eep scars. *Metasternum* finely punctured in lateral a[illegible] very [illegible] der behind than in front and are not in contact wit[illegible] area; more strong[illegible]c-tured in anterior intermediate areas; [illegible] nctured in posterior interi[illegible] areas. *Hind coxae* and *abdominal st*[illegible]ed, almost unpunctured. *Elytra* f[illegible] punctured in dorsal grooves, mo[illegible] in lateral ones.

Subfamily *LEPTAULACINAE.*

Genus **LEPTAULAX**, Kaup.

Leptaulax beccarii, Kuwert.

Described from two specimens from Sumatra in the Berlin collections, one of them determined by Kuwert.

Description.—Length 21 mm. Differs from *L. humerosus* in the following characters only. Frontal area of *head* shorter and broader. *Pronotum* and *abdominal* sterna more as in *L. dentatus*, the latter not extensively punctured. Posterior parts of *hind coxae* smooth. Sculpturing of lateral grooves of *elytra* reduced (to a variable extent) in a somewhat different way, a polished tubercle being more or less distinctly developed from the middle part of each of the partly obsolete transverse ridges.

Leptaulax humerosus, Kuwert.

Pl. xiii, fig. 51.

Regd. No. $\frac{1888\text{-}1901}{19}$ Ten miles south of Kuching, Sarawak C. W. Beebe.

There is a single specimen from Kuching in the Sarawak Museum collection and another from the same locality in Mr. Andrewes' collection. I have also examined specimens from Perak, Deli, W. Sumatra, Ardjoeno, and Tengger Mountain in the collection [illegible]sches Entomologisches Museum.

[illegible]15–20 mm. Differs from the common allied species, *L.*

dentatus, in the following characters only. Upper tooth of *mandibles*, usually weaker, anterior lower tooth simple. Inner tubercles of *head* perhaps a little more widely separated[1]; frontal area almost always about as long as broad, semilunar or almost quadrangular in shape; the two frontal ridges more or less evenly [illegible] one another and joined to central tubercle by [illegible] ridge—not curving round to meet in an acute angle cl[illegible]bercle as is usually the case in *L. dentatus*. Scars of *m*[illegible]nly continuous with a dull band extending [illegible]e remaining length of ou[illegible]. Lateral areas of *metasterna* [illegible]ader behind than in front, about equal [illegible] widest part to minimum [illegible] intermediate areas. *Abdomen* bordered beneath by [illegible]om-plete broad ba[illegible] fine but dense puncturing which includes the whole of the terminal segm[illegible]th the exception, in some specimens, of a small smooth spot near the posterior [illegible]n. Depressed surface of two or three outermost grooves of *elytra* dull, the scul[illegible]g somewhat indistinct and worn-looking, especially at the ends; the [illegible]th and [illegible]bs narrow throughout.

[illegible]lax dentatus (Fabr.).

1. [illegible]ATUS, Fabr. s. str.

Pl. [illegible]2-52*d*.

	Reg. No.					
	[illegible]	1650 / 6	1652 / 6	1654-5 / 6	Near Vizagapa[illegible]	Museum Collector.
,,		7569-14 / 19			La-ai [illegible]	D. G. A. Pritchard and J. R. Waterfield.
,,		3073-6 / 19			Kobo, 400 ft., Abor Country	S. W. Kemp.
,,		3071-2 / 19			Janakmukh, 600 ft., Abor Country	
,,		3077-3103 / 19	3266[2] / 19		Rotung, 1300–1400 ft., Abor Country	
,,		3064-6 / 19			Upper Rotung, 2000 ft., Abor Country	
,,		3055-63 / 19			Renging to Rotung 2600 ft. Abor Country	
,,		3067-70 / 19			Kalek, 3800 ft., Abor Country	
,,		2642 / 5	2649 / 5	2657 / 5	N.-E. Frontier	?
,,		977-82 / 19			Sibsagar, Assam	S. E. Peal and Museum Collector.
,,		975 / 19			Dafla Expedition	H. H. Godwin-Austen.
,,		6419-3 / 14	6456 / 14	964 / 19	Burroi, base of Dafla Hills	
,,		6422 / 14	962-3 / 19		Harmutti, base of Dafla Hills	
,,		6417-20 / 14	967-74 / 19		Dikrang Valley, Northern Frontier of Assam	
,,		9205 / 1	6421 / 14		Dunsiri Valley, Assam	?
,,		6415-6 / 14	965-6 / 19		Durrang, Assam	H. H. Godwin-Austen.

[1] This remark, since it relates to a character which is somewhat variable in both [illegible] applies only to the species as a whole

[2] Larvae, pupae, and adults in spirit.

Regd. No.	9135-6 / 1, 9367-73 / 1, 9490 / 1, 9492 / 1	Bhutan	Stoliczka bequest, Dr. Cameron. ?
,,	9150-67 / 1, 9165-7 / 1, 9170-1 / 1, 9211 / 1, 9219-20 / 1, [illegible] / 1, [illegible] / 14		Stoliczka bequest, etc.
	[illegible] / 1	Darjeeling (Sikkim in register)	Stoliczka.
,,	9169 / 1, 9580 / 1, 9185 / 1, 985-7 / 19	Assam	[illegible]iczka bequest, [illegible]ic Soc.'s collection, ([illegible]tkinson, ?.
,,	976 / 19	E. Cachar	J. [illegible]d-Mason.
,,	9137 / 1, 9139-40 / 1, 9142-9 / 1, 9378 / 1	Pegu	[illegible]a bequest, [illegible]rz.
	861-871[1] / 19, 3272[1] / 19	Kawkareik, Tenasserim	
,,	9549 / 19	Misty Hollow, W[illegible]a Hills, Tenasser[illegible]	F. H. Grav[illegible]
,,	945-953 / 19	Bet[illegible]ow and Sukli, top of [illegible]lls, 2100-2500 ft.	F. H. Gravely.
,,	1041-3 / 19	Between [illegible]ng and Sukli, E. side o[illegible]ills, 000-2100 ft.	F. H. Gravely.
,,	2913 / 4, 872-96 / 19, 898 / 19	Tenasser[illegible]	J. Wood-Mason.
,,	5875-6 / 10, 5879-85 / 10, 5887 / 10, 5889-92 / 10, 897 / 19, 899-944 / 19	Upper T[illegible]m	J. Wood-Mason.
,,	7729 / 4, 7726 / 4, 7737 / 4, 7740 / 4, 7748 / 4, 7754 / 4, 7888 / 4, 7891 / 4, 7897 / 4, 7936 / 4, 8102 / 4, 8105-6 / 4, 90 / 5, 8763-4 / 5, 665 / 6	Tavoy	Museum Collector.
,,	9168 / 1, 9381-2 / 1, 9486 / 1	Mergui	Stoliczka bequest, Dr. W. Abbay. ?
	9356-8 / 1, 9515 / 1, 960-1 / 19	Johore, Malay Peninsula	J. Wood-Mason. ? ? Museum Collector.
,,	4491-5 / 10, 4497 / 10, 4499-4504 / 10	Perak, Malay Peninsula	Moti Ram.
,,	2866 / 19	Java	H. E. Andrewes.

[1] Specimens selected to show the full range of continuous variation from a series of 47 specimens taken fro[illegible]ony. No. 3272/19 is from the same colony.

[illegible]pirit.

I have also seen specimens from Buxa (Duars) in Mr. Andrewes' collection; one from Silonbari at the base of the Lakhimpur hills in Mr. Stevens' collection; and specimens in the Dehra Dun collection from Kochugarh, Goalpara District, 14-v-06; Kapti, Chittagong Hill Tracts; and Chadaur, Assam, 9-iv-06. In th collection there is also a specimen said to be from M but as bel also bears the name *Lucanus lunifer* it has probably n another insect. This somewhat improbable locality mu

Description—*Length* 19·5– *labrum* punctured and ha ior margin more or less concav ngle or less rounded or acute; sides stro vex or almost straight, th direction parallel, or slightly convergent behind. *Man-dibles* strongly an outer side; upper tooth well developed; lowest terminal tooth somewhat sma an and posterior to the other two; anterior lower tooth double, its anterior par and sharply pointed in unworn specimens, the posterior part extending bac as a narrow and more or less bilobed ridge, less completely separated from ner on the right side than on the left, and much more extensive in lar an in s—in the latter it may be obsolete. *Mentum* with some large p of, a pair of V-shaped, crescentic, or almost circular *Head* distinctly ith round punctures which may be replaced in erior half by an obscure l rugosity; frontal area very variable in (compare figs. 52*b-c*), usually tra more or less distinct median distance between two inner tubercle verage about equal to that ween these tubercles and the outer atter being situated about half way between the former and the an f the head; the exact proportions between these distances depends on the frontal area; even when this is at its broadest, the distance between the bercles is scarcely twice as great as that between the inner and outer tuber lian tubercle distinct, obscure, or obsolet uptly truncate, prominent in large specimens but as a rule in sma etal ridges short, not extending to the supra-orbital ridges. *Pronotum* smooth highly polished above; thickly punctured at the sides, especially in the anterior gles and the neighbourhood of the scars; median groove strongly developed. *Lateral plates* of lower side of prothorax more or less punctured in front of the coxae, unpunctured behind. *Prosternum* smooth and highly polished between and behind coxae, keel sometimes strongly grooved transversely in front, anterior median semicircular area dull and radially grooved, lateral areas finely punctured behind with a row of hair along their posterior margins. *Scutellum* with usual median hairy patch on anterior margin, otherwise smooth and highly polished; *mesothoracic episterna* strongly punctured abov along anterior margin; *mesosternum* smooth and highly polished, except in lateral angles which are dull, and in scars which are often finely roughened; these scars do not extend to the posterior margin of the sternum; they are very sharply defined on the inner side, and often also (to a less degree) on the outer side, which does not always coincide with the outer margin of the sternum; a few pu metimes present behind the scars. Central area of *metasternum* polished

with or without a few symmetrically arranged depressions of greater or less distinctness, not in contact with lateral areas; lateral areas narrow, parallel sided or nearly so, more or less rugose; intermediate areas strongly punctured. Posterior parts along anterior margin more or less roughened or punctured. *Abdominal sterna* finely punctured strongly in a mot[tled] margin (absent completely in the last two segments), and more from last segment with a patch of very variable size (sometimes absent throughout). Lateral grooves about as broad as the smooth and polished. *Elytra* polished punctures extended to form short transverse grooves, the ridges between them, their th[ird] rib broader than the fifth in part, the tenth broader throughout.

Habits.—This species is gregarious, it lives under the bark of logs which have rotted till their outer parts have lost their strength.

2. L. DENTATUS var. GLABRIVENTRIS, n. var.

Regd. No.	9134/1, 9340/1, 9513-4/1	Andaman Isles	a bequest [illegible] Wood-
	2913/5, 4083/6, 8141/7		
	8725-3/10, 8727/10		
,,	2867/19	Java	H. E. Andrew[s]
,,	2868/19	Borneo	
,,	7673/3	Ph[ilippines]	East India C[ompany's] Museum.

This variety is not a very distinct [form], forms intermediate between it and the typical form being sometimes found. It is represented in the Sarawak Museum collection by a specimen from Mat[ang] and another from Kuching—the former is of about the same size as the And[aman] and Philippine specimens in the Indian Museum collection (24·5–29 mm.), the latter is much smaller than any other specimen I have seen (21 mm.). Mr. [illegible] specimens from Borneo and Java.

Description.—Differs from the typical form only in having the frontal ridges of the *head* normally rising from a short anterior prolongation of the central tubercle; and especially in the smaller size of the triangular punctured areas of the *abdominal sterna*, those of the last segment having almost always disappeared.

Leptaulax cyclotaenius, Kuwert.

1. L. CYCLOTAENIUS, Kuwert, s. str.

Pl. xiii, fig. 53.

Regd. No.	9431/1, 9567/1	Johore	J. Wood-Mason, ?
	6491-2/14	Sinkep I.	Moti Ram.
,,	2612/19	Kuching	Sarawak Museum.
,,	2613/19	Penrissen	

Description.—*Length* 14–16 mm. A somewhat smaller and much flatter insect than the [typical] subspecies, from which it further differs in the following points [illegible] *head* perhaps a little longer; *mesosternum* finely roughened

along outer margin, otherwise highly polished with fine puncturing in middle and usually behind scars also; intermediate areas of *metasternum* as in *L. dentatus*.

2. L. CYCLOTAENIUS subsp. HIMALAYAE, Kuwert.

Regd. No. $\frac{3749}{19}$ Dikrang Valley } Colonel Godwin-Austen.
" $\frac{3747\text{-}3748}{19}$ Dafla Expedition }
" $\frac{3196\text{-}3207}{19}$ Renging, [illegible], 2150 ft. } C. F. Kemp.
" $\frac{3185\text{-}8}{19}$ [illegible]um.

Differs from *L. dentatus* in the following respects only.

Description.—*Length* [illegible] as in *L. humerosus* except that the parietal ridges [illegible] me-only. *Head and* [illegible]ntal areas always semicircular. *Mesosternum* very variable; what longer and [illegible]n the latter case always,[1] in the former usually, with some large rough or polish[illegible]l area of *metasternum* more or less strongly punctured; inter-punctures. C[illegible] somewhat broader in their narrowest part, with the outer margin mediate areas [illegible] imperfectly defined. Posterior parts of *hind coxae* usually quite frequently so[illegible] usually more extensively punctured than in *L. dentatus*, roug[illegible] Abdo[illegible] and the greater part of the rest punctured. All some[illegible] of *elytra* of abo[illegible]idth.

late[illegible]*its*.—Mr. Kemp informs [illegible] got this species from under very thin [illegible]ghtly attached to the logs it [illegible]e only found it on the crest of the [illegible]at Renging.

L. macassariensis [illegible]ubsp. anibarbis, Kuwert.

[illegible] 54.

Regd. No. $\frac{6206}{19}$ Penriss[illegible] Sarawak Museum.

Represented in the Sarawak Museum [illegible]ion by two specimens from Penrissen, one of them f[illegible]

Description.—L[illegible] [illegible]vex and rather coarse-looking species, closely resembling in general appea[illegible]he much smaller form *L. cyclotaenius* subsp. *himalayae*, from which it differs in [illegible] following respects only. Angle of outer side of *mandible* obsolete. Parietal ridg[illegible] of *head* more as in *L. cyclotaenius*; outer tubercles rudimentary, situated about twi[illegible] as far from anterior angles of head as from the long inner tubercles. *Mesosternum* as in *L. humerosus*, but with the scars and dull lateral bands less sharply defined. Central area of *metasternum* unpunctured. Posterior parts of *hind coxae* polished.

Leptaulax anipunctus (Zang).

Pl. xiii, fig. 55.

Regd. No. $\frac{1135}{19}$ Sansi Gorge, Chinese Frontier, Upper Burma, 6000-8000 ft. C. W. Beeb[illegible].

Description.—*Length* 18 mm. *Mandibles* as in the following species. *Head* coarsely but not very distinctly striate in front, unpunctured [illegible]cept right at the back; frontal area broad, the inner tubercles being about [illegible] from one

[1] In the specimens I have seen, but not in those descri[illegible]

another and from anterior angles of head; outer tubercles longer than inner, and situated only about $\frac{1}{3}$ of the way from them to anterior angles; parietal ridges short as in *L. dentatus*[1]. *Pronotum* rather sparsely punctured in anterior angles and beside [illegible] more closely in scars. *Scutellum* and *mesothoracic episterna* as in *L. dentatus* and *L. bicolor*; *mesosternum* polished, the surface of the scars uneven, their inner walls [illegible] *metasternum* with [illegible] the whole length of the plate. Central area of [illegible] arranged in [illegible] lateral groups [illegible] in front, and a few large punctures linear, sli[illegible]oughened; intermediate areas smoo[illegible] half way back; lateral areas inner [illegible] of posterior division. *Hind coxae* and [illegible]apt for some punctures near highly polished. *Elytra* much as in *L. bicolor*, the grooves a[illegible]*terna* smooth and and the punctures correspondingly coarser, but scarcely transver[illegible]roader, however,

Leptaulax bicolor (Fabricius).

1. L. BICOLOR (Fabricius), s. str.

Pl. xiii, fig. 56.

Regd. No.	$\frac{1119}{19}$	Naga Hills	
,,	$\frac{3194}{19}$	Janakmukh, 600 ft.,	S. W. Kemp[illegible]
,,	$\frac{1120\text{-}2}{19}$	Dafla Expediti[illegible]	H. H. Godwin-A[illegible]
,,	$\frac{1121\text{-}6}{19}$	Dikr[illegible]ern frontier	H. H. Godwin-Aust[illegible]
,,	$\frac{9506}{1}$	Duns[illegible] Assam	?
,,	$\frac{1127}{19}$	Dunsiri V[illegible]	H. H. Godwin-Austen.
,,	$\frac{9187}{1}$ $\frac{9189\text{-}93}{1}$ $\frac{9195\text{-}9}{1}$	Sikkim	Stoliczka bequest, etc.
,,	$\frac{9200\text{-}3}{1}$ $\frac{9208\text{-}10}{1}$ $\frac{9212\text{-}8}{1}$		
,,	$\frac{9221\text{-}3}{1}$ $\frac{9225\text{-}8}{1}$ $\frac{9230\text{-}1}{1}$		
	$\frac{9234\text{-}9}{1}$ $\frac{9503\text{-}4}{1}$ $\frac{1129\text{-}51}{19}$		
,,	$\frac{9172\text{-}3}{1}$ $\frac{9564\text{-}66}{1}$ $\frac{9494\text{-}5}{1}$	Darjeeling [illegible]	Stoliczka bequest, J. Wood-Mason. ?
,,	$\frac{2869\text{-}72}{19}$	Nilgiri Hills	H. E. Andrewes.
,,	$\frac{1133}{19}$	Between Su[illegible] and Misty Hollow, Dawna Hills, Tenasserim, 2100–2500 ft.	F. H. Gravely.
,,	$\frac{1132}{19}$	?	?
,,	$\frac{2614\text{-}6}{19}$	Kuching, Sarawak	Sarawak Museum.
,,	$\frac{2873\text{-}5}{19}$	Mt. Kina-Balu, N. Borneo	H. E. Andrewes.

[1] Zang placed this species in his genus *Leptaulacides*, which is characterized by the possession of long parietal ridges, and in the type specimens there is less of a break than in ours, between these ridges and the supraorbital ridges. In our specimen the break, on one side especially, is of a somewhat uncertain character, and I hesitated for some time before definitely describing the parietal ridges as short. Subsequent observations of additional specimens have convinced me that the nature of these ridges is variable in all species which fall, in the arrangement adopted here, between (but not including) the typical species *L. dentatus* and *L. bicolor*.

[illegible] subject to particularly great variation as in other species.

This form is represented in the Sarawak Museum collection by specimens from Kuching, Matang Rd., 4th mile Rock Rd., Mt. Kinabalu 5000–6000 ft., and Lingga; in Mr. Andrewes' collection by specimens from Karkur Ghat (1500 ft., May 1911) and Nadgam (2500 ft., Oct. 1910) in the Nilgiris, and from Kuching and Mt. [illegible] Borneo and from Java; and in Mr. Stevens' collection by a specim[illegible] Silombari at the base of the N. Lakhimpur hills in Assa[illegible].

Description.—Length 16–25 mm. [illegible]s in the previous species of the genus. *Mandible*[illegible] angular, upper tooth [illegible]ped, though less prominent than in *L. de*[illegible]; in front of it a characteristic obli[illegible] which forms an equally [illegible] tooth in large specimens but is often imperfe[illegible]sent in very small o[illegible]terior lower tooth simple on right side, simple or faintly lobed on left. [illegible] more or less clearly punctured in depressions; frontal area usually traver[illegible] a more or less distinct median ridge, more or less longitudinally rugose, [illegible]ble in form but normally much broader than in *L. dentatus*, the inner tub[illegible]eing at least twice as far from each other as from the smaller oute[illegible]bercles [illegible]rea connected to central tubercle by narrow median ridge; pariet[illegible]r as margin of supra-orbital ridges, low but sharply crest[illegible]g their ante[illegible]; canthus less prominent than in *L. dentatus*. *Pro*[illegible] with strong median [illegible] large specimens strongly and somewhat c[illegible]punctured in and around [illegible]arsely near angles; in somewhat [illegible] specimens the puncturing [illegible]is denser, and in smaller ones [illegible] the pronotum is equally d[illegible]ured along the whole of the sides. *Prothorax beneath* as in *L. dentatu*[illegible]nd *mesothoracic episterna* also as in that species. *Mesosternum* with inner w[illegible]mally short and straight (rarely longer and more or less curved), the surface o[illegible] polished, becoming often more or less roughened or rugulose (in small specim[illegible]ecially) and sometimes dull in the lateral angle[illegible]ply defined, in most large specimens highly polished as in [illegible]ones usually roughened at least in front by fine close puncturing of varying distin[illegible], a few large scattered punctures sometimes present; anterior intermediate ar[illegible]nely punctured; a broad unpunctured band extending from anterior intermediat[illegible]rea between central and lateral areas along whole outer border of posterior intermedi[illegible]e area, the inner angle only of which area is punctured in large specimens and that sparsely; lateral areas narrow, linear, rough. *Hind coxae* quite smooth and polished, punctured, or rough. *Abdominal* sterna with lateral punctured areas well developed, otherwise smooth or more or less extensively and distinctly punctured, the whole of the last segment and the greater part of the last but one being densely punctured in some specimens; especially [illegible]l ones. Lateral grooves of *elytra* not wider than the ridges between them, the strong punctures with which they are marked not distinctly drawn out to form transverse grooves.

Habits.—Mr. H. L. Andrewes tells me that the much-flattened examples of this species which he sent to Mr. H. E. Andrewes from the Nilgiris [illegible]btained in Karkur Ghat and adds, "It is gregarious and seems, as its shap[illegible]ne to

suppose, to keep between the bark and the wood of decaying trees instead of working into the rotten wood as the other Passalidae I know do."

2. L. BICOLOR var. VICINUS (Perch.).

Pl. xiii, fig. 56*a*.

Regd. No.	[illegible]		I. M. Mackwood.
,,	2622/19	[illegible]	Colombo Museum.
,,		Dimbula, [illegible]	
,,	[illegible]/7	Rangoon	?
	6127/14	Moulmein	Collector.
,,	9175-7/1, 9318-23/1, 9325-32/1; 9334-9/1, 9341-51/1, 9353-5/1; 9486-7/1, 9487-8/5, 4086/5; 3721/10, 3724-6/10, 3728/10; 3730-2/10, 1157-8/19	Andamans	Stolic[illegible]quest, J. W[illegible]on, etc.
,,	9178/1, 9181/1, 9184-5/1; *3859-61/1, 9499/1, 9501/1; 519/6, 6425/14, 1139/19	Nicobars	
	2877-8/19	Ja[illegible]	
,,	2876/19	Batjan	
,,	6307/14, 6309/14, 1141/19	Sinkep Is[illegible]	
,,	7074/3	Philippi[illegible]	
,,	1140/19	?	
	2617/19	Kuchi[illegible]	
,,	2618/19	Borneo	

This form is represented in the Sa[illegible]Museum collection by specimens from Kuching and Matang Road, in the Colo[illegible] Museum collection by specimens from Gamaduwa and Dimbulla, in Mr. Green's collection by specimens from Pundaloya, and in Mr. Andrewes' collection by specim[illegible]s from Java and Batjan.

Description.—Length 13–25 mm. Differs from the typical form in the following respects only. Frontal area of *head* as a rule somewhat more nearly rectangular in shape. *Pronotum* less strongly punctured; large specimens with a few sparce punctures in anterior angles, a few set very close together in scars and, as a rule, a few more scattered near outer margin; small specimens more densely punctured, especially in neighbourhood of scars.[1] Mesosternum always highly polished, its scars with inner wall usually longer and more strongly arched. Puncturing of intermediate areas of *metasternum* sometimes less distinct or more irregular; central area always highly polished. Lateral punctured areas of *abdominal sterna* more or less obsolete.

[1] The p[illegible]f the pronotum in small specimens is very like that found in larger specimens of the [illegible]ve not seen any with the uniformly dense marginal puncturing found in most [illegible]orm.

Leptaulax roepstorfi, Kuwert.

Pl. xiii, fig. 57.

This species and the next are the most strongly flattened forms known to me.

Regd. No.	$\frac{3172\text{-}87}{19}$	Yambung, 1100 ft.	Kemp.
,,	$\frac{3188\text{-}93}{19}$	Rotung	
,,	$\frac{1145}{19}$	Hollow, W. side of Dawna	N.
		Hills, Tenasserim, c. 2200 ft.	
,,	$\frac{6401}{14}$	Tenasserim	?
,,	$\frac{7692}{1}$	Tavoy	Museum Collector.
,,	$\left\{\begin{matrix}\frac{\quad}{\quad} & \frac{4101}{5} & \frac{4111}{5} \\ \frac{3735\text{-}6}{19} & \frac{6402}{14} & \end{matrix}\right\}$	Andamans	J. Wood-Mason, etc.

Description ... 17–18 mm. *Mandibles* sometimes without ridge between upper ... ; otherwise as in *L. bicolor*. *Head* proportionally broad ... er tubercles more widely separated from outer tub ... parietal ridges less overhanging. *Prono-t* ... edian groove; very sparsely, punc- ... terior angles; *prothorax beneath*, ... preceding species of the genus; *meso-* ... entral area occasionally marked with ... unpunctured, often more or less ... te areas, more rarely in posterior ... not in contact with central area. ... ooth and polished, mostly rough. *Abdominal sterna* ... band and lateral patches of punctures of variable extent; terminal sternum ... or more or less covered with more or less indistinct punctures. Lateral groove ... *elytra* not broader than ridges between them, their strong punctures not drawn ... transversely.

Habits.—Mr. Kemp tells me that this species lives, in company with flattened Staphylinids and many other kinds of beetles, in deep fissures in very hard jack-fruit logs.

Leptaulax planus (Illiger).

Pl. xiii, fig. 58.

Regd. No.	$\frac{8634}{5}$	Tenasserim[1]	Museum Collector.
,,	$\frac{8771}{5}$	Tavoy	Museum Collector.
,,	$\left\{\begin{matrix}\frac{9388\text{-}9}{1} & \frac{9391\text{-}9402}{1} \\ \frac{9568}{1} & \frac{6391\text{-}5}{14}\end{matrix}\right\}$	Johore, Malay Peninsula	J. Wood-Mason, etc.
,,	$\frac{9569}{1}$ $\frac{8511}{1}$	"Malacca"	

[1] According to Register "Hills between Tenasserim and Siam, about ..."

Regd. No.	$\frac{2619\text{-}20}{19}$	Borneo	Sarawak Museum.
,,	$\frac{6398}{14}$ $\frac{6400}{14}$	Sinkep Island	Museum Collector.
	$\frac{1149}{19}$	Mujang, Sarawak, Borneo	C. W. Beebe.

Specimens [illegible] Sarawak Museum from Kuching, Matang Road, Sadong and Paku.

Description [illegible] from *L. roepstorfi* in the following characters: *Mandibles* with a minute [illegible]ve at base of upper terminal tooth [illegible] specimens. Frontal area of *head* usual[illegible]he middle line and mor[illegible]anded behind. *Pronotum* somewhat more thickly a[illegible]nly punctured at sides. *Mesosternum* with inner wall of scars more or less incom[illegible]behind; central area more often, and sometimes also more distinctly, roughened [illegible]ly punctured; central area of *metasternum* normally marked thus; intermediate ar[illegible]sing metasternum strongly punctured throughout. *Hind coxae* polished. Abdomi[illegible] that na uniformly marked with large shallow punctures quite unlike those found [illegible]d a [illegible]er spe[illegible]s of the genus that is known to me.

[illegible]; and th[illegible]s majori[illegible]riginal [illegible]s of tha[illegible]en th[illegible]e averag[illegible]

Genus TRICHOS[illegible], Kaup

Tricho[illegible]horeyi, Kaup.

Described from a single specime[illegible] Luzon, in the Hamburg Museum all collection.

Description.—*Length* 24 mm. *[illegible]ppendages* much as in the specimen of *Leptaulax bicolor* shown on pl. xiii, [illegible] the middle lower tooth of both mandibles is, however, somewhat more [illegible]e median tubercle of the anterior margin of the head is obsolete; the frontal a[illegible] larger and almost rectangular; and on the me[illegible] are [illegible] sharply bent than is usual in the genus *Leptaulax*. *Pron*[illegible] with strongly developed median and marginal grooves, former scarcely com[illegible]e in front, latter markedly incomplete across middle before and behind; a few p[illegible]ctures devoid of hairs present in anterior angles, in anterior extremities of two halves of marginal groove, and above scars; scars and rest of marginal groove thickly set with hair-bearing punctures. *Lateral plates* of prothorax smooth in front and behind, somewhat sparsely punctured and hairy between ends of coxal cavities and lateral margins. *Scutellum* with a few distinct punctures near middle. *Mesothoracic episterna* punctured above and along almost[illegible] length of anterior margin. *Mesosternum* smooth except in scars which are rugose. Lateral areas of *metasternum* narrow, linear, finely roughened, widely separated from central area; posterior intermediate areas punctured beside inner margin, smooth laterally and behind. *Hind coxae* and *abdominal sterna* almost entirely smooth. *Elytra* with lateral grooves more strongly punctured than dorsal, punctures of last fou[illegible] somewhat confused with somewhat smaller hair-bearing punctures with[illegible] between them are thickly covered.

5. THE VARIABLE SPECIES.

One of the most striking features of the species of Oriental Passalidae, as these have been defined above, is that a few of them are remarkably variable in size, whereas most are not. The two most variable species are found in the Leptaulacinae. They are *Leptaulax bicolor* (length 13–25 [illegible]) and *[illegible]entatus* (19·5–37 mm.). Of both of them the largest [illegible] are about twice as long as the smallest. Next to th[illegible] species [illegible] *Episphenus indicus* (25–41 mm.), *Epist[illegible] comptoni* (27·5–42 mm.) and [illegible] *grandis* (northern race, wh[illegible] been better able to study than southern one[illegible] mm., total range of sp[illegible]luding southern forms, 33–54 mm.), of each of which the largest specimen [illegible] a little more than half as long again as the smallest. Of the remaining species of Oriental Passalidae none appear to vary in size in any such strikers of a single co[illegible] most variable, as far as my own observations go, are *Aceraius hel[illegible]* ively little one from a[illegible] *humerosus* (15–20), *Leptaulax planus* (11–14 mm.), *Pl[illegible]* ely uniform in structure also. [illegible] ent individuals, instead of different co[illegible] and *Ophrygonius cantori* (*s. lat.*, 27–34 mm.), conducted with great caution; f[illegible]ens are somewhat more than one and a quarter times series from different colonies, i[illegible] *Ceracupes austeni* (20–25 mm.) and *Tiberioides* number of more or less distinct ty[illegible] the largest specimens are just one and a any other has led, on account of th[illegible] allest, followed by others little less variable *L. bicolor* and *L. dentatus*, to the appalli[illegible] all th[illegible] *Leptaulax dentati[illegible] Episphenus indicus*, *Episphenus comp-* genus[illegible], and *Aceraius grandis* are all [illegible]cies, so it is natural to suppose that their range of variation may be l[illegible] known than that of other species, most of which seem to be less abu[illegible]t if this was the real and only reason for their apparently exceptional variabi[illegible] ought to find isolated examples of unusual dimensi[illegible] of the many rarer species, and such are n[illegible], a[illegible] in length of all specimens of the long series I have seen of *Episphenus neelgh[illegible]* is sufficient to indicate that even species closely allied to those of exceptional varia[illegible] may be remarkably constant. *Tiberius andamanensis* and *sikkimensis*, too, are re[illegible]sented in our collection by uniform series of sufficient size to render it practically [illegible]rtain that these species do not vary in length to any great extent.

I have examined over a hundred specimens of each of the five variable species, except *Episphenus comptoni*, of which I have seen only thirty-eight[1]; so it is not surprising that the continuity of the variation in length of the specimens before me, is much more broken in this species than in any of the others. But for the presence among these of three specimens from Bulutota, of which one is 27·5, one 30, and one 37 mm. long, all the evidence would point to the species being divisible into two groups distinguished from one another by size alone, in view of which I have thought it best provisionally to describe these groups above under separate names, since names already in use can be applied to both of them. To m[illegible]d, however,

[1] I have since seen a number of additional specime[illegible]

5. THE VARIABLE SPECIES.

One of the most striking features of the species of Oriental Passalidae, as these have been defined above, is that a few of them are remarkably variable in size, whereas most are not. The two most variable species are found in the Passalinae. They are *Leptaulax bicolor* (length 13–25 mm.) and *Leptaulax dentatus* (19·5–37 mm.). Of both of them the largest specimens are about twice as long as the smallest. Next to these in variability are the species of *Episphenus*, *Episphenus indicus* (25–41 mm.), *Episphenus comptoni* (27·5–42 mm.) and *Acerainus grandis* (northern race, which I have been better able to study than southern ones, 25–45 mm., total range of species including southern forms, 33–54 mm.), of each of which the largest specimens are a little more than half as long again as the smallest. Of the remaining species of Oriental Passalidae none appear to vary in size in any such striking degree as the most variable, as far as my own observations go, are *Acerainus helvolus* (relatively little variable, 15–20), *Leptaulax humerosus* (15–20), *Leptaulax planus* (11–14 mm.), *Pleurarius* (extremely uniform in size, 35·5–45 mm.) and *Ophrygonius cantori* (*s. lat.*, 27–34 mm.), of which individuals, instead, the largest specimens are somewhat more than one and a quarter times as long as the smallest. *Ceracupes austeni* (20–25 mm.) and *Tiberioides kuhlii* (34–44 mm.), in both of which the largest specimens are just one and a quarter times as long as the smallest, are followed by others little less variable themselves; and so on through all the species.

Leptaulacides bicolor, *Leptaulax dentatus*, *Episphenus indicus*, *Episphenus comptoni*, and *Acerainus grandis* are all comparatively rare species, so it is natural to suppose that their range of variation may be more imperfectly known than that of other species, most of which seem to be less abundant. But if this was the real and only reason for their apparently exceptional variability, one ought to find isolated examples of unusual dimensions among the specimens of the many rarer species, and such are not found. The continuity in length of all specimens of the long series I have seen of *Episphenus neelgherricus* is sufficient to indicate that even species closely allied to those of exceptional variability may be remarkably constant. *Tiberius andamanensis* and *sikkimensis*, too, are represented in our collection by uniform series of sufficient size to render it practically certain that these species do not vary in length to any great extent.

I have examined over a hundred specimens of each of the five variable species, except *Episphenus comptoni*, of which I have seen only thirty-eight[1]; so it is not surprising that the continuity of the variation in length of the specimens before me, is much more broken in this species than in any of the others. But for the presence among these of three specimens from Bulutota, of which one is 27·5, one 30, and one 37 mm. long, all the evidence would point to the species being divisible into two groups distinguished from one another by size alone, in view of which I have thought it best provisionally to describe these groups above under separate names, since names already in use can be applied to both of them. To me, however,

[1] I have since seen a number of additional specimens

the Bulutota specimens indicate with sufficient clearness that a larger series would prove the range of variation to be perfectly continuous, as it is in the other four variable forms; for which reason I have described them above without the introduction of a name. This view, as will be seen later, is further supported by the fact that *Epispa[illegible]uptoni*, a gregarious species, is the only asymmetrical member of the Aceraiinae [illegible] is also the commonest member of that sub-family living in th[illegible]

The sp[illegible]m which my descript[illegible] *phenus indicus* and *Aceraius grandis* [illegible]*rsutus* were drawn up show, as a w[illegible]no breaks in the continuity of th[illegible]e of variation in length. Moreover they see[illegible]ate that different colonies differ from one another in average size, and that t[illegible]ths of different members of any one colony do not usually differ very greatly [illegible]from another. The evidence is most definite in the case of *Aceraius grandis*. [illegible]f a series of 38 specimens of this species known to have been taken from [illegible]le colony at Janakmukh, 37 show a continuous range of length from 36 to [illegible], the remaining specimen being 33 mm. long; and again, the specimen[illegible] form [illegible]gle short series of individuals all between 38 and 40 m[illegible] [illegible]and, two specimens, presumably of opposite sex, ta[illegible] [illegible]ung were 34 and 41 mm. long respectively. S[illegible] [illegible]d small specimens may be quite well[illegible] spring tend to be to of a mo[illegible] mens in each colony are the descend[illegible] which do not leave their home until th[illegible] either found new colonies or enter t[illegible] they may differ very considerably.

Such evidence as is available re[illegible] points in the same direction. *Leptau*[illegible] by over three hundred specimens, wh[illegible]na[illegible]length is unbroke[illegible] but when these are arranged according t[illegible]nties from which they come, it is found that those from each well-represented loca[illegible] fall into several separate series, each of which probably includes only specimens [illegible]m colonies that are not represented in any of the other groups, unless it be by one[illegible]r two specimens that have come into the colony from outside. I have not attempted to make any elaborate measurements with which to support these facts; for length measurements of dried Passalids are only approximately comparable one with another, on account of the variable extent to which the back of the head and front of the metathorax are telescoped into the prothor[illegible]and breadth measurements are so variable in proportion to length that it would be still more misleading if I were to use them as an index of length. The following measurements of the extreme members of each of the several unbroken series, into which the specimens from each of our three best represented localities appear to the unaided eye to fall, will I think give a better idea than anything else

[1] Since the above was written I have obtained direct confirmation of the continuity of the variation found in this species. See below, p. 282, footnote.

of what has been found. Out of 46 specimens labelled "Upper Tenasserim" 17 are 21·5–24·5 mm. long; 2 are 26·5 and 28 mm. long respectively; and 27 are 30–37 mm. long. Out of 45 specimens labelled "Tenasserim" 21 are 21–24·5 mm. long, 1 is 27·5 mm. long; and 23 are 30–35 mm. long. And out of 43 speci[illegible] "Sikkim" 2 are 19·5 and 20 mm. long respectively, 8 [illegible] 21–23 m[illegible], and 33 are 24·5–31 mm. long. On the other hand, 47 sp[illegible]ave been collected from a single colony at Kawkareik [illegible]nd form a single unbroken series.

Leptaulacides bicolor is [illegible]ually variable in the extent to wh[illegible] body is flattened, as well [illegible]l length, and in the extent to which certa[illegible]s are punctured. For [illegible]ason, and partly, perhaps, because the specimens I have seen belong in almo[illegible]al numbers to two different forms of the species, which must, at least provisio[illegible] be treated separately, these specimens have proved not to be nearly enough to for[illegible]isfactory basis for any full account of the manner in which different colonies vary [illegible]m another. It appears, however, that size is not a character that [illegible]t all [illegible]e of any great importance for the sub-division of the speci[illegible]s.

[illegible]is, as in other variable species, probably differ co[illegible]ze, which suggests that they may be com-[illegible]tigations on a collection in which [illegible]e to be taken as units, must be [illegible]e in collections of a number of short false appearance of the constancy of a [illegible]n confident that this fact more than [illegible]ble variability of the common species [illegible]plication of so-called species of the [illegible]ion, to replace the individual as the unit for taxonomic [illegible] species, and it is partly in the hope that collectors will turn their attention to c[illegible]ng separate colonies, and partly to avoid adding to what I am convinced is largely [illegible]meaningless multiplication of names, that I put forward here, on the somewhat inc[illegible]clusive evidence at present before me, the hypothesis that members of any one P[illegible]ssalid colony are much more uniform than the species as a whole when this is markedly variable.

In connection with this hypothesis it would be interesting to know how long logs of different kinds can remain suitable for the habitation of a single species of Passalid under the normal conditions of different jungles, and the length of time occupied by the life cycle of different species of Passalidae in various localities, togeth[illegible]with any facts relating to the period or periods of reproduction of individual pairs. For if logs rot more rapidly than colonies can be formed, it would follow that colonies are produced by the attraction of suitable food; in which case the members of each would be unlikely to have a common descent, and it would no longer seem [illegible]probable that members of a single colony should be more uniform than the species to which it belongs.

In the Passalidae, as in the Lucanidae, variation in certain structural characters is found to be more or less closely correlated with variation in size. The mandibles of a Passalid never attain anything approaching the remarkable development of [illegible] Lucanid except in the genus *Ceracupes*, the species of which are not known to vary [illegible] two of the most variable Passalids—*Aceraius grandis* sub-sp. *hir*[illegible]*tus* (? s. str. only)—their dentition is less complex in sm[illegible] former the upper tooth of the left mandible i[illegible]ouble in very large specime[illegible]8*a*), but not in medium sized (fig. 28[illegible]all ones; and in the latter, the anterio[illegible]f the left mandible is t[illegible]tate in large specimens (fig. 52) and bidentate (so[illegible]arcely more than unidentate) in small ones (fig. 52*d*).

The processes of the anterior margin of the head on the oth[illegible]d tend to be more acute, and often proportionally longer, in small specimens [illegible] in large ones, when any such differences are found. This is best seen in the [illegible]ses developed from the anterior angles of the head in *Episphenus indicus* [illegible] *ceraius grandis* (? sub-sp. *hirsutus* only) as will be seen on com[illegible] and fig. 28 with fig. 28*a*. A somewhat similar phenom[illegible]ae in the genus *Aegus*. In large specimens of certa[illegible]*nsis* and *A. roepstorffi*) the front of the head [illegible]ve the other; while in smaller speci[illegible] these disappears, the lower one is r[illegible] side by side and more distinctly separa[illegible]

The relative extent of the punctu[illegible] however, a much better instance of t[illegible] associated with variations in size, [illegible] seems to be always the small spe[illegible] species in which any such differe[illegible] Himalayan species of Dorcinae) the dif[illegible]most mar[illegible]d in the elytra, and [illegible]er that in the pronotum and sometimes t[illegible]bdominal sterna. In the Passalidae the elytra are always furrowed, and such slig[illegible] variations as occur in the extent to which the furrows are punctured, do not appear [illegible] be in any way correlated with variations in the size of the insect, nor does the puncturing of the lateral ribs of the elytra of *Aceraius grandis* appear to be so correlated; but in *Episphenus indicus* and *Leptaulax bicolor* (s. str. and to a less extent var. *vicinus* as well), the pronotum is more extensively punctured in small than in large specimens; and in *Leptaulax bicolor* the punctured areas of the abdominal sterna are commonly more extensive in small specimens than in large [illegible]

6. THE GEOGRAPHICAL DISTRIBUTION AND SYNONYMY OF THE SPECIES OF PASSALIDAE BELONGING TO GENERA FOUND IN THE ORIENTAL REGION.

The principal difficulty in drawing up this list has been the working out of the [illegible]onymy which it has involved. An attempt to discuss the distribution of Oriental

Passalidae, which does not include an attempt to deal with the synonymy of Kuwert's multiplicity of names, would be of little value, since for most species he gives only a single record; but his descriptions are so inadequate that no synonymy drawn up—as this is—without reference to a complete set of his types is likely to [illegible] from error. As, however, the large series of [illegible] I have been able to examine, especially of the genera *Episphenus* [illegible], besides showing how unexpectedly variable in size, [illegible] structure, certain species of these genera may [illegible] given me an exceptionally [illegible] ortunity of acquainting myself [illegible] nge of variation which individual [illegible] mally exhibit, I have ve[illegible] apply the knowledge thus acquired to the [illegible] of species which I ha[illegible] seen. It should be noted that the collection in the Königliches Zoologisches M[illegible] in Berlin shows that Kuwert was often himself unable to recognize his specie[illegible] econd time, and has sometimes applied the same name to quite distinct specie[illegible] ell as describing specimens of a single species under a number of different na[illegible] n examination of Kuwert's cotypes, such as I have made in a numb[illegible] f inst[illegible] herefore, so safe a guide in dealing with his synonymy as it o[illegible]

[illegible] rt of the paper every published reference to ev[illegible] sent known from the Oriental Region t[illegible] he inclusion of many species with [illegible] completeness of the synonymy [illegible] nt genera. The names of genera and [illegible] marked with an asterisk, as also are [illegible] consult. References to works which [illegible] he particular species mentioned are [illegible] w species in Kuwert's catalogue of [illegible] w names there published were *nomina nu*[illegible] and remained such [illegible] the pu[illegible] f his dichotomous tables in 1896–1898. The word "part" in square brackets in su[illegible] ases indicates that two or more distinct species have been included in the author's [illegible] nonymy; but when used in connection with a published description it implies th[illegible] two or more species have been confused by the author himself when drawing up his description, no notice being taken of his synonymy. Apart from this, square brackets always indicate that a species is not known from the Oriental Region, China or Japan. A cross (†) in front of a specific name, implies that I have seen specimens to which this name has been applied by the author mentioned in the reference accompanying the name so marked.

The names of forms which I regard as distinct varieties or sub-species are included in the synonymy of the species to which I consider them to belong, as at present any attempt to recognize them separately could only lead to confusion. All Passalids recorded from "Sikkim" belong to species found in "British Sikkim", which is now better known as the "Darjeeling District"; that term [illegible] employed throughout this list in place of the term "Sikkim." And it has been found convenient to group together all localities in the Eastern Himalayas and their foothills

restricting the terms Bengal and Assam to the parts situated south of these slopes. "Malacca" has so often been used to signify the whole of the Malay Peninsula that it is unsafe to attach any more precise significance to it when dealing with old records; "Malacca" has therefore been replaced by the term "Malay Peninsula" [illegible] term [illegible] include islands situated close to the mainland, such as Singapore.

[illegible]*CLINAE.*

Members of this subfamily occur in China and [illegible] and throughout almost the whole of the Indo-Australian region; but only one species has yet been recorded from the Indian Peninsula, and none from Ceylon.

Genus COMACUPES, Kaup, 1871.

= *Aulacocyclus* [part], Kaup, 1868.

This genus occurs in the Malay Peninsula, Sunda Islands, Philippines and Celebes. "*Comacupes*" *felderi*, Stoliczka (1873, p. 152), belongs to the genus *Tristorthus*, so is omitted here.

Comacupes foveicollis [illegible]rt.

Comacupes foveicollis, Kuwert, 1891, p. [illegible]
Comacupes foveicollis, Kuwert, 18[illegible]
Comacupes † *minor*, Heller, [illegible]1-11*a*.

The hairless abdomen and practi[illegible]ctured mesosternum suggest that this species may be more closely allied [illegible]an genera *Tristorthus* and *Aulacocyclus* than to any member of the ot[illegible]ly Oriental genus *Comacupes*. The mentum is, however, more or less keele[illegible], so I retain it in the last-named genus.

In the ten specimens from Sar[illegible]the British Mu[illegible] the central tubercle is even less distinctly bifid than in the [illegible] the latter probably represents a distinct loca[illegible]

Localities:—

1. C. FOVEICOLLIS, s. str.

Borneo: Sarawak—Baram River.

2. Sub-sp. MINOR, Heller.

Celebes: N. coast—Buol.

Comacupes basalis (Smith).

Passalus † *basalis*, Smith, 1852, p. 18, pl. i, fig. 5.
Aulacocyclus comatus, Kaup, 1868*a*, p. 9.
([illegible]*clus comatus* + *Leptaulax basalis*, Gemminger and Harold, 1868, pp. 968–9).
Comacupes basalis, Kaup, 1871, p. 19, pl. iii, figs. 3*a*–3*b*.
(*Comacupes basalis*, Wytsmann, 1884, p. 329).
(*Comacupes Basalis*, Kuwert, 1891, p. 171).
Comacupes basalis, Kuwert, 1896, pp. 284–5.
(*Comacupes basalis*, Zang, 1903*b*, pp. 418–9).

Locality:—

Philippine Islands.

Comacupes cavicornis, Kaup.

Aulacocyclus cavicornis, Burmeister in Kaup[1], + *laevicornis*, Kaup, 1868*a*, p. 6.
(*Aulacocyclus cavicornis* + *laevicornis*, Gemminger and Harold, 1868, pp. 698-9).
Comacupes cavicornis, Kaup, 1871, p. 19.
(*Aulacocyclus* † *parryi*, Stoliczka, 1873, p. 150).
(*Comacupes cavicornis*, Wytsman, 1884, p. 329)
(*Comacupes Cavicornis* [part], Kuwert, 18
Comacupes † *westermanni*, Kuwert
Comacupes cavicornis, Zang
Comacupes † *c* *rneensis* + var. † *laevicornis*, Gravely, above, p 5, pl xi, figs. 1–2*b*.

All the spec identified by Stoliczka as *Aulacocyclus parryi* have proved to be in reality *Co es cavicornis* var. *laevicornis*. Zang has pointed out that Kuwert's *Comacupes wes nni*, not his *Tristorthus cavicornis*, is identical with Kaup's *Comacupes cavicorn*

alities:
Johore (? all var. *laevicornis*).
an Islands Sinkep Island (? all typical form).
a (? another form).
rneo Sarawak:—Kuching *rneensis*).

Comacup vely.

Comacupes cylindraceus (part), K , pl. iii, upper unit of fig 4.
Comacupes † *cylindraceus*, Stol
?(*Comacupes cylindraceus*, Kuwert. 85.
? *Comacupes cylindraceus* [part] Kuwert
Comacupes † *stoliczkae*, Gravely, above, p , figs. 3-3*a*.

T of *C. cylindraceus*. As pointed out above (pp. 205–6) Kaup two ylindraceus are quite distinct; and it is probably to the other that the name w st applied.

Localities:—
Malay Peninsula: Johore; ? Singa re.
Sumatran Islands: Sinkep Island.
Java.

Kuwert definitely recorded this species from Singapore in 1891; but later he appears to have doubted the correctness, either of his identification of the insect, or of the label indicating the locality from which it came.

Comacupes masoni, Stoliczka.

Comacupes † *masoni*, Stoliczka, 1873, pp. 151-2.
Comacupes Masoni, Kuwert, 1891, p. 171.

[1] Kaup appears to have described this species under an unpublished name attached Burmeister to the type specimen in Germar's collection.

[2] This record is based on a specimen in the British Museum.

Comacupes † *cylindraceus*, [part], Kuwert, 1897, p. 285.
Comacupes † *masoni*, Gravely, above, p. 207, pl. xi, figs. 4-4*a*.

Zang has suggested that Kuwert's *C. masoni* of 1897 is not Stoliczka's, and that [illegible] identical with Kuwert's *C. angusticornis*; an examination of the type of *C.* [illegible] of specimens determined by Kuwert, has confirmed the former suggesti[illegible]

Locality:

Ma[illegible]sula: Johore; Perak[1]; [illegible]ntain.[1]

[illegible]atra: Silulangit.[2]

Kuwert's 1891 record "Lahore" is doubtless a mistake [illegible] appears to have been unacquainted with the species at that time except throu[illegible]liczka's account of it.

Comacupes cylindraceus (Perty).

Passalus cylindraceus, Perty, 1831, p. 36, fig. 3.
Passalus cylindraceus, Percheron, 1841, pp. 40-1, pl. lxxix, fi[illegible]
Passalus punctifrons, Hope, 1845, p. 29.
Passalus cylindraceus, Burmeister, 1847, pp. 516-7[illegible]
(*Aulacocyclus cylindraceus* [part], Kaup, 1868[illegible]
(*Aulacocyclus cylindraceus* [part], Gem[illegible]arold, 1868, p. 968).
Comacupes cylindraceus [part], [illegible]. iii, lower unit of fig 4.
(*Comacupes cylindraceus* [pa[illegible]329).
Comacupes † *angusticornis* + † *cylindr*[illegible]*oni*, Kuwert, 1897, p. 285.
(*Comacupes cylindraceus*, Zang, 1903*b*[illegible]
(*Comacupes* † *Masoni*, Zang, 1905*c*, p[illegible]
Comacupes † *cormocerus*, Zang; 1905[illegible]
Comacupes † *punctifrons*, Arrow, 19[illegible]4.
Comacupes † *cylindraceus*, Gravely[illegible]07, pl. xi, figs. [illegible]t fig 2.

Other references to the name *cy*[illegible]under [illegible]*czkae* (previous page).

Localities:—

Malay Peninsula: S. Perak (Tel[illegible], 4000 ft.), Larut Hills, 3300–4300 ft., Singapore.
Sumatran Islands: Sinkep Island.
Sumatra—Padang; St. Rambé.
Java.
Borneo: Sarawak—Kina-Balu, *ca.* 5000 ft.; Kuching; Trusan; Penrissen 4200–[illegible]00 ft.; Klingkang.

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[1] These records are based on specimens in Berlin which I did not see in time to include any account of them in part [illegible] of this paper.

[2] There is [illegible]gle specimen from this locality in the British Museum; it is less distinct from *C. cylindra*[illegible]s than the specimens I have seen from the Malay Peninsula, the anterior part of the central tubercle, though much elevated, being angular beneath; it may perhaps belong to a distinct [illegible]ul race.

Genus TAENIOCERUS, Kaup, 1871.

= *Aulacocyclus* [part], Kaup, 1868; *Taeniocerus* [part], Kaup, 1871.

This genus includes species found in all parts of the Oriental Region except the Indian Peninsula and Ceylon.

T. platypus, K[illegible]

Aulacocyclus platypus, Kaup, 1868*a*, p. 5[illegible]
(*Aulacocyclus platypus*, Gemminger a[illegible] p. 969.)
Taeniocerus platypus, Kaup[illegible]
Aulacocyclus pla[illegible]us, L[illegible]883, p. 341.
(*Taeniocerus p[illegible]*tsman, 1884, p. 329.)
(*Taeniocerus* [illegible], Kuwert, 1891, p. 170.)
Taeniocerus [illegible]*us*, Kuwert, 1897, p. 275.

Localities[illegible]

Malay P[illegible]sula: Perak; Naungchik (Bukit Besar, 2500 ft.).[2]

Sumatr[illegible]

Borneo:[1] [illegible]

T. [illegible] bicanthatus (Percheron).

[illegible]*salus bicanthatus*, Guérin[illegible] Percheron, 1841, pp. 41-2, pl. lxxix, fig. 5.
[illegible]*ssalus bicanthatus*, Burmeister, 1[illegible]
(*Passalus bicanthatus*, Smith, 1852, [illegible]
Aulacocyclus bicanthatus, Kaup, 18[illegible]
(*Aulacocyclus bicanthatus*, Gemmin[illegible] 1868, p. 968).
Taeniocerus bicanthatus, Kaup[illegible] fig. 6.
Taeniocerus †*bicanthatus*, Stolicz[illegible]
(*Taeniocerus bicanthatus*, Wytsman, [illegible]
(*Taeniocerus Bicanthatus*, Kuwert, 1891, p.[illegible]
Taeniocerus †*bi*[illegible] ab *Awturba*[illegible] Kuwert, 1897, p. 276.
Taeniocerus †*bican*[illegible] Gravely, [illegible]8-209, pl. xi, figs. 7-7*b*.

Burmeister's description of this spec[illegible] not altogether in agreement with my observations. Neither in this, nor in eith[illegible]f the other known species of *Taeniocerus*,

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[1] Borneo is the locality given by Kaup, who m[illegible]tions 19 specimens in the British Museum. Lewis, however, speaks of "*A. platypus*, Kaup, from Tibet, of which there is a series in the National Collection" of Britain. The other localities given here are those of specimens in Berlin, which I did not see in time to include any account of them in part 4 of this paper.

[2] This record is based on a pair of specimens in the Oxford Museum.

[3] Percheron gives Guérin-Méneville as the author of this and other names, without giving a reference. In the case of *Passalus* (*Episphenus*) *neelgherriensis*, where he gives as reference "Rev. Zool. [illegible]", a search through all possible volumes of that publication has failed to reveal any mention of the species; and as Guérin-Méneville himself wrote (1843, p. 50) two years after the publication of Percheron's paper "Cette espèce a été découverte par M. Ad. Delessert sur le plateau des Neelgheries. Nous l'avons communiqué à M. Percheron, qui l'a fait entrer en notre nom, dans sa Monogra[illegible] . . . . " it is evident that Percheron was the first to publish both the name and the description. Consequently in all such cases I have attributed the species to him, giving in the synonymy, however, also the name of the author to whom he attributed it.

is the mesosternum hairy; whereas this is the case in every species of *Comacupes* known to me. Consequently, I should have had no hesitation in regarding the specimen described by Burmeister from Germar's collection, as a member of the latter [illegible] his description of the head appeared to me to be rather that of the head of the for[illegible]enus. Until the specimen is re-examined its identity must remain uncer[illegible] *mason*[illegible]ssalio[illegible] between the pro- and mesothorax, and it is quite p[illegible]n but not a[illegible] specim[illegible]omposite one, the anterior part of a *Taeniocerus* h[illegible]ng been gummed on to the poste[illegible]t of a *Comacupes*. Concerning Zang's [illegible]gestion that variations in the form of [illegible]tubercle indicate a split[illegible] into local races, see above, p. 208 footnote.

Localities:—
Malay Peninsula: Johore.
Sumatra: N. E. Sumatra.
E. Sumatra—Langkat.
Bornean Islands: Borneo.
Labuan.

Smith's record of this species from India is too vague to be of any value, since the term may easily have been used to include the whole of "Further India" as well as the Indian Peninsula.

Taeniocerus [illegible]us Kaup.

Aulacocyclus pygmaeus, Kaup, 1868*a*, [illegible]
(*Aulacocyclus pygmaeus*, Gemminger a[illegible]68, p. 969.)
Taeniocerus pygmaeus, Kaup, 1871, [illegible].
(*Taeniocerus* † *pygmaeus*, Stoliczka, [illegible]
(*Taeniocerus pygmaeus*, Wytsman, 188[illegible]
(*Taeniocerus Pygmaeus*, Kuwert, 1891, p.[illegible]
Taeniocerus † *parvus* + *pygmaeus*, Kuwert[illegible] p. 276.
(*Taeniocerus pygmaeus*, Zang, 1903*b*, p. 41[illegible]
Taeniocerus † *pygmaeus*, Gravely, above, p[illegible]09-210, pl. xi, figs. 8–8*a*.

The specimens of this species that I have seen show quite clearly that the three characters by which Kuwert separates his *T. parvus* from Kaup's *T. pygmaeus* are all of them variable. Indeed, the hook-shaped and antler-shaped pronotal scars, by which they are primarily distinguished in his table, may occur on opposite sides of the same individual.

Localities:—
Malay Peninsula.
Sumatra.[1]
Borneo [illegible]arawak—Kuching.

[1] This record is based on specimens in Berlin, not seen in time for description in part 4 of this paper.

Taeniocerus bicuspis, Kaup.

? *Passalus bihastatus* ? , Percheron, 1844, p. 13.
Aulacocyclus bicuspis, Kaup, 1868*a*, p. 5.
(*Aulacocyclus bicuspis*, Gemminger and Harold, 1868, p. 968.)
Taeniocerus bicuspis, Kaup, 1871, pp. 21–2.
Taeniocerus † bicuspis, Stoliczka, 1873, p. 152.
(*Taeniocerus bicuspis*, Wytsman, 188[illegible]
(*Taeniocerus Bicuspis*, Kuwe[illegible]176.)
Taeniocerus bicuspis, Ku[illegible]807, pp. 276–7.
Taeniocerus †[illegible]ively, above, pp. 210–211, pl. xi, figs. 6–6*a*.

Localities:—
E. Hima[illegible]s: Darjeeling Dist.—Sureil; Choongtang; Upper Tista, 4000 ft.; Gopaldhara, Rungbong Valley.
Dafla Hills—Harmutti, base of Dafla Hills; Dikrang Valley.
Abor Country—Kobo, 400 ft.; Rotung, 1400 ft.; Upper Rotung, 2000 ft.; Upper Renging.
Assam: Cachar.
N. Lakhimpur—Silonbari (base of hills).
Siam.
Malay Peninsula.
Sumatra[1].
Borneo.[1]

Genus AULAC[illegible], Kaup (1868) 1871.

= *Aulacocyclus* [part], Kaup, 1868; *Taeniocerus* [part] Kaup, 1871.

I have not [illegible]to [illegible]ept the opinions of previous authors in t[illegible]wing [illegible]enus. Blackburn (1896, p. 234) has already pointed out the difficulty of [illegible]with it. He suggests that several of the names accepted below are really synony[illegible]s. I am inclined to agree with him; but I cannot help thinking, in addition, that [illegible]e characters to which he has been driven to attach the greatest taxonomic imp[illegible]tance, are likely to prove to have been misleading, when a larger number of specimens are compared together.

The genus is centred in the parts of the Indo-Australian Region east of Wallace's Line, but occurs in the Philippines and Sunda Islands also. Only one specimen has yet been found on the mainland of Asia; it is from the Indian Peninsula.

[Aulacocyclus deyrollei, Kaup.]

Aulacocyclus Deyrollei, Kaup, 1868*a*, p. 7.
(*Aulacocyclus Deyrollei*, Gemminger and Harold, 1868, p. 968.)
Taeniocerus Deyrollei, Kaup, 1871, p. 20.
(*Taeniocerus Deyrollei*, Wytsman, 1884, p. 329.)

[1] These records are based on specimens in Berlin, not seen in time for description in part 4 of this paper.

(*Taeniocerus Deyrollei*, Kuwert, 1891, p. 170.)
Taeniocerus deyrollei, Kuwert, 1897, p. 275.
Taeniocerus deyrollei, Arrow, 1907, p. 447.

Locality:—
Australia: N. Queensland—Port Denison[1].

[Aulacocyclus mastersi, MacLeay.]

**Taeniocerus mastersi*, MacLeay, 1871, p. 174.
(*Taeniocerus Mastersii*, Wytsman, 1884, p. 329.)
(*Taeniocerus Mastersii*, Kuwert, 1891, p. 170.)
Taeniocerus mastersi, Kuwert, 1897, p. 275.

It is possible, I think, that this species and the last may prove to be identical.

Locality:—
Australia: Queensland—Gayndah[2].

[*Aulacocyclus teres (Percheron).]

Passalus teres, Percheron, 1841, pp. 39–40.
Passalus teres, Burmeister, 1847, p. 515.
Passalus teres, Smith, 1852, p. 19.
Passalus teres, Redtenbacher, 18[illegible]
Aulacocyclus teres, Kaup, 18[illegible]
(*Aulacocyclus teres*, Gemminger and Ha[illegible]9.)
Aulacocyclus teres, Kaup, 1871, pp. 15–[illegible]
(*Aulacocyclus teres*, Wytsman, 1884, p[illegible]
(*Aulacocyclus Teres*, Kuwert, 1891, p.[illegible]
Aulacocyclus teres, Kuwert, 1897, p.[illegible]

Locality:—
Australia: ? Sidney.

Redtenbacher's Sidney specimen v[illegible]ossibly has the same sort of history as his *Mastochilus politus*, concerning which [illegible] Stoliczka, 1873, p. 156.

[*Aulacocyclus tereoides, Kuwert].

Aulacocyclus Tereoides, Kuwert, 1891, p. 170.
Aulacocyclus tereoides, Kuwert, 1897, p. 277.

Locality:—
Australia.

[*Aulacocyclus aliicornis, Kuwert.]

Aulacocyclus alicornis + ab. *sulcatipons*, Kuwert, 1897, pp. 277–9.
Aulacocyclus alicornis ab. *sulcatipons*, Zang, 1905*c*, p. 230.

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[1] Not St. D[illegible] Réunion Islands (see Arrow loc. cit.).

[2] Kuwert's 1891 catalogue gives not Queensland but N.S. Wales as the locality of this species, perhaps because it was originally described in the "Transactions of the Entomological Society" of that country. This is not repeated in his later work.

Locality :—
Australia.

[* Aulacocyclus foveipunctatus, Kuwert.]

Aulacocyclus foveipunctatus, Kuwert, 1897, p. 278.

Locality :—
Australia.

[* Aulacocyclus, rotundatoclypeatus, Kuwert.

Aulacocyclus Rotundatoclypeatus, Kuwert, 1891, p. 170.
Aulacocyclus rotundatoclypeatus, Kuwert, 1897, pp. 278 and 282.

Locality :—
Australia: Cape York.

[* Aulacocyclus arcuatoclypeatus, Kuwert.]

Aulacocyclus Arcuatoclypeatus, Kuwert, 1891, p. 170.
Aulacocyclus arcuatoclypeatus, Kuwert, 1897, pp. 278 and 282.

Locality :—
New Guinea: Fly River.

* Aulacocyclus fratricornis, Kuwert.]

Aulacocyclus Fratricornis, Kuwert, 1891, p. 170.
Aulacocyclus fratricornis, Kuwert, 1897, pp. [illegible] 282.

Locality :—
? South Sea Islands or A[illegible]

[illegible]rgii, Kaup.

Aulacocyclus [illegible] pp. 7 and 8.
[illegible]nd Harold, 1868, p. 969.)
Aulacocyclus Rosen[illegible], Kaup, [illegible]
(*Aulacocyclus Rosenbergii*, Wytsman, 18[illegible]28.)
(*Aulacocyclus Rosenbergii*, Kuwert, 1891, p[illegible]0.)
Aulacocyclus Rosenbergii + *Percheroni*, Bla[illegible]urn, 1896, p. 234.
Aulacocyclus rosenbergi Kuwert, 1897, pp[illegible]79 and 282.
(*Aulacocyclus Rosenbergii*, Zang. 1903*b*, p. 419.)

Localities :—
Sumatran Islands: Nias.
Australia: Brisbane[1].

Zoogeographical considerations suggest that Kaup, in his effort to reduce the number of species of *Aulacocyclus* to five, regarded two distinct forms as one when he merged *A. percheroni* in *A. rosenbergii*. This course has, however, been followed by all subsequent authors, except perhaps Blackburn, most of them omitting any reference to the locality of the type specimens of *A. percheroni*.

[1] Kaup gives "Trisbane," but Gemminger and Harold are presumably right in regarding this as a misprint for Brisbane.

[* Aulacocyclus kaupi, MacLeay.]

**Aulacocyclus kaupi*, MacLeay, 1871, p. 173.
(*Aulacocyclus Kaupi*, Wytsman, 1884, p. 328.)
(*Aulacocyclus Kaupi*, Kuwert, 1891, p 170.)
Aulacocyclus Kaupi, Blackburn, 1896, p. 234.
Aulacocyclus kaupi, Kuwert, 1897, pp. 280 and 282.

Locality:—
Australia: Queensland—Gayndah.

[* Aulacocyclus edentulus (MacLeay).]

Passalus edentulus, MacLeay, 1826, p. 439.
**Passalus furcicornis*, Boisduval, 1835, p. 242.
Passalus cylindraceus, Percheron, 1835, pp. 103–4, pl. vii, fig. 8.
**Passalus furcicornis*, Dejean,[1] 1837, p. 195.
Passalus edentulus, Percheron, 1841, p. 39.
Passalus edentulus, Burmeister, 1847, pp. 515–6.
(*Passalus edentulus*, Smith, 1852, p. 20.)
Passalus furcicornis, Montrouzier, 1855, p. 29.
Passalus furcicornis, Montrouzier, 1860, p. 288.
Passalus furcicornis, Fauvel, 1862, p. 135.
(*Aulacocyclus edentulus*, Kaup, 1868[illegible], p. 8.)
(*Aulacocyclus edentulus*, Gem[illegible]l Harold, 1868, p. 969.)
Aulacocyclus edentulus, Kaup, 1871. p[illegible]
(*Aulacocyclus edentulus*, Wytsman, 1884[illegible]
(*Aulacocyclus Edentulus*, Kuwert, 189[illegible]
Aulacocyclus edentulus, Blackburn, 18[illegible]
Aulacocyclus edentulus, Kuwert, 1897[illegible] and 282.

Localities:—
Australia: Port Jackson.
New Caledonia: Balade.

[* Aulacocyclus errans, Blackburn.]

Aulacocyclus errans, Blackburn, 1896, pl. [illegible].

Locality:—
Australia.

[* Aulacocyclus collaris, Blackburn.]

Aulacocyclus collaris, Blackburn, 1896, pp. 233–4.

Locality:—
Australia.

Aulacocyclus andrewesi, Gravely.

Aulacocyclus † *andrewesi*, Gravely, above, pp. 211–212, pl. xi, figs. 10–10*a*.

Locality:—
India: Anamalai Hills, *ca.* 3500–4000 ft.

[1] Gemminger and Harold give d'Urville as the author of this name in Dejean's catalogue.

[* Aulacocyclus glabriusculus, Kuwert.]

Aulacocyclus Glabriusculus, Kuwert, 1891, p. 170.
Aulacocyclus glabriusculus, Kuwert, 1897, pp. 280 and 282.

Locality:—
Aru Islands.

* Aulacocyclus dilatus, Kuwert.

Aulacocyclus Dilatus, Kuwert, 1891, p. 170.
Aulacocyclus dilatus, Kuwert, 1897, pp. 281 and 282.

Locality:—
Philippine Islands.

Aulacocyclus parryi, Kaup.

Aulacocyclus Parryi, Kaup, 1868*a*, p. 8.
(*Aulacocyclus Parryi*, Gemminger and Harold, 1868, p. 969.)
Aulacocyclus Parryi, Kaup, 1871, p. 16.
Aulacocyclus parryi, Kirsch, 1877*a*, p. 139.
(*Aulacocyclus Parryi*, Wytsman, 1884, p. 328.)
Aulacocyclus Parreyi, Kuwert, 1891, p. 170.
Aulacocyclus parryi, Kuwert, 1897, p. 281.
Aulacocyclus parreyi, Kuwert, 1897, p. 282.

Localities:—
? Java.
Moluccas: Ceram.
New Guinea: Rubi.
? Australia.

Kuwert in 1897 omits all reference [illegible] vanese record of 1891, so it may be doubted[illegible]

[* [illegible]ocyclus perlatus, Kaup.]

Aulacocyclus perlatus, Kaup, 1868*a*, p. 7.
(*Aulacocyclus perlatus*, Gemminger and Harold, 1868, p. 969.)
Aulacocyclus perlatus, Kaup, 1871, p. 15.
(*Aulacocyclus perlatus*, Wytsman, 1884, p. 328).
Aulacocyclus Parreyi var. *perlatus*, Kuwert, 1891, p. 170.
Aulacocyclus perlatus, Kuwert, 1897, pp. 281 and 282.

Localities:—
New Guinea.
? Australia.

The Australian record rests solely on the authority of Kuwert's 1891 list; it is omitted in his subsequent paper.

[1] There are specimens in the Stuttgart Museum collection from Java, which perhaps belong to this species.

Aulacocyclus aruensis, Kuwert.

Aulacocyclus Parreyi var. *aruensis*, Kuwert, 1891, p 170.
Aulacocyclus aruensis, Kuwert, 1897, p. 282.

Localities:—
Borneo: Sarawak.[1]
Aru Islands.

[*Aulacocyclus celebensis, Heller.]

Aulacocyclus celebensis, Heller, 1898, pp. 22–3.

Locality:—
Central Celebes: Luhn-Djaladja.

[*A. variolosus, Kuwert.]

Aulacocyclus variolosus, Kuwert, 1897, p. 282.

Locality:—
New Guinea.

[*A. pugnax (Fauvel)]

**Comacupes pugnax*, Fauvel 1903, p. 359.
Aulacocyclus pugnax, Zang, 1905, p. 228.

Locality:—
New Caledonia.

Genus ERACUPES, Kaup, 1871.

= *Aulacocyclus* [part], Kaup, 1868.

The genus *Ceracupes* is only known from S.E. Himalayas, Tibet, Tonkin, Upper Burma and Formosa.

Ceracupes fronticornis (Westwood).

Passalus fronticornis, Westwood, 1842, pp. 124–5.
Passalus bihastatus ♂, Percheron, 1844, pp. 12–13, pl. cxxxv, fig. 3.
**Passalus fronticornis*, Hope, 1845.
Passalus bihastatus, Burmeister, 1847, p. 517.
Passalus bihastatus, Smith, 1852, p. 17.
(*Aulacocyclus bihastatus*, Kaup, 1868*a*, p. 6.)
(*Aulacocyclus bihastatus*, Gemminger and Harold, 1868, p. 968.)
Ceracupes fronticornis, Kaup, 1871, p. 17, pl. iii, fig. 2 2*a*
Ceracupes fronticornis, Stoliczka, 1873, p. 151.
(*Ceracupes fronticornis*, Wytsman, 1884, pp. 328–9.)
(*Ceracupes Fronticornis*, Kuwert, 1891, p. 171.)
Ceracupes fronticornis, Kuwert, 1897, p. 271.

[1] Kuwert has determined as *A. aruensis* a specimen preserved in the Königliches Zoologisches Museum in Berlin, collected by Wallace in Sarawak.

Ceracupes †fronticornis [? part], Zang, 1905*a*, p. 100.[1]
Ceratocupes fronticornis, Arrow, 1907, p. 444.
Ceracupes †fronticornis, Gravely, above, p. 212, pl. xi, fig. 12.

Zang refers Fruhstorfer's *Nigidius*-like Passalid from Ke-Lung in Formosa (Fruhstorfer, 1902, p. 28) to this species; but Heller has since described a Formosan form under a separate specific name, and it is therefore probable that it is really to this species that Fruhstorfer's specimens belong.

Localities:—

E. Himalayas: Nepal.
Darjeeling District—Gopaldhara, Rungbong Valley.
Tibet.
Tonkin: Mt. Mauson 2000–3000 ft.; Than Moi.
Burma: Ruby Mines[2].
Bhamo—Sin Lum[2].

Stoliczka remarks: "It must come from the Chinese portion of eastern Tibet, for western Tibet has no forests."

The specimen from Than Moi (whose altitude above sea level is not, Dr. Horn informs me, very great) is in the Deutsches Entomolgisches Museum. Its horn is more slender and more strongly widened and turned up at the end, and its elytra are less strongly punctured than in the specimens I have seen from higher altitudes in the Darjeeling District and Mt. Mauson; but I do not feel justified in describing it as a new species or variety without seeing longer series of specimens from all three localities.

Ceracupes arrowi, Heller.

* ? Fruhstorfer, 1902, p. 28.
? *Ceracupes fronticornis* [part], Zang, 1905*a*, p. 100.
Ceracupes Arrowi, Heller, 1911, pp. 256-7, text-fig.
Ceracupes † arrowi, Gravely, [redacted]

Localities:—

Fomosa: Kosempo; Hoozan; ? Ke-Lung.

Ceracupes austeni, Stoliczka.

Ceracupes † austeni, Stoliczka, 1873, p. 151.
(*Ceracupes Austeni*, Wytsman, 1884, p. 329.)
(*Ceracupes Austeni*, Kuwert, 1891, p. 171.)
Ceracupes austeni, Kuwert, 1897, p. 274.
Ceracupes † austeni Gravely, above, pp. 212–213, pl. xi, figs. 11–11*a*.

Localities:—

E. Himalayas: Dafla Expedition, Camp 9; Dikrang Valley.
Naga Hills: Manipur and an unrecorded locality at an altitude of about 6000 ft. above sea level.

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[1] Fruhstorfer has apparently referred to the species in a price-list under the name *Ceratocupes cornutus* (see Zang, loc. cit.).

[2] These records are based on specimens in the British Museum.

Stoliczka recorded this species from the "Naga Hills, North-Eastern Districts of Bengal"; and Wystman and Kuwert have both been content to quote Bengal as its locality. The Dafla and Naga Hills are situated on the Northern and Eastern Frontiers of Eastern Assam, and are nowhere near Bengal in its modern restricted sense.

Genus CYLINDROCAULUS, Fairmaire, 1880.

Only one species of this genus is yet known; it comes from China.

*C. bucerus, Fairmaire.

**Cylindrocaulus bucerus*, Fairmaire, 1880, p. 164.
Cylindrocaulus bucerus, Fairmaire, 1887, pp. 99–100.
(*Cylindrocaulus Bucerus*, Kuwert, 1891, p. 173.)
Cylindrocaulus bucerus, Kuwert, 1897, p. 304.
Cylindrocaulus bucerus, Zang, 1905*c*, pp. 228–9.
Cylindrocaulus bucerus, Arrow, 1907, p. 446.

Locality:—

Western China: Sz-Tschwan—Moupin.

Genus AURITULUS, Zang, 1905.

This genus is only known from Japan.

Auritulus patalis (Lewis).

Aulacocyclus †patalis, Lewis, 1883, p. 341, pl. xiv. figs. 6–7.
Auritulus patalis, Zang, 1905*c*, pp. 228–9.
Aurikulus †patalis, Arrow, 1907, p. 446.

Locality:—

Japan: "in three or four decaying hard-wood trees of three feet girth, which had been blown down, and had remained five or six years under shade of a dense forest above Yuyama, on the western side of Ichibosayama.

Subfamily *PLEURARIINAE*.

Of this sub-family only one genus of two species is known.

Genus PLEURARIUS, Kaup, 1886.

This genus is recorded from Sumatra and the Indian Peninsula.

*Pleurarius pilipes, Kaup.

Pleurarius pilipes, Kaup, 1868*b*, pp. 1–2.
(*Pleurarius pilipes*, G mininger and Harold, 1868, p. 970.)
Pleurarius pilipes, Kaup, 1871, p. 28, pl. iv, fig. 1.
(*Pleurarius pilipes*, Wytsman, 1884, p. 330.)
(*Pleurarius Pilipes*, Kuwert, 1891, p. 179.)
Pleurarius pilipes, Kuwert, 1898, p. 162.

Locality:—

Sumatra: Gambong District—Fort Mangala.

Pleurarius brachyphyllus, Stoliczka.

Pleurarius † brachyphyllus, Stoliczka, 1873, pp. 152–3.
(*Pleurarius brachyphyllus*, Wytsman, 1884, p. 330.)
(*Pleurarius Brachyphyllus*, Kuwert, 1891, p. 179.)
Pleurarius brachyphyllus, Kuwert, 1898, p. 162.
Pleurarius † brachyphyllus, Gravely, above, pp. 213–214, pl. xi, figs. 13–13*a*.

Localities:—

Travancore: Kulattupuzha (W. base of W. Ghats).
Cochin: timber forest.
Madras Presidency: Malabar.
Nilgiri Hills.
Anamalai Hills—Puddutottam, 4200 ft., and other unrecorded localities up to 5500 ft.
S. Arcot or Chengalput—Palur.

Subfamily *ACERAIINAE*.

This sub-family occurs throughout the Oriental Region to which it is probably confined.

Genus TIBERIOIDES, Gravely, 1913

= *Aceraius* [part] Kaup, 1868; *Basilanus* [part] Kaup, 1869; *Tiberius* [part] Kuwert, 1896–8.

The genus *Tiberioides* is only known from the E. Himalayas and Naga Hills.

Tiberioides kuwerti (Arrow).

Aceraius cancrus, Kaup, 1868*a*, p. 29.
Aceraius cancrus, Kaup, 1868*b*, p. 4.
(*Aceraius cancrus*, Gemminger, and Harold, 1868, p. 972.)
Basilianus cancrus, Kaup, 1871, pp. 56–7.
Basilianus † cancrus, Stoliczka, 1873, p. 160.
(*Basilianus cancrus*, Wytsman, 1884, p. 336.)
(*Tiberius Cancrus*, Kuwert, 1891, p. 164.)
Tiberius † cancrus, Kuwert, 1898, p. 188.
Tiberius kuwerti, Arrow, 1906, p. 446.
Tiberioides † kuwerti, Gravely, above, pp. 215–216, pl. xi, fig. 14.

Arrow has pointed out that Kaup, who has been followed by other authors, was mistaken when he identified a species of the genus *Basilianus* as defined by him, with Percheron's *Passalus cancrus*.

Localities:—

E. Himalayas: Nepal.
Darjeeling District—Peshoke.
Bhutan.
Assam: Naga Hills—Manipur.
Burma.

Tiberioides austeni, Gravely.

Tiberioides † austeni, Gravely, above, pp. 216–217 pl. xi, figs. 15–15*a*.

Localities:—

E. Himalayas: Dafla Hills—Dikrang Valley.
Abor Country—Kalek, 3800 ft.

Tiberioides borealis (Arrow).

Chilomazus † borealis, Arrow, 1906, pp. 467–8.

Locality:—

Assam: Naga Hills.

Genus EPISPHENUS, Kaup, 1871.

Incl. *Aceraius* [part], Kaup, 1868; *Laches* (= *Chilomazus*, Zang, 1905) [part] + *Basilianus* [part], Kaup, 1871.[1]

This genus is confined to the Indian Peninsula and Ceylon.

Episphenus moorei, Kaup.

Episphenus Moorei, Kaup, 1871, p. 45.
(*Episphenus Moorei*, Wytsman, 1884, p 334.)
(*Episphenus Moorei*, Kuwert, 1891, p. 165.)
Episphenus † moorei, Kuwert, 1898, p. 189
Episphenus † moorei, Zang, 1905*a*, p. 163.
Episphenus † moorei + † *pearsoni*, Gravely, above, pp. 217–218, pl. xi, figs. 16–17.

Localities:—

Ceylon: Central Province—Nitre Cave district, c. 1800–3000 ft.; Patipolla; Nalanda.
Ratnapura District—Bulutota.

The series of specimens in Berlin and the British Museum prove conclusively that the characters by which I supposed *E. pearsoni* to be distinguished from *E. moorei* (see above, loc. cit.) have no real taxonomic value.

Episphenus comptoni (Kaup).

Aceraius Comptoni, Kaup, 1868*a*, p. 28.
Aceraius Comptoni, Kaup, 1868*b*, pp. 3–4.
(*Aceraius Comptoni*, Gemminger and Harold, 1868, p. 972.)
Laches Comptonii, Kaup, 1871, pp. 49–50, pl. iv, figs. 5–5*a*.
(*Laches Comptonii*, Wytsman, 1884, p. 335.)
Laches Comptonii + *Flachii* + *Frustorferi* + *Puella*, Kuwert, 1891, p. 167.
Laches parallelogrammifrons + *fruhstorferi*, + *puella* + *flachi* + *socius* + *comptoni*, Kuwert, 1898, pp. 328–9.
Laches † Comptoni, Zang, 1905*a*, p. 163.
Episphenus † comptoni + *var.* † *flachi*, Gravely, above, pp. 218–219, pl. xi, figs. 18–19*a*.

[1] See Appendix I, p. 316.

Zang has shown that Kuwert's species are all of them identical with *C. comptoni*, Kaup; and the specimens I have seen confirm this[1].

Localities:—

Ceylon: Central Province—Hakgalla; Patipolla c. 6000 ft.; Namunakuli Hill.
Uva—Haputale.
Ratnapura District—Bulutota.

Episphenus indicus (Stoliczka).

Aceraius Cantori [part] + *neelgherriensis* [? part], Kaup, 1868*a*, pp. 28 and 30.
Aceraius Cantori [part] + *neelgherriensis* [? part], Kaup, 1868*b*, p. 4.
(*Aceraius Cantori* [part] + *neelgherriensis*, [part] Gemminger and Harold, 1868, p. 972.)
Basilianus neelgherriensis [? part], Kaup, 1871, pp. 55–6.
Basilianus † *indicus*, Stoliczka, 1873, pp. 159-160.
(*Basilianus neelgherriensis* [part] + *indicus*, Wytsman, 1884, p. 336.)
(*Basilianus Indicus* + *Certus*, Kuwert, 1891, p. 164.)
Basilianus indicus + *stoliczkae* + *neelgherriensis*, Kuwert, 1898, pp. 340–341.
Basilianus indicus, Zang, 1905*c*, p. 223.
Basilianus † *certus* + *stoliczkae* + † *indicus*, Zang, 1906*a*, pp. 180–3.
Episphenus † *indicus*, Gravely, above, pp. 220–222, pl. xi, figs. 20–20*b*.

The great range of variation found in this species appears to have been fully recognized by Kaup, for it is evident from the measurements he gives for his *Basilianus neelgherriensis* that he must have referred to that species specimens of the present one. The localities which he quoted for his *B. cantori* in 1868, show that he confused certain specimens of *Episphenus indicus* with that species also. Kuwert's *B. stoliczkae* and *B. indicus* cannot be recognized as distinct species; and his *B. neelgherriensis* is doubtless a worn specimen of the same. Kuwert's *B certus* of 1891 appears to be identical with *Episphenus indicus*, while that of his 1898 paper is identical with *E. neelgherriensis*; that they are not identical one with another has already been indicated by Zang in his synonymy of 1906.

Localities:—

Bombay Presidency: N. Kanara.
Mysore: Bababudin Hills, 4000–5000 ft.
? Cochin.
Travancore: High Range.
Madras Presidency: Anamalai Hills—Puddutottam, 4200 ft.; Monica Estate, 4000 ft.; other unrecorded localities up to 5500 ft.

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[1] While this paper was still in the press I was able myself to examine Zang's series in Berlin. It contains a specimen 38 mm. long, so the only distinction found between *E. comptoni* var. *flachi* (32–37 mm.) and *E. comptoni*, s. str. (39–42 mm.) breaks down as was expected (see above, p. 220). In this series the three first lamellae of the antennae are markedly shorter than the last three in small specimens and the two first than the last four in large ones. This character is not, however, quite perfectly correlated with size; and further, the series includes a specimen with antennae exactly intermediate between the two extreme forms. The degree of asymmetry found in different specimens varies greatly, and may be very much greater than is shown in my figure.

Nilgiri Hills—Ootacamund; Gudalur; Naduvatum.
Madura—Dindigal.
Trichinopoli.
Cuddapah.

Episphenus neelgherriensis (Percheron).

Passalus neelgherriensis, Guérin-Méneville in Percheron,[1] 1841, p. 4, pl. lxxvii, fig. 1.
Passalus neelgherriensis, Burmeister 1847, p. 469.
(*Passalus neelgherriensis*, Smith, 1852, p. 6.)
? *Aceraius neelgherriensis* [part], Kaup, 1868*a*, p. 30.
Aceraius † *infantilis* + † *puerilis* + ? *neelgherriensis* [part], Kaup, 1868*b*, pp. 4 and 6.
(*Aceraius infantilis* + *puerilis* + *neelgherriensis* [part], Gemminger and Harold, 1868, p. 972.)
Laches † *infantilis* + † *puerilis* + ? *Basilianus neelgherriensis* [part], Kaup, 1871, pp. 48 and 55–6.
(*Laches infantilis* + *puerilis* + *Basilianus neelgherriensis* [part], Wytsman, 1884, pp. 335–6.)
(*Basilianus Neelgherriensis* + *Laches Puerilis* + *Epilaches Infantilis*, Kuwert, 1891, pp. 164 and 167.)
Analaches † *filius* + *infantilis* + *Laches puerilis* + *Basilianus inaequalis* + *certus*, Kuwert, 1898, pp. 336, 338 and 341.
Basilianus † *binominis*, Zang, 1905*a*, pp. 243–4.
Basilianus † *neelgherriensis*, Zang, 1905*c*, p. 223.
Basilianus † *neelgherriensis* + † *binominis*, Zang, 1906, pp. 179–183.
Episphenus † *neelgherriensis*, Gravely, above pp. 222–223, pl. xi, figs. 21–21*a*.

The measurements given by Kaup indicate that he has confused with this species some large form (doubtless *E. indicus*). Although *E. neelgherriensis* is less variable in size than the preceding, it is sufficiently variable in other respects to have received several distinct generic and specific names, based on characters which are proved by the series before me to be of no taxonomic value.

The name *Analaches filius*, Kuwert 1898, should read *Epilaches filius*; for the generic names *Analaches* and *Epilaches*, Kuwert 1891, have been transposed by their author in his 1898 paper, as Zang has already pointed out (1905, p. 24). *Epilaches filius*, Kuwert, of which I have seen specimens determined by Kuwert himself, is identical with *Episphenus neelgherriensis*; and so are *Epilaches infantilis* (Kaup) and *Laches puerilis*, Kaup, of which I have seen the types. Of two specimens of the former species from Mniszech's collection one proved to be *Episphenus neelgherriensis* and the other a species of *Cetejus*.

Localities:—
Madras Presidency: Coorg.
Malabar.
Nilgiri Hills—Coonoor, c. 6000 ft.[1]; Ootacamund, 7800 ft.
Annamalai Hills—various localities ranging from about 3000–5500 ft.[2]
Madura—Dindigal.

[1] See above, p. 270, footnote 3.
[2] For more detailed reference to localities round Coonoor and in the Annamalais see above, p. 223.

Mysore: Bababudin Hills, 4000–5000 ft.
Cochin.
Travancore—High Range.
Pondicherry.

Kuwert's record of "*Basilianus inaequalis*" from Malacca doubtless refers to the true *inaequalis*, and not to the species which he described under that name from specimens which clearly must have come from Dindigal. The localities given for the types of *Laches infantilis* and *puerilis*, Kaup—Vanicoro and Aru—can hardly be correct.

Genus OPHRYGONIUS, Zang, 1904.

Incl. *Basilianus* [part] Kaup, 1871.[1]

This genus probably occurs throughout the Oriental Region east of the mouths of the Ganges and Brahmaputra, but it has not yet been recorded with certainty from the Philippines. It is not known from the Andamans or Nicobars.

Ophrygonius cantori, Percheron.

Passalus cantori, Percheron, 1844, pp. 3–4, pl. cxxxiv, fig. 2.
Passalus Cantori, Burmeister, 1847, pp. 468–9.
(*Passalus Cantori*, Smith, 1852, p. 7.)
Aceraius Cantori [part], Kaup, 1868*a*, p. 28.
Aceraius Cantori [? part], Kaup, 1868*b*, p. 4.
(*Aceraius Cantori*, Gemminger and Harold, 1868, p. 972.)
Basilianus Cantori [part], Kaup, 1871, p. 57.
Basilianus †*Cantoris*, Stoliczka, 1873, p. 159.
(*Basilianus Cantori* [part], Wytsman, 1884, p. 336.)
(*Basilianus Cantori*, Kuwert, 1891, p. 164.)
Basilianus cantori + †*interrogationus*, Kuwert, 1898, pp. 340–1.
Basilianus †*convexifrons*, Zang, 1904*a*, p. 698 footnote.
(*Basilianus cantori*, Arrow, 1907, p. 445.)
Basilianus †*Cantori* + †*convexifrons*, Zang, 1905, pp. 178–183.
Ophrygonius †*cantori* + subspp. † *convexifrons* + † *dunsiriensis*, Gravely, above, pp. 224-225, pl. xi, figs. 22-22*a*.

Kaup records this species from Malabar, Malacca, and Cambodia, and as it has otherwise never been recorded from any locality outside the E. Himalayas, Assam and Burma the probability is very strong that he has confused several species under one name. *O. convexifrons* (Zang) at present seems to be a distinct local race, although it differs from the typical form of *O. cantori* in size only; the convexity of the frontal area, by which Zang distinguishes it, is a variable character found in some specimens of both forms.

Localities:—

1. O. CANTORI, Percheron, s. str.

E. Himalayas: Darjeeling District—Tista; Sureil; Kurseong; Gopaldhara, Rungbong Valley.

[1] See Appendix I, p. 316, below.

Sikkim—Gantok.
Bhutan.
Dafla Hills—Dikrang Valley.
Naga Hills: Manipur.

2. Subsp. CONVEXIFRONS, Zang.

Assam: Khasi Hills—Shillong; Teriaghat.
Burma: Ruby Mines; Sin Lum, Bhamo, 6000 ft.

3. Subsp. *dunsiriensis*, Gravely.

Assam: Dunsiri Valley.

Ophrygonius birmanicus, Gravely.

? *Basilianus cantori* [part], Kaup, 1871, p. 57.
Ophrygonius † *birmanicus*, Gravely, above, p. 226, text-fig. 3A.

The specimen from Cambodia which Kaup identified as *O. cantori*, may very possibly have belonged to this species; but his specimen from the Malay Peninsula can scarcely, I think, have done so, in view of the great difference that exists between the Passalid fauna of this peninsula and that of the rest of the continent of Asia.

Localities:—
Burma: Ruby Mines.
? Cambodia.
?? Malay Peninsula.

Ophrygonius singapurae, Gravely.

?? *Basilianus cantori* [part], Kaup, 1871, p. 57.
Ophrygonius † *singapurae*, Gravely, above, pp. 226–227, text-fig. 3B.

It is difficult to identify with this species the specimen from the Malay Peninsula which Kaup referred to *O. cantori*; for in his description of that species he notes particularly the shortness of the antennal lamellae. No other species of *Ophrygonius* is yet, however, known from the Malay Peninsula except *O. inaequalis*, which he himself recognizes as distinct.

Locality:—
Malay Peninsula: Singapore.

Ophrygonius inaequalis (Burmeister).

Passalus inaequalis, Burmeister, 1847, p. 468.
Passalus † *oroleius* [1], Smith, 1852, pp. 17–18, pl. I, fig. 4.

[1] The type specimen of *Ophrygonius oroleius* has elytra with strongly punctured lateral grooves; but the punctures are round, rather than transversely linear as in the typical *O. inaequalis* from the Sunda Islands. The British Museum collection contains a series of exactly similar specimens from Penang, and also two or three specimens transitional between the two forms; so *oroleius* ought perhaps to be recognized as a variety.

(*Leptaulax orolicus* + *Aceraius inaequalis*, Gemminger and Harold, 1868, pp. 970 and 972.)
Leptaulax orolicus, Kaup, 1869, p. 40.
Basilianus inaequalis, Kaup, 1871, p. 56.
Basilianus †*inaequalis*, Stoliczka, 1873, p. 159.
(*Basilianus inaequalis*, Wytsman, 1884, p. 336.)
(*Basilianus inaequalis*, Kuwert, 1891, p. 164.)
Basilianus †*sinkepicus*, Kuwert, 1898, pp. 339–340.
(*Basilianus inaequalis*, Zang, 1903*b*, pp. 418–9.)
Ophrygonius †*quadrifer*, Zang, 1904*a*, pp. 697–700, text-fig. 3.
Ophryonius †*inaequalis*, Zang, 1905*a*, p. 192.
Basilianus sinkepicus, Zang, 1906*a*, pp. 177–183.
Ophrygonius †*inaequalis*, Gravely, above, pp. 227–228, pl. xii, figs. 24–24*a*.

Kuwert gives 36 mm. as the length of his *Basilianus sinkepicus*; but I have seen specimens identified by himself, and found the biggest of them to be only 27 mm. long.

Localities:—
Malay Peninsula: Penang; Perak; Johore; Singapore.
Sumatran Islands: Sinkep Island.
Sumatra: Deli.
Java.
Borneo.
? Philippines.

The sub-family to which this species belongs is so abundant in the Oriental Region right up to Wallace's Line and seems to stop so abruptly there, that I am inclined to regard Burmeister's "Mollucca" record as a misprint for "Malacca" (see also Kaup, 1871, p. 56).

Genus ACERAIUS, Kaup (1868) 1871.

= Ocythoe [part], Castelnau, 1850; incl. *Heterochilus*, Kuwert, 1896 = *Rhipsaspis*, Zang, 1905.

Kuwert's classification of this genus is extremely unsatisfactory, for it is based primarily on variable characters. The order in which the species are arranged here is based primarily on the form of the upper margin of the left mandible which, though not always quite constant, is the best group character that I have been able to find.

The genus is common throughout the Oriental Region east of the mouths of the Ganges and Brahmaputra, and is probably not found elsewhere. It is doubtful whether it occurs in the Andamans or Nicobars.

Aceraius wallacei (Kuwert).

(*Heterochilus crinitus*, Kuwert, 1891, p. 166.)
Heterochilus †*wallacei* + *crinitus* + *oculitesselatus*, Kuwert, 1898, pp. 334–5.
Heterochilus †*wallacei*, Zang, 1905*a*, p. 167.
Aceraius †*wallacei*, Gravely, above, pp. 228–229, pl. xii, figs. 26–26*b*.

Localities:—

Malay Peninsula.

Sumatran Islands: Nias.

Sumatra—Somgei Lalah in Indragiri.

Borneo: Sarawak—Kuching.

British N. Borneo—Mt. Kina-Balu, c. 5000 ft.

Aceraius perakensis, Kuwert.

Aceraius perakensis, Kuwert, 1898, p. 308.

Aceraius † *perakensis*, Gravely, above, p. 229.

Localities:—

Malay Peninsula: S. Perak (Telom, 4000 ft.); Taiping 4000–4500 ft.[1]; Larut Hills, 3300–4300 ft.[2]

Sumatra: Mt. Singaleng.

Aceraius möschleri, Kuwert.

Aceraius möschleri, Kuwert, 1891, p. 163.

Aceraius möschleri, Kuwert, 1898, p. 344.

Aceraius † *möschleri*, Gravely, above, pp. 229–230, pl. xii, fig. 33.

Localities:—

Malay Peninsula: Singapore.

Sumatran Islands: Linga; Sinkep; Sumatra; Nias.

Java.

Aceraius illegalius, Kuwert.

Aceraius illegalis, Kuwert, 1891, p. 163.

Aceraius illegalis, Kuwert, 1893, p. 345.

Aceraius † *illegalis*, Gravely, above, p. 230, pl xii, figs. 32–32*a*.

Localities:—

Malay Peninsula: Johore; Penang.

Borneo: Kuching; between Ulu Madahit and Limbang.

Aceraius laevicollis (Illiger).

Passalus † *laevicollis*, Illiger, 1800, p. 103.

Passalus emarginatus, Weber, 1801, pp. 81-2.

Passalus emarginatus, Fabricius, 1801, pp. 255-6.

**Passalus laevicollis*, Schönherr, 1806-17, I (3) p. 333.

**Passalus laevicollis*, Dejean, 1837, pp 194 and 501.

Passalus emarginatus, Smith, 1852, p. 6.

Aceraius emarginatus [part], Gemminger and Harold, 1868, p. 972.

Aceraius † *emarginatus* [part], Stoliczka, 1873, p. 158.

(*Aceraius emarginatus* [part], Wytsman, 1884, p. 336).

Aceraius Meyeri, Kuwert, 1891, p 163

Aceraius meyeri + † *pontifex* + † *luzonicus*, Kuwert, 1898, p. 345.

Aceraius laevicollis, Gravely, above, pp. 230–231, pl. xii, figs 27–27*a*.

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[1] Dr. Annandale informs me that there is no hill of anything like this altitude in the immediate neighbourhood of the town of Taiping.

[2] This record is based on specimens in the British Museum.

The species is a very variable one and in each of three, at least, of the series before me (from Borneo, Sinkep Island, and Johore) I find forms identical with Kuwert's species *meyeri*, *pontifex*, and *luzonicus* together with all intermediate forms.

Localities:—

Malay Peninsula: Perak, Johore.

Sumatran Islands: Sumatra (Deli, Somgei Lalah, Serdang, Peinan and Solok); Nias; Lingga; Sinkep Island; Billiton.

Java.

Borneo: Kuching; Limbong; Busa; Serai; Tandjong; Bandjermasin.

Banguey Island.

Philippines: Luzon; S. Palawan.

I have also seen two specimens in the Deutsches Entomologisches Museum collection labelled "Assam," and one in the British Museum labelled "Nepal," but these records are scarcely credible, as the species appears to be confined to the Malay Peninsula, the Sunda Islands, and the Philippines.

Aceraius grandis (Burmeister).

Passalus emarginatus, Percheron, 1835, pp. 21–2, pl. ii, fig. 1.
Passalus emarginatus, Percheron, 1841, p. 3.
Passalus grandis, Burmeister, 1847, p. 463.
Oeythoe emarginatus, Castelnau, 1850, p. 179.
Passalus grandis, Smith, 1852, p. 5.
Aceraius grandis, Kaup, 1868*a*, p. 27.
Aceraius grandis, Kaup, 1868*b*, p. 3.
(*Aceraius grandis*, Gemminger and Harold, 1868, p. 972).
Aceraius †*grandis*, Stoliczka, 1873, p 158.
(*Aceraius grandis*, Wytsman, 1884, p. 336).
Aceraius Addendus + *Rectidens* + *Hirsutus* + *Ceylonicus*, Kuwert, 1891, p. 163.
Aceraius addendus + †*grandis* + †*minutifrons* + *prosternisulcatus* + *ceylonicus* + †*hirsutus* + †*rectidens* + †*magnus* + *chinensis* + *molossus*, Kuwert, 1898, pp. 342–4.
Aceraius †*grandis*, Zang, 1904*b*, pp. 184–5.
Aceraius †*hirsutus*, Zang, 1905*a*, p 104.
Aceraeus †*palawanus*, Zang, 1905*d*, pp. 236–238.
Aceraius †*grandis*, Gravely, 1914*a*, p. 31.
Aceraius †*grandis* + var. †*rectidens* + sub. sp. †*hirsutus*, Gravely, above, pp. 231-233, pl. xii, figs. 28–30.

Zang (1904*b*) has shown that *A. addendus* and *minutifrons* are identical with *A. grandis*, at the same time suggesting that *A. rectidens*, *magnus* and *molussus* might also prove to be identical with this species. The three last named are probably all identical with the var. *rectidens* described above, which alone of them seems to me to be sufficiently distinct for recognition.

Kuwert's description of the elytra of *A. chinensis* makes it clear that this form is not identical with the north Indian race *hirsutus*; and it seems improbable that *A. grandis*, s. str., can occur in S. China, in view of the fact that *hirsutus* is known to occur in Tonkin and Hainan, and so presumably occurs all along the

hill ranges of Yunnan and the southern Chinese frontier. Unless there has been some mistake about the locality record, therefore, *A. chinensis* must provisionally be regarded a distinct race.

Kuwert's *hirsutus* and *ceylonicus* are undoubtedly the same, as Zang has already suggested (1905*a*, p. 104). Specimens of this northern race with the process of the left anterior angle of the head fully developed, and directed forwards or a little outwards, are not common; but they do occur in the series before me, and they are not sharply separated from others in which the process is directed inwards; so I am unable to recognize them even as a definite variety.

Localities:—

1. Sub sp. HIRSUTUS, Kuwert.

E. Himalayas: Darjeeling District—Gopaldhara, Rungbong Valley.
Bhutan.
Dafla Hills—Dikrang Valley; Harmutti (base of hills).
Abor Country—Kobo, 400 ft.; Janakmukh, 600 ft.; Rotung 1400 ft.; Upper Rotung, 2000 ft.; Kalek 3800 ft.
N. Lakhimpur—Silonbari (base of hills).
Assam: Sibsagar; Khasi Hills; Dunsiri Valley; Cachar.
Upper Burma: Cachin Cauri.
Bhamo—Sin Lum, 6000 ft.
Lower Burma: Amherst District—Sukli, E. side of Dawna Hills, 2100 ft.
Tavoy.
Cambodia.
Tonkin: Mt. Mauson 2–3000 ft.
Hainan Island.
Formosa: Kosempo; Polisha; Le-hi-ku; Chip-Chip; Lake Candidius; Fuhosho; Hoozan; Sokutsu (Banshoryo Distr.); Kankau; Taihorinsho; Suisharyo; Taihorin.
Philppine Islands: South Palawan.

Kuwert's Ceylon record is hardly credible, as Zang has already pointed out (1905*a*, p. 104). The genus *Aceraius* seems to occur neither in Ceylon nor in the Indian Peninsula.

2. A. GRANDIS, Burmeister, s. str.[1]

Malay Peninsula.
Bintang Island.
Sumatra: Deli.
Java: Tengger Mountain, Bankalan.
Borneo: Bandjermasin; N. Borneo.

Kuwert records *A. prosternisulcatus* (=*A. grandis*, s. str.) from the Moluccas; but as the Aceraiinae seem to be strictly an Oriental subfamily it is probable that this record is based on a misreading of the word Malacca.

[1] See below, p. 322, last paragraph of footnote 2.

3. Var. RECTIDENS, Kuwert.[1]

Malay Peninsula.
Sumatra: Solok; Tebing tinggi.
Java.
Borneo: Sarawak—Kuching.

?4. Subsp. CHINENSIS, Kuwert.

?Southern China.

Aceraius occulidens, Zang.

Aceraius †*occulidens*, Zang, 1905*a*, pp. 190–1.
Aceraius †*occulidens*, Gravely, above, p. 234, text-fig. 4A.

Locality:—
Borneo: Mt. Kina-Balu.

Acerais laniger, Zang.

Aceraius †*laniger*, Zang, 1905*a*, p. 191–2.
Aceraius †*laniger*, Gravely, above, p. 234.

Locality:—
Borneo: Mt. Kina-Balu, c. 5000 ft.

Aceraius kuwerti, Zang.

? *Aceraius emarginatus* [part], Kaup, 1868*a*, p. 27.
? *Aceraius emarginatus* [part], Kaup, 1868*b*, p. 3.
? *Aceraius emarginatus* [part], Kaup, 1871, p. 53.
Aceraius †*Kuwerti*, Zang, 1903*a*, p. 339.
Aceraius Kuwerti, Zang, 1905*a*, p. 189.
Aceraius †*kuwerti*, Gravely, above, p. 235, pl. xi, fig. 31.

Specimens of each species in which the anterior angles of the head are not prominent appear to be without exception of comparatively uniform size. With the exception of *A. tricornis*, whose head is markedly peculiar, and *A. laniger*, which seems to be very rare, this is the only one of these species yet described which is large enough to be identified with the biggest of the specimens to which Kaup applied the name *emarginatus*. His other specimens must have belonged to different smaller species, including perhaps *A. alutaceosternus*.

Localities:—
?Java (*A. emarginatus*, Kaup).
Borneo: Mount Kina-Balu, c. 5000 ft.

Aceraius tricornis, Zang.

Aceraius †*tricornis*, Zang, 1903*a*, p. 339.
Aceraius tricornis, Zang, 1905*a*, p. 189.
Aceraius †*tricornis*, Gravely, above, p. 235, text-fig. 4B.

Locality:—
Borneo: Mount Kina-Balu, c. 5000 ft.

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[1] See below, p. 322, last paragraph of footnote 2.

Aceraius laevimargo, Zang.

Passalus emarginatus, Burmeister, 1847, pp. 463–4.
(*Passalus emarginatus*, [part], Gemminger and Harold, 1868, p. 982.)
(*Aceraius emarginatus* [part], Wytsman, 1884, p. 336.
Aceraius † *laevimargo*, Zang, 1905*a*, pp. 244–5.
Aceraius † *laevimargo*, Gravely, above, p. 235.

Localities:—
Sumatra.
Borneo: Mt. Kina-Balu, c. 5000 ft.

Aceraius pilifer (Percheron).

Passalus pilifer, Percheron, 1835, pp. 23-4, pl. ii, fig. 2.
Passalus pilifer, Percheron, 1841, p. 3.
(*Aceraius emarginatus* [part], Gemminger and Harold, 1868, p. 972.)
(*Aceraius emarginatus* [part], Wytsman, 1884, p. 336.)
(*Aceraius pilifer*, Kuwert, 1891, p. 166.)
Aceraius emarginatus + † *reticulaticollis* + † *borneanus* + † *nicobaricus*, Kuwert, 1898, pp. 346-8.
Aceraius † *pilifer*, Gravely, above, pp. 235–236, pl. xii, fig. 35.

The name *nikobaricus* Redtenbacher (1867, p. 94) ought I think to be allowed to drop altogether, so I insert it here for reference. Redtenbacher states that in his insect the head is symmetrical, and his description, until he comes to the elytra, seems to me to be that of *Tiberius nicobaricus* and not that of an *Aceraius* at all. When he comes to the elytra, however, there can be no doubt that he is dealing with an *Aceraius* as stated by Stoliczka (1873, p. 158), followed by Kuwert. The head and pro- and meso-thorax of a Passalid often get detached from the remainder of the body, and there can I think be little doubt that his type was a mixture of two different insects. Kuwert appears to have examined a complete insect of the genus *Aceraius* which he supposed came from the Nicobars; but in view of Kuwert's frequent inaccuracies and of the fact that no other specimen of the genus ever seems to have been recorded either from the Andamans or from the Nicobars some confirmation of the locality record is desirable.

Localities:—
?? Nicobars.
Sumatra.
Java: Tjibodas, *ca.* 5000 ft.; Preanger, 4–6000 ft.
Borneo.

Aceraius alutaceosternus, Kuwert.

? *Aceraius emarginatus* [part], Kaup, 1868*a*, p. 27.
? *Aceraius emarginatus* [part], Kaup, 1868*b*, p. 3.
? *Aceraius emarginatus* [part], Kaup, 1871, p. 53.
Aceraius † *emarginatus* [part], Stoliczka, 1871, p. 158.
Aceraius alutaceosternus, Kuwert, 1898, pp. 347-8.
Aceraius † *alutaceosternus*, Gravely, above, p. 236, text-fig. 4E, pl. xii, figs. 34–34*a*.

Localities :—

Malay Peninsula : Penang Hill ; Taiping, 4000–5000 ft. ; Larut Hills, 3300–4300 ft.[1]

Aceraius himalayensis, Gravely.

Aceraius †*emarginatus* [part], Stoliczka, 1873, p. 158.
Aceraius †*himalayensis*, Gravely, above, pp. 236–237, pl. xii, figs. 36–36*a*.

Localities :—

E. Himalayas : Darjeeling District.
Dafla Hills—Dikrang Valley.
Sikkim : Pedong.
Abor country—Sirpo Valley, nr. Renging.
Assam : Naga Hills.

Aceraius assamensis, Kuwert.

Aceraius †*emarginatus* [part], Stoliczka, 1873, p. 158.
Aceraius assamensis, Kuwert, 1898, p. 347.
Aceraius †*assamensis*, Gravely, above, p. 237, pl. xii, figs. 37–37*a*.

Localities :—

Assam : Khasi Hills—Cherra Punji.
Naga Hills—Manipur.

Aceraius helferi, Kuwert.

Aceraius Helferi, Kuwert, 1891, p. 163.
Aceraius pilifer + *helferi*, Kuwert, 1898, pp. 346–7.
Aceraius †*tavoyanus*[2] + †*helferi*, Gravely, above, pp. 237–238, pl. xii, figs. 38–39*a*.

Localities :—

Upper Burma : Carin Ghecù, 4000–5000 ft. ; Carin Asciuii Cheba 3500–4000 ft. Carin Cheba 3000–3500 ft. ; Ruby Mines ; Sin Lum, Bhamo 6000 ft.
Lower Burma : Rangoon.
Amherst District of Tenasserim.—Dawna Hills between Misty Hollow and Thingannyinaung, 900–2500 ft.
Tavoy District of Tenasserim.
Siam.
Tonkin : Mt. Mauson, 2000–3000 ft.

Aceraius borneanus, Kaup.

Aceraius †*borneanus*, Kaup, 1871, p. 52.
Aceraius kaupii, Kirsch in Kaup, 1871, p. 52.
Aceraius percheronii, Kaup, 1871, p. 53.

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[1] This record is based on a specimen in the British Museum.

[2] The series of specimens in the British Museum has convinced me of the identity of *tavoyanus* and *helferi*. It includes a number of specimens from Sin Lum and several from the Ruby Mines as well as some from various places previously recorded.

Aceraius incidens, Kirsch, 1877, p. 28.
(*Aceraius emarginatus* [part], Wytsman, 1884, p. 336.)
(*Aceraius Percheroni* + *Incidens* + *Kaupi*, Kuwert, 1891, p. 164.)
Aceriaius †percheroni + *†incidens* + *†Kaupi* + *†nanus*, Kuwert, 1898, pp. 348-9.
Aceraius †Kaupii, Zang, 1905*a*, p. 112.
Aceraius laevicollis, Zang, 1905*c*, p. 225.
Aceraius †borneanus, Gravely, above, pp. 238–239, pl. xii, figs. 25–25*b*.

The only two differences Kaup was able to find between *A. percheronii* and *A. kaupii* can be accounted for by supposing the latter to have been described originally from rubbed specimens—especially as the denticle in the middle of the truncation of the left outer tubercle varies greatly in size in the specimens before me. That this difference in freshness is the only real difference between the two, seems to be indicated by the fact that in Kuwert's description of the specimens that he identified as *A. kaupii*, there is no reference to the left, but only to the right, outer tubercle being shorter than in *A. incidens*, the only difference given between *A. incidens* and *A. percheronii* being one of no value whatever. *A. nanus*, Kuwert, also appears to be identical with the present species.

Localities:—
Malay Peninsula: Perak.
Sumatran Islands: Sumatra—Deli; Indrapura; Tebing tinggi; Peinan; Langkat.
Nias—Hili Zobobo.
Mentawei—Sipora.
Java: Batavia.
Borneo: Kina-Balu, c. 5000 ft.; Sampit; Tandjong; Bandjermasin; Banguey Island.
Phillippines: South Palawan.

Aceraius minor, Gravely.

Aceraius † minor, Gravely, above, p. 240, text-fig. 4D.

Locality:—
Malay Peninsula: Taiping, 4000–5000 ft.; S. Perak (Telom, 4000 ft.).

Aceraius aequidens, Gravely.

Aceraius † aequidens, Gravely, above, p. 240, text-fig. 4E.

Locality:—
Borneo: Kina-Balu.

Sub-family *MACROLININAE*.

This sub-family is known from Celebes, and from all parts of the Oriental Region except the Indian Pensinsula. Only one genus can at present be recognized.

Genus MACROLINUS, Kaup, 1868.

Incl. *Aceraius* [part], Kaup, 1868; *Basilianus* [part], Kaup, 1871; *Tiberius* [part], Kuwert 1891.

[Macrolinus duivenbodei, Kaup.]

Macrolinus † Duivenbodei, Kaup. 1868*a*, p. 19.
(*Macrolinus Duivenbodei*, Gemminger and Harold, 1868, p. 970.)
Macrolinus Duivenbodei, Kaup, 1871, p. 43, pl. iv, fig. 6
(*Macrolinus Duivenbodei*, Wytsman, 1884, p. 334.)
(*Macrolinus Duivenbodei*, Kuwert, 1891, p. 165.)
Macrolinus duivenbodei, Kuwert, 1898, p. 184.

Locality :—
Celebes: Menado.

[Macrolinus urus, Heller.]

(*Macrolinus † urus*, Heller, 1898, pp. 23–4, pl. i, fig. 26.)

Locality :—
Celebes; Mt. Bonthain, 5000–7000 ft.

Macrolinus nicobaricus, Gravely.

Basilianus † andamanensis [part], Stoliczka, 1873, pp. 160–1.
Tiberius Andamanensis [part], Kuwert, 1891, p. 164.
Macrolinus † nicobaricus, Gravely above, pp 241–242, pl. xiii, figs. 40–40*a*.

Localities[1] :—
Nicobars.
?? Burma: Rangoon.

Macrolinus andamanensis (Stoliczka).

Basilianus † andamanensis [part], Stoliczka, 1873, pp. 160-1.
(*Basilianus andamanensis*, Wytsman, 1884, p. 336.)
(*Tiberius andamanensis* [part], Kuwert, 1891, p. 164.)
Tiberius andamanensis, Kuwert, 1898, p. 188.
(*Tiberius andamanensis*, Zang, 1905*a*, p. 163.)
Macrolinus † andamanensis, Gravely, above, p. 242, pl. xiii, figs. 41–41*a*.

Localities :—
Andamans.
?? Lower Burma: Amherst District—Moulmein.

Macrolinus sikkimensis (Stoliczka).

Basilianus † sikkimensis, Stoliczka, 1873, pp. 161-2.
(*Basilianus sikkimensis*, Wytsman, 1884, p. 336.)
(*Tiberius sikkimensis*, Kuwert, 1891, p. 164.)
Tiberius sikkimensis, Kuwert, 1898, p. 188.
(*Tiberius sikkimensis*, Zang, 1905*a*, p. 163.)
Macrolinus † sikkimensis + subsp. † *tavoyanus*, Gravely, above, pp. 243–244, pl. xiii, figs. 42–42*a*.

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[1] There are specimens in Berlin labelled "Andamans, de Roepstorff"; but it is very unlikely, I think, that the species really occurs outside the Nicobars.

Localities :—

1. M. SIKKIMENSIS, Stoliczka, s. str. :—

E. Himalayas: Darjeeling District—*ca.* 1500 ft., 2 miles. E. of Punkabari.
Dafla Hills—Dikrang Valley; Harmutti (base of hills).
Abor Country—Kobo, 400 ft.; Janakmukh, 600 ft.; Rotung, 1400 ft.

Assam: Khasi Hills.
Cachar.
Naga Hills.

2. Subsp. TAVOYANUS, Gravely :—

Upper Burma: Carin Cheba, 3000–3500 and 4000–5000 ft.

Lower Burma: Tenasserim—between Misty Hollow and Thingannyinaung, Dawna Hills, Amherst District, at various altitudes between 900 and 2500 ft.; Tavoy.

Macrolinus crenatipennis, Kuwert.

Macrolinus † crenatipennis, Kuwert, 1898, p. 185.
Tiberius crenatipennis, Zang, 1905*a*, p. 163.
Macrolinus † crenatipennis, Gravely, above, p. 244.

Locality :—
Ceylon.

Macrolinus rotundifrons, Kaup.

Macrolinus rotundifrons, [? part], Kaup, 1871, pp. 44-5.
(*Macrolinus rotundifrons*, Wystman, 1884, p. 334.)
(*Macrolinus rotundifrons*, Kuwert, 1891, p. 165.)
Macrolinus rotundifrons + singhalensis, Kuwert, 1898, p. 185.
Tiberius † rotundifrons + singhalensis, Zang, 1905*a*, p. 163.
Macrolinus † rotundifrons, Gravely, above, pp. 244–245, pl. xiii, fig. 43.

Localities :—

Ceylon: Central Province—Kandy; Peradeniya; Nalanda; Patipolla; Galagedara.

Kaup's Chinese record has never been confirmed, though Kuwert accepts it with a query in his 1891 catalogue, and definitely in his later work. Possibly Kaup failed to distinguish between this species and *T. sikkimensis*; or possibly the mistake has arisen through some error in the labelling of Cantor's collection, to which the Chinese specimens belonged.

Macrolinus waterhousei, Kaup.

Macrolinus Waterhousei, Kaup, 1871, pp. 43-4.
(*Macrolinus Waterhousei*, Wytsman, 1884, p. 334.)
(*Macrolinus Waterhousei*, Kuwert, 1891, p. 165.)
Macrolinus Waterhousei, Kuwert, 1898, p. 185.
(*Tiberius Waterhousei*, Zang, 1905*a*, p. 163.)
Tiberius † waterhousei, Gravely, above, p. 245, pl. xiii, fig. 44.

Localities:—

Ceylon: Ratnapura Distict—Bulutota.

[Macrolinus sulciperfectus, Kuwert.]

Macrolinus sulciperfectus, Kuwert, 1891, p. 165.
Macrolinus †sulciperfectus, Kuwert, 1898, p. 184.

Locality:—

South Celebes: Bonthain.

Macrolinus weberi, Kaup.

Macrolinus Weberi, Kaup, 1868*a*, p. 19.
(*Macrolinus Weberi*, Gemminger and Harold, 1868, p. 971.)
Macrolinus Weberi, Kaup, 1871, p. 44.
(*Macrolinus Weberi*, Wytsman, 1884, p. 334.)
(*Macrolinus Weberi*, Kuwert, 1891, p. 165.)
Macrolinus †weberi, Gravely, above, p. 245.

Locality:—

Philippine Islands.

Macrolinus latipennis (Percheron).

Passalus marginepunctatus, Dejean, 1837, p. 194.
Passalus latipennis, Dup. in Percheron,[1] 1841, pp. 8–9, pl. lxxiii, fig. 3.
Passalus latipennis, Burmeister, 1847, pp. 464–5.
(*Passalus latipennis*, Smith, 1852, p. 6.)
Macrolinus latipennis, Kaup, 1868*a*, p. 19.
(*Macrolinus latipennis*, Gemminger and Harold, 1868, p. 970.)
Macrolinus latipennis, Kaup, 1871, p. 43.
(*Macrolinus †latipennis* + *†weberi*, Stoliczka, 1873, p. 155.)
(*Macrolinus latipennis*, Wytsman, 1884, p. 334.)
Macrolinus latipennis, Kuwert, 1891, p. 165.
Macrolinus †latipennis + ab. *orbatus* + *javanus* + *dissimilis* + *fraternus* + *parallelipennis* + *batesi* + *†weberi*, Kuwert, 1898, pp. 186–7.
Macrolinus †latipennis, Gravely, above, pp. 245–246, pl. xiii, figs. 45–46.

Gemminger and Harold regard *marginepunctatus*, Dejean, as a synonym of *latipennis*, Percheron. As the former name has priority over the latter, and has been accepted by nobody, it is presumably not accompanied by a description. In any case it seems a pity to drop Percheron's well-known name.

I have seen specimens supposed (by Zang, I think) to belong to each of the species *orbatus*, *javanus*, *dissimilis*, *parallelipennis* and *batesi*, Kuwert, but I can find no satisfactory character by which they can be distinguished one from another. A little cleaning showed even the maxillary palp of the so-called *M. orbatus* to be perfectly normal. And it is scarcely likely, I think, that Kuwert's types are any more distinct one from another than these.

Localities:—

Burma.

[1] See above, p. 270, footnote.

Malay Peninsula: Johore.
Sumatran Islands: Nias—Ombolata.
Sumatra—Deli.
Java: Buitenzorg.
S. E. Borneo.
Philippine Islands: S. Palawan.
Molucca (? = Malacca).

Subfamily *GNAPHALOCNEMINAE.*

The principal home of this sub-family is in the islands east of Wallace's Line; but certain species are found further west, one or two getting as far as Southern Burma.

Genus **PARAPELOPIDES**, Zang.

Parapelopides symmetricus, Zang.

Parapelopides † *symmetricus*, Zang, 1904*a*, pp. 695–7, figs. 1–2.
Parapelopides symmetricus, Zang, 1905*a*, p. 189.
Parapelopides † *symmetricus*, Gravely, above, pp. 246–247, text-fig. 6A-B.

Locality:—
Borneo: Mt. Kina-Balu, c 5000 ft.

Genus **TRAPEZOCHILUS**, Zang, 1905.

= *Eriocnemis* [part], Kaup, 1871; = *Phraortes*, Kuwert, 1898.

The genus *Trapezochilus* occurs in Sumatra, the Malay Peninsula, and the extreme south of Burma.

Trapezochilus dorsalis (Kaup).

Eriocnemis † *dorsalis*, Kaup, 1871, p. 41.
(*Eriocnemis dorsalis*, Wytsman, 1884, p. 334.)
(*Eriocnemis Dorsalis*, Kuwert, 1891, p. 168.)
Eriocnemis dorsalis + *Phraortes generosus* + *respectabilis*, + *nobilis*, Kuwert, 1898, pp. 323 & 326.
Trapezochilus † *nobilis* + † *respectabilis*, Gravely, above, pp. 247–248, text-fig. 5C–E, pl. xiii, fig. 48.

The two specimens of this species in the Indian Museum collection, and also those examined later in Europe, seem to indicate the identity of *generosus* and *nobilis*, Kuwert. One of the two Indian Museum specimens has six distinct antennal lamellae, though one of them is very small; but in the other (the one figured) the anterior face of the fifth joint bears only a swelling whose proximal face is steeper than its distal one. This fact, and doubt as to the locality of the type of *T. generosus*,[1] has led me to use the name *nobilis* in part 4 of this paper in preference to *generosus*, although the original description of the latter precedes that of the former by a few lines. Since that part of the paper went to press I have examined a fine series of specimens from four localities in the Malay Peninsula, submitted to me through the kindness of Prof.

[1] Kuwert states that he had only one specimen of *T. generosus*, but gives both Perak and Sumatra as its localities.

Poulton under whose care they are preserved in the Oxford Museum. These prove conclusively that *T. nobilis* and *T. respectabilis* are also indistinguishable from one another; and the type of *Eriocnemis dorsalis*, Kaup, has proved to belong to same species. Consequently none of the names given by Kuwert in this genus can be retained.

Localities:—

Lower Burma: Tenasserim—Tavoy.

Malay Peninsula: Perak—Taiping, 4000–5000 ft.; Telom, 4000 ft.; Larut Hills, 4000–4500 ft.

E. Siamese Malay States—Nawngchik (Bukit Besar, 2500 ft.; and Ban Sai Kau, base of Bukit Besar).

Sumatra: Deli.

Genus GNAPHALOCNEMIS,[1] Heller, 1900.

= *Ocythoe* [part], Castelnau, 1850[2] + *Eriocnemis* [part], Kaup, 1868.

This genus occurs throughout that part of the Oriental Region which lies south-east of Burma; it is perhaps also found in the Philippines and the Moluccas.

Eriocnemis gelon, Schaufuss (1885, pp. 187-8) has been identified by Kuwert with a species of *Plesthenus* from Macassar in Celebes, so has been omitted from the following list.

Gnaphalocnemis simplex, Gravely.

Gnaphalocnemis † *simplex*, Gravely, above, p. 248, text-fig. 6.

Locality:—

Malay Peninsula: Perak.

Gnaphalocnemis burmeisteri (Kaup).

Eriocnemis † *Burmeisteri*, Kaup, 1868*a*, p. 22.

(*Eriocnemis Burmeisteri*, Gemminger and Harold, 1868, p. 971.)

Eriocnemis Burmeisteri, Kaup, 1871, pp. 41-2.

(*Eriocnemis Burmeisteri*, Wytsman, 1884, p. 334.)

(*Eriocnemis Burmeisteri*, Kuwert, 1891, p. 168.)

Eriocnemis burmeisteri + † *faberi*, Kuwert, 1898, p. 323.

Gnaphalocnemis † *burmeisteri*, Gravely, above, p. 249, pl. xiii, fig. 49.

Localities:—

Sumatra: Somgei Lalah (Indragiri); Soerian Platation (near Solok); Deli; Pedong; Peinan; Battak Mountain; Kepahiang; Redjang-Lebong.

Java.

Gnaphalocnemis monticulosus (Smith).

Passalus † *monticulosus*, Smith, 1852, p. 6, pl. i, fig. 1.

Eriocnemis tridens, Kaup, 1868*a*, p. 22.

(*Acerainus monticulosus*, Gemminger and Harold, 1868, p. 972.)

Eriocnemis monticulosus, Kaup, 1869, pp. 38-9.

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[1] In addition to the species here mentioned "*Pelopides*" *gravidus*, Kuwert (1891, p. 168; and 1898, p. 332) from Mindanao perhaps belongs to this genus (see Zang, 1905*a*, p. 316, & 1905*c*, p. 227).

[2] This name has priority. But it has been so long forgotten in this connection that it seems a pity to revive it after it has been adopted for a genus of Cephalopoda.

Eriocnemis monticulosus + tridens, Kaup, 1871, pp. 41–42.
(*Eriocnemis monticulosus*, Stoliczka, 1873, p. 155.)
(*Eriocnemis monticulosus*, Wytsman, 1884, p 333.)
(*Eriocnemis dispar + monticulosus*, Kuwert, 1891, p. 168.)
Eriocnemis † dispar + ignotus + † monticulosus, Kuwert, 1898, p. 324.
(*Eriocnemis monticulosus*, Zang, 1903*b*, p. 419.)
Gnaphalocnemis † monticulosus, Gravely, above, pp. 249–20, pl. xiii, figs. 49–49*a*.

Localities :—

Siam.

Malay Peninsula : Penang, Tengah Mountain.

Sumatra : Tandjong Morawa (Serdang) ; Deli ; Solok ; Lampung ; Medan.

Borneo : Sarawak—Kuching.

British N. Borneo—Mt. Kina-Balu.

Gnaphalocnemis tridens (Wiedemann).

Passalus † tridens, Wiedeman, 1823, pp. 109-110.
Passalus lateriseulptus, Perty, 1831, p. 37, fig. 2.
Passalus tridens, Percheron, 1835, pp. 24-6, pl. ii, fig. 3.
* *Passalus † orientalis*, Dejean, 1837, p. 194.
Passalus tridens, Percheron, 1841, p. 5.
Passalus tridens, Burmeister, 1847, pp. 461-3.
Oeythoe tridens, Castelnau, 1850, II, p. 170.
(*Passalus tridens*, Smith, 1853, p. 6.)
(*Passalus tridens*, Redtenbacher, 1867, p. 49.)
Eriocnemis Mniszechi, Kaup, 1868*a*, p. 22.
(*Eriocnemis Mniszechi + tridens*, Gemminger and Harold, 1868, pp. 971–972.)
Eriocnemis Mniszechi, Kaup, 1871, p 41, pl. iv, figs. 3–3*a*.
(*Eriocnemis † tridens*, Stoliczka, 1873, p. 155.)
(*Eriocnemis tridens + Mniszechi*, Wytsman, 1884, p. 334.)
Eriocnemis Mniszechi + Tridens, + var. *Angustior* Kuwert, 1891, p. 168.
Eriocnemis mniszechi + † tridens, + ab. *angustior*, Kuwert, 1898, pp. 322 and 324.
Gnaphalocnemis † tridens, Zang, 1904*b*, p. 185.
Gnaphalocnemis tridens, Gravely, above, p. 250, pl. xiii, figs. 50–50*a*.

Localities :—

Sumatra : Palembang.

Javanese Islands : Java—Ardjoeno ; Tengger Mountain ; Tjibodas, c. 5000 ft. ; Soekaboemi ; Preanger ; East Java.

? Moluccas : Amboina.[1]

Genus GONATAS, Kaup, 1871.

= *Acerdius* [part], Kaup, 1868 ; = *Gonatas* [part], Kaup, 1871 ; = *Gonatas*, Kuwert, 1897.

This genus is found in Australia, and the islands between there and Java ; it seems to be centred in the region east of Wallace's Line. I have simply accepted the opinions of previous authors in the following synonymy.

[1] This record rests on Kuwert's authority. It is the only one yet made outside the Oriental Region.

[*Gonatas tridentatus, Kuwert.]

Gonatus Tridentatus, Kuwert, 1891, p. 169.
Gonatus tridentatus, Kuwert, 1898, p. 313.

Locality:—
New Guinea.

[*Gonatas schellongi, Kuwert.]

Gonatas Schellongi, Kuwert, 1891, p. 169.
Gonatas schellongi, Kuwert, 1898, p. 314.

Locality:—
New Guinea.

[*Gonatas differens, Kuwert.]

Gonatas Schellongi var. ? *differens*, Kuwert, 1891, p. 168.
Gonatas differens, Kuwert, 1898, p. 314.
Gonatas differens [incl. *G. tibialis* Zang, MS.], Zang, 1905*a*, p. 110.

Localities:—
Moluccas: Amboina.
Aru Island.
New Guinea: Kaiser Wilhelms Land—Finschhafen.
Bismark Archiplego: New Britain.

[*Gonatas albertisi, Kuwert.]

Gonatas Albertisi [*Yorkensis* Fairm. ?],[1] Kuwert, 1891, p. 169.
Gonatas albertisi, Kuwert, 1898, p. 314.

Localities:—
New Guinea.
? Bismark Archipelago: New Britain (omitted in Kuwert's later work).
Australia: Queensland—Cape York.

[*Gonatas major, Kuwert.]

Gonatas Major, Kuwert, 1891, p. 169.
Gonatus major, Kuwert, 1898, p. 314.

Localities:—
Aru Islands.
New Guinea.

[*Gonatas novaebritanniae, Kuwert.]

Gonatas novaebritanniae, Kuwert, 1898, p. 314.
Gonatas novaebritanniae, Zang, 1895*a*, pp. 110–1.

Locality:—
Bismark Archipelago: New Britain—Kinigunang.

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[1] Kuwert gives no reference to the place where this name was published, and I have been unable to trace it.

Gonatas germari, Kaup.

Aceraius Germari, Kaup, 1868*a*, p. 30.
Aceraius Germari, Kaup, 1868*b*, p. 4.
(*Aceraius Germari*, Gemminger and Harold, 1868, p. 972.)
Gonatas Germari, Kaup, 1871, p. 51.
Gonatas † *Germari*, Stoliczka, 1873, p. 158.
(*Gonatas Germari*, Wytsman, 1884, p. 335.)
Gonatas Germari, Kuwert, 1891, p. 169.
Gonatas germari + ab. *brevis*, Kuwert, 1898, p. 315.
Gonatas † *germari*, Gravely, above, pp. 250–251, pl. xiii, figs. 47–47*a*.

Localities:—
Java.
Moluccas: Batchian; Ceram.
Ternate.
Australia: Queensland—Lizard Islands.

[* Gonatas cetioides, Zang.]

Gonatas cetioides, Zang, 1905*a*, p. 316.

Locality:—
Unknown.

[* Gonatas peregrinus, Kuwert.]

Gonatas peregrinus, Kuwert, 1898, p 315.

Perhaps only a variety of the following species, according to Kuwert.

Locality:—
New Guinea.

* G. naviculator (Percheron).

Passalus naviculator, Percheron, 1844, pp. 1–2, pl. cxxxiv, fig. 1.
? *Passalus naviculator* [part], Burmeister, 1847, pp. 467–8.
Aceraius naviculator, Kaup, 1868*a*, p. 31.
Aceraius naviculator, Kaup, 1868*b*, pp. 3 & 7.
Aceraius naviculator, Gemminger and Harold, 1868, p. 972.
Gonatas naviculator, Kaup, 1871, pp. 50–1.
Gonatas naviculator, Stoliczka, 1873, pp. 157–8.
Gonatas naviculator, Kirsch, 1877*b*, p. 141.
Gonatas naviculator, Kuwert, 1891, p. 169.
Gonatas naviculator, Kuwert, 1898, p. 315.
(*Gonatus naviculator*, Arrow, 1907, p. 445.)

Localities:—
Java.
Philippines.
Moluccas: Batchian; Ceram; Amboina.
Papuan Islands: New Guinea—Dore.

Mafoor.
Mysore.
Jobi.

Australia.

[*Gonatas altidens, Heller.]

Gonatas altidens, Heller, 1910, pp. 15–16, pl. 1, fig. 13.

Locality:—

New Guinea, c. 3000.

Subfamily *LEPTAULACINAE*.

This subfamily occurs throughout the tropical parts of the Indo-Australian region.

Genus **LEPTAULAX**, Kaup, 1868.

incl. *Leptaulacides*, Zang, 1905.

The characters used by Kuwert in his tables, especially those by which he divided the genus up into groups, have unfortunately proved to have, for the most part, no taxonomic value whatever. After eliminating the characters which are either worthless or of varietal value only, very little is left. In the following list I have grouped as best I can, with the help of the little that does remain, the names of such species as I am unable to recognize, under the names of such as appear to be distinct; but in places the process has been little better than guess-work. Fortunately the principal zoogeographical results of this process are free from the doubts to which the synonymmy must remain open, as most of the synonyms fall under the names of *L. dentatus* or *L. bicolor*, both of them species of whose wide distribution and variability there is abundant proof of quite a definite nature.

The subfamily Leptaulacinae is found in all parts of the Indo-Australian region inhabited by Passalidae.

Leptaulax beccarii, Kuwert.

Leptaulax beccarii, Kuwert, 1891, p. 189.
Leptaulax †beccarii, Kuwert, 1898, pp. 294–5.
Leptaulax †humerosus [part], Zang, 1905*a*, p. 112.
Leptaulax †beccarii, Gravely, above, p. 251.

Locality:—

Sumatra.

Leptaulax humerosus, Kuwert.

Leptaulax humerosus, Kuwert, 1891, p. 189.
Leptaulax humerosus, Kuwert, 1898, pp. 289 and 294.
Leptaulax humerosus, Zang, 1904*b*, p. 185.
Leptaulax †humerosus [part], Zang, 1905*a*, p. 112.
Leptaulax humerosus, Gravely, above, pp. 251–252, pl. xiii, fig. 51

Localities:—

Sumatran Islands: Sumatra—Battak and Solok Mountains.
Nias.

Java: Tengger Mt.; Ardjoeno; and an unrecorded locality at an altitude of 5000 ft.

Borneo: Sarawak—Kuching; 10 miles south of Kuching.

Leptaulax anna, Zang.

Leptaulax †*anna*, Zang, 1905*a*, p. 316.

Locality:—
Sumbawa.

Leptaulax timoriensis (Percheron).

Passalus timoriensis, Percheron, 1841, pp. 19–21, pl. lxxviii, fig. 1.
(*Leptaulax timoriensis* [part], Wystman, 1884, p. 332.)
?? *Leptaulax dentatus* var. *Timorensis*, Schaufuss, 1885, pp. 116–7.
Leptaulax †*glabricollis*, Kuwert, 1898, pp. 203–4.
Leptaulax timoriensis, Zang, 1905*c*, p. 223.

Locality:—
Timor.

Leptaulax dentatus (Fabricius).

Passalus dentatus, Fabricius, 1792, p. 241.
Passalus dentatus, Fabricius, 1801, p. 256.
Passalus dentatus, Weber, 1801, p. 82–3.
Passalus quadridentatus, 1826, Sturm, p. 182.
Passalus dentatus, Percheron, 1835, pp. 66–7, pl. v, fig. 1.
Passalus dentatus, Percheron, 1841, p. 21.
Passalus timoriensis + *dentatus*, Burmeister, 1847, pp. 473 and 477–8.
Passalus dentatus, Castelnau, 1850, p. 178.
Passalus Timoriensis + *dentatus*, Smith, 1852, pp. 17 and 20.
Passalus dentatus, Redtenbacher, 1867, p. 49.
Passalus dentatus, Kaup, 1868*a*, p. 14.
(*Leptaulax dentatus*, Gemminger and Harold, 1868, p. 969.)
Leptaulax timoriensis + *dentatus*, Kaup, 1871, pp. 33–34.
Leptaulax †*dentatus* + †*bicolor* [part] Stoliczka, 1873, p. 155.
(*Leptaulax timoriensis* [part] + *dentatus*, Wystman, 1884, p. 332.)
Leptaulax dentatus + ? var. *Timorensis*, Schaufuss, 1885, pp. 186–7.
Leptaulax ? *Ribbei* + *Saigonicus* + ? *Dentatus* + ? var. *Bornensis* + ? var. *Indicus* + *Timoriensis* + *Darjeilingi*, Kuwert, 1891, pp. 188–190.
Leptaulax ? *abdominibarbatus* + *malitiosus* + *submedius* + *saigonicus* + †*indicus* + ? ab. *insignis* + *timoriensis* + *exterris* + †*darjeelingi* + †*celebensis* + †*dentatus* + *mixtus* + *interponendus* + †*bornensis* + †*ribbei* + ? *geminatus*, Kuwert, 1898, pp. 293–300.
Leptaulax †*malitiosus*, Zang, 1904*b*, p. 185
Leptaulax †*tonkinensis* + †*humerosus* [part], Zang 1905*a*, pp. 102–4 and 112.
Leptaulax †*dentatus*, Gravely, 1914*a*, p. 31.
Leptaulax †*dentatus* + var. †*glabriventris*, Gravely, above, pp. 252–255, pl. xiii, fig. 52–52*d*.

This species is so common, so widely distributed, and so variable that it is not surprising to find that isolated colonies or individuals have received a number of different specific names

It is impossible to be sure from Kuwert's description alone where *L. abdominibarbatus* should be placed. The three Bornean specimens that I have identified as his *L. anibarbis* from Borneo, agree, however, with his description of that species perfectly as far as it goes; and the essential characters in which *L. anibarbis* differs from *L. abdominibarbatus* are just those in which the specimens I have identified as

L. anibarbis differ from *L. dentatus*.[1] Kuwert's descriptions of *L. ribbei* and *L. gemminatus* leave it uncertain whether the specimens from which they were drawn up belong to *L. dentatus* or to *L. novaeguineae*, but as they are both larger than the latter species is known to become they probably belong to the former. A specimen determined by Kuwert as the former species, which I saw in Berlin, confirms this suggestion. It is possible that *L. dentatus* var. *glabriventris* may be identical with one or more of the forms described by Kuwert, but as there is no indication of this in any of the descriptions I have been compelled to adopt a new name for it.

Localities:—

Madras Presidency: Nr. Vizagapatam.

?W. Himalayas: Mussoorie.

E. Himalayas: Darjeeling District.
Buxa.
Bhutan.
Dafla Hills—Dikrang Valley; Burroi (base of hills); Harmutti (base of hills).
Abor Country—Kobo, 400 ft.; Janakmukh, 600 ft.; Rotung, 1300–1400 ft.; Upper Rotung, 2000 ft.; Renging to Rotung, 2600 ft.; Kalek, 3800 ft.
Mishmi country—Beside the La-ai, a tributary of the Kalem River.

Assam: Kochugarh, Goalpara District; Chaduar; Sibsagar; Dunsiri Valley; Silonbari, base of N. Lakhimpur Hills; E. Cachar.

Chittagong Hill Tracts: Kapti.

China.

Formosa: Kosempo; Chikutoge; Taihorin; Taihorinsho; Hoozan; Fuhosho; Polisha; Chip-Chip; Sokutsu, Banshoryo Dist.; Suishfryo.

Lower Burma: Pegu.
Tenasserim—Kawkareik, Amherst District, c. 300 ft.; Misty Hollow to Thingannyinaung, Dawna Hills, Amherst District, various altitudes between 900 and 2500 ft.; Tavoy; Mergui.

Andaman Islands.

French Indo-China: Tonkin—Mt. Mausson, 2000–3000 ft.
Cochin China—Saigon.

Malay Peninsula: Perak; Johore; Singapore

Sumatran Islands: Sumatra; Nias.

Java: Ardjoeno.

Borneo: Matang; Kuching.

Philippines: ? Mindanao.

Sumbawa[2].

[1] It appears from the collection of the Deutsches Entomologisches Museum, that Zang applied the name *abdominibarbatus* to a form of *L. bicolor* which I am unable to recognize as distinct.

[2] There are specimens from this island in the Hamburg Museum.

Celebes.
Amboina.
New Guinea.
Australia.

Many of the recent records of this species east of Wallace's line are appended to descriptions that may refer either to it or to *L. novaeguineae*; so it may ultimately prove to be rarer and less widely distributed there than is indicated by the evidence at present available. The occurrence of any species of the genus in Guadaloup Island or Brazil seems so improbable that these two records (made by Fabricius and Kuwert respectively) have been omitted from the above list. Concerning the Mussoorie record see above, p. 254.

Leptaulax cyclotaenius, Kuwert.

Leptaulax cyclotaenius, Kuwert, 1891, p. 188.
Leptaulax himalayae + *cyclotaenius* + † *angustifrons*, Kuwert 1898, pp. 285–6.
Leptaulax † *cyclotaenius* subsp. † *himalayae*, Gravely, above, pp. 255–256, pl. xiii, fig. 53.

This species is very near the last, and may prove to be nothing more than a variety of it.

Kuwert's description of *L. angustifrons* contains not even a hint of the position of the form to which he applied this name. I have, however, seen a specimen identified by Kuwert as *L. angustifrons*, and found it to be *L. cyclotaenius*, s. str.

Localities:—

1. L. CYCLOTAENIUS, Kuwert, s. str.

Malay Peninsula: Johore; Perak; Singapore.
Sumatran Islands: Sinkep.
Borneo: Sarawak—Kuching; Braang; Matang Road (near Kuching); Mt. Penrissen.

2. Sub-sp. HIMALAYAE, Kuwert.

E. Himalayas: Dafla Hills—Dikrang Valley.
Abor Country: Renging, 2150 ft.; Upper Renging, 2150 ft.
Tonkin: Mt. Manson 2000–3000 ft.[1]

Leptaulax macassariensis, Schaufuss.

Leptaulax Macassariensis, Schaufuss, 1885, p. 186.
Leptaulax Macassariensis Kuwert, 1891, p. 189.
Leptaulax macassariensis + *papua* + *anibarbis*, Kuwert, 1898, pp. 291 and 293.
Leptaulax macassariensis subsp. † *anibarbis*, Gravely, above, p. 256, pl. xiii, fig. 5.

The Bornean species which I have identified as *L. anibarbis*, Kuwert, agrees with Kuwert's description of that species as far as it goes, and does not appear to differ from *L. macassariensis* or *L. papua* in any constant character. The inner margin of the lateral area of the metasternum is slightly straighter in one of the specimens before me than in the other two, making the area appear slightly narrower

[1] There is a specimen from this locality in Berlin.

behind; but the difference is quite a trivial one. A difference in the widths of these areas appears to be the only character in the least degree likely to be of importance between *L. macassariensis* and *L. papua* as described by Kuwert.

Localities:—

1. L. MACASSARIENSIS, Kuwert, s. str.

South Celebes: Macassar.
New Guinea.

2. subsp. ANIBARBIS, Kuwert.

Borneo: Sarawak.

Leptaulax anipunctus (Zang).

Leptaulacides † anipunctus, Zang, 1905*a*, pp. 234–5.
Leptaulax † anipunctus, Gravely, above, pp. 256–257, pl. xiii, fig. 55.

Localities:—
Assam.
Burmo-Chinese Frontier: Sansi Gorge, 6000—8000 ft.
Upper Burma: Catchin Cauri.[1]

[* Leptaulax novaeguineae, Kuwert.]

Leptaulax Novaeguineae + ? consequens, Kuwert, 1891, pp. 88-9.
Leptaulax novaeguineae + ab. morator + hansemanni + ? consequens, Kuwert, 1898, pp. 287-300.

The principal differences between *L. novaeguineae* and *L. hansemanni*, as described by Kuwert, seem to be that the pronotum is somewhat less and the intermediate areas of the metasternum are somewhat more extensively punctured in the former than in the latter; I do not think that these differences are very likely to prove constant. It is impossible to tell with certainty from the structural characters mentioned in Kuwert's descriptions whether *L. batchianae*, *cicatrosus* and *consequens* differ in any constant character either from this species or from *L. bicolor*; or whether *ribbei* and *geminatus* differ in any constant character either from this species or from *L. dentatus*. But the two last are much larger than any known specimen of *L. novaeguineae* or of any of the forms I have identified with it; so for the present their names are best associated with that of *L. dentatus*. I have moreover, seen specimens identified by Kuwert as *L. batchianae* and *L. cicatrosus*, all of which appeared to me to be *L. bicolor*; while a specimen identified by him as *L. ribbei* was *L. dentatus*. It is possible, I think, that all the forms here grouped together as *L. novaeguineae*, may ultimately prove to be identical with one or other of the dominant forms *dentatus* and *bicolor*.

Localities:—
? Batchian (*L. consequens*).
New Guinea.

[1] There is a specimen from this locality in the Kgl. Zool. Museum in Berlin.

[* Leptaulax obtusidens, Kuwert.]

Leptaulax obtusidens, Kuwert, 1891, p. 188.
Leptaulax obtusidens, Kuwert, 1898, p. 292.

This species is perhaps only a variety of the last.

Locality:—
New Guinea.

[Leptaulax glaber (Kirsch).]

Trichostigmus glaber, Kirsch, 1877*b*, pp. 139-140.
(*Trichostigmus glaber*, Wytsman, 1884, p. 331.)
Leptaulax glaber, Kuwert, 1891, p. 188.
Leptaulax glaber, Kuwert, 1898, p. 292.
Leptaulacides † *glaber*, Zang, 1905*c*, pp. 227-8.
Leptaulacides † *glaber* + † *pulchellus*, Arrow, 1907, pp. 466-7.

L. pulchellus from New Guinea is apparently a distinct variety, for Arrow was able to compare his type with several specimens of the typical *glaber*. As all he actually saw of the latter were collected by Wallace in Batchian, however, their uniformity may have been due to their being all from a single colony, and a direct comparison of these and of the type of *L. pulchellus* with the type of *L. glaber* from Jobi is much to be desired.

Localities:—
Molluccas: Batchian.
Papuan Islands: New Guinea; Jobi.

Leptaulax bicolor (Fabricius).

Passalus bicolor, Fabricius, 1801, p. 256.
* *Passalus bicolor*, Schönherr, 1806-17.
Passalus bicolor, Percheron, 1835 pp. 69-70; pl. v, fig. 3.
* *Passalus bicolor* + *innocuus*, Dejean, 1837, p. 195.
Passalus bicolor, Percheron, 1841, p. 21.
Passalus vicinus, Hope in Percheron, 1844, p. 11.
Passalus bicolor + *vicinus*, Burmeister, 1847, pp. 478-9.
(*Passalus bicolor* + *vicinus*, Smith, 1852, pp. 17 and 20.)
Leptaulax Eschscholtzi + *bicolor*, Kaup, 1868*a*, pp. 14 and 16.
Leptaulax bicolor [part] + *Eschscholtzi*, Gemminger and Harold, 1868, p. 969.
Leptaulax Eschscholtzi + *bicolor*, Kaup, 1871, pp. 323.
Leptaulax † *bicolor* [part], Stoliczka, 1873, p. 155.
Leptaulax bicolor, Kirsch, 1877*b*, p. 140.
(*Leptaulax Eschscholtzi* + *bicolor* [part], Wystman, 1884, p. 332.)
Leptaulax bicolor, Schaufuss, 1885, p. 186.
Leptaulax Manillae + *Malaccae* + ? *Consequens* + † *Batchianae* + *Bicolor* + † *Cicatrosus* + *Abdominisculptus* + *Differentispina* + *Incipiens* + *Eschscholtzii* + *Aurivillii* + *Separandus*,[1] + vars. *Medius* and *Maxillonotus*, *Kuwert*, 1891, pp. 188-190.

[1] Since drawing up this synonymy I have seen a specimen determined by Kuwert as *L. separandus* and found it to be *L. dentatus*, not *L. bicolor*. As this is the only instance in which I have not found

Leptaulax † *malaccae* + *manillae* + *dindigalensis* + † *batchianae* + † *roepstorfi* [part] + † *cicatrosus* + ? *consequens* + † *subsequens* + † *bicolor* [part] + *insipiens* + *sumatrae* + † *calcuttae* + *abdominisculptus* + † *geminus* + *sequens* + † *niae* + † *eschscholtzi* + † *aurivillii* + *tenasserimensis* + *evidens* + † *differentispina* + *separandus*[1] + *maxillonotus* + *medius* + ab. *divaricatus*, Kuwert, 1898, pp. 286-300.

Leptaulacides † *rugulosus* + † *Fruhstorferi* + † *Eschscholtzi* + † *barbicauda* + † *Andamanarum* + † *palawanicus* + † *anaulax* + † *Nietneri*, Zang, 1905*a*, pp. 100-2, 106-9, 164-7, 232-4, 235-6, 246-7.

Leptaulacides vicinus, Arrow, 1907, p. 445.

Leptaulacides † *papuanus* + † *analis*, Zang, 1906*b*.

Leptaulax † *bicolor*, Gravely, 1914*a*, p. 31.

Leptaulax † *bicolor* + var. † *vicinus*, Gravely, above, pp. 257–259, pl. xiii, figs. 56–56*a*.

Kuwert's descriptions of *L. dindigalensis* and *L. consequens* agree as well with the characters of *L. novaeguineae* as with those of the present species; zoogeographical considerations, however, seem to preclude the possibility of the identity of the former with that species.

The best reason for placing many of Kuwert's species here rather than under *L. dentatus* is a purely negative one—the absence of any reference to the great width of the lateral punctured grooves of the elytra that is such a conspicuous feature of *L. dentatus* and its allies. This, however, is a character which Kuwert is not likely to have omitted when it was present[2]; and I do not think that the long list of synonyms that has resulted from the procedure is bigger than was to be expected in view of the extraordinary variability of the specimens which I have been compelled to regard, for the present at least, as belonging to the single species, *L. bicolor*, with one variety, *vicinus*. It is of course possible that some of the names given above as synonyms may in reality apply to distinct species, sub-species or varieties; but I do not think this will ever be settled without reference to Kuwert's types, and until some one is able to approach the question with a far bigger and more representative collection of the genus than I have had to deal with, when it is possible that some of the above names may have to be revived. To attempt to distinguish such now would, I am convinced, only throw into yet greater confusion the nomenclature of this already complicated genus.

It is not at all surprising that Zang, using to a large extent the same characters that Kuwert had regarded as of importance, should have described a number of new species from specimens, many of which are unique or from a single collection from a single locality and so very likely from a single colony.

the synonymy adopted here confirmed by such specimens determined by Kuwert as I have since seen, and as Kuwert's inability to recognize his own species a second time is shown by his having applied the name *L. roepstorfi*, to specimens of what I take to be this species and to specimens of *L. bicolor* in different boxes belonging to a single collection, I prefer in the absence of the type, to leave the name *separandus* provisionally in the place in which his description renders it most probable that it ought to go.

[1] See footnote on previous page.

[2] It should, however, be pointed out here that this character is not equally strongly developed in all specimens of *L. dentatus*; and I find that Zang has identified specimens of this species in which the punctures in these grooves are so little elongated as to remain almost round, with Kuwert's *L. maxillonotus* and *medius*, names which appear in the above list as synonyms of *L. bicolor*.

Localities :—

Ceylon : Central Province—Ganiduwa ; Dimbula ; Pundaloya.
Madras Presidency : Nilgiri Hills—Karkur Ghat, 1500 ft. ; Nadgam, 2500 ft. ; Madura ; Dindigal.
? Bengal : Calcutta.
E. Himalayas : Darjeeling District.
Daffla Hills—Dikrang Valley.
Abor Country—Janahmukh, 600 ft.
Assam : Dunsiri walley ; Silonbari, base of N. Lakhimpur Hills ; Naga Hills.
Lower Burma : Hanthawadi District of Pegu—Rangoon.
Amherst District of Tenasserim—Between Sukli and Misty Hollow, Dawna Hills, 2100-2500 ft. ; Moulmein.
Andamans.
Nicobars.
Formosa : Kosempo ; Polisha.
Siam.
Tonkin : Than-Moi ; Mt. Mauson, 2000-3000 ft.
Cambodia.
Malay Peninsula.
Sumatran Islands: Sumatra ; Sinkep ; Nias.
Java, 4,000 ft.
Borneo : Sarawak—Kuching ; Matang Road ; 4th mile, Rock Road ; Lingga (on the Batang Lupar River).
British N. Borneo.—Mt. Kina-Balu.
Philippines : Manilla ; S. Palawan.
S. Celebes.
Moluccas : Batchian.
Papuan Islands : New Guinea ; Jobi.
Australia.

I have omitted from the above list of localities Kuwert's "? Old Calabar," as it is almost certainly incorrect. His Calcutta specimens probably came from some collection here, or from imported timber, as no Passalids seem to live anywhere in the Indo-Gangetic Plain.

Leptaulax roepstorfi, Kuwert.

Leptaulax † planus [part], Stoliczka, 1873, p. 155.
Leptaulax † roepstorfi [part] + *planicollis*, Kuwert, 1898, pp. 288-290.
Leptaulax † roepstorfi, Gravely, above, p. 260, pl. xiii, fig. 57.

Localities :—

? Bengal : Calcutta.
E. Himalayas : Abor County—Yambung, 1100 ft. ; Rotung, 1400 ft.
Lower Burma : Tenasserim—Misty Hollow, W. side of Dawna Hills, Amherst District, c. 2200 ft. ; Tavoy.
Andamans.

Leptaulax planus (Illiger).

Passalus planus, Illiger, 1800, p. 104.
(*Leptaulax bicolor* [part], Gemminger and Harold, 1868, p. 969.)
Leptaulax † planus [part]. Stoliczka, 1873, p. 155.
(*Leptaulax bicolor* [part], Wytsman, 1884, p. 332.)
(*Leptaulax planus* [part], Kuwert, 1891, p. 188.)
Leptaulax † planus, Kuwert, 1898, p. 285.
Leptaulacides † planus, Zang, 1904*b*, p. 185.
Leptaulax † planus, Gravely, above, pp. 260-261, pl. xiii, fig. 58.

Localities :—

Lower Burma : Tenasserim—Tavoy.
Malay Peninsula ; Johore.
Sumatran Islands : N. E. Sumatra—Serdang.
Sinkep Island.
Java.
Borneo : Sarawak—Kuching ; Mujang ; Sadong ; Matang Road ; Paku.

Genus TRICHOSTIGMUS, Kaup.

This genus appears to be restricted to Celebes and the Philippines.

Trichostigmus thoreyi, Kaup.

Leptaulax Thoreyi, Kaup, 1868*a*, pp. 13-14.
(*Leptaulax Thoreyi*, Gemminger and Harold, 1868, p. 970.)
Trichostigmus Thoreyi, Kaup, 1871, p. 31.
(*Trichostigmus Thoreyi*, Wystman, 1884, p. 331.)
(*Trichostigmus Thoreyi*, Kuwert, 1891, p. 187.)
Trichostigmus Thoreyi, Kuwert, 1898, p. 283.
Trichostigmus † thoreyi, Gravely, above, p. 261.

Locality :—

Philippine Islands : Middle Luzon.[1]

[Trichostigmus ursulus (Schaufuss).]

Leptaulax † ursulus, Schaufuss, 1885, p. 187.
Trichostigmus Ursulus, Kuwert, 1891, p. 187.
Trichostigmus ursulus, Kuwert, 1898, p. 283.

Locality :—

South Celebes (according to the labels on the type specimens; Schaufuss gives no definite record).

ZOOGEOGRAPHICAL RESULTS.

The above summary of our present knowledge of the geographical distribution of the Oriental genera of Passalidae, shows that the family occurs in the Oriental region chiefly in the neighbourhood of hills. There are one or two records of specimens coming from Calcutta, but as these are the only records from any part of the Gangetic Plain, they may safely be regarded as records of the place from which specimens were dispatched after having been caught elsewhere. Geographically, therefore, the species found in the Indian Peninsula are at least as widely separated from

[1] There is a specimen from this locality in the Hamburg Museum collection.

those found in the Himalayas, Assam, Burma and the Malay Peninsula as from those found in Ceylon. Further, no Passalids are known from the dry hills of the Deccan or from the northern parts of the Western Ghats; and in the Himalayas only one species appears to extend further west than the Darjeeling District, this being *Ophrygonius cantori* which has been recorded from the Dehra Dun District.

There does not appear to be much to be learnt from the distribution of the subfamilies in which asymmetry does not occur.

Of these the Aulacocyclinae are at present centred towards the east of the Indo-Australian area; but the occurrence of a species of *Aulacocyclus* in the Indian Peninsula suggests that the subfamily may once have been commoner towards the west, and some of the genera more widely distributed, than is now the case. The genus *Ceracupes* is intermediate between the aberrant Chinese and Japanese genera *Cylindrocaulus* and *Auritulus* on the one hand, and the rest of the subfamily on the other, not only in certain structural peculiarities, but also in locality.

The Pleurariinae occur only in the Indian Peninsula and Sumatra—a discontinuous distribution which also suggests that the subfamily formerly occupied a more extensive area.

The most curious features in the distribution of the Macrolininae are their absence, so far as is known, from the Indian Peninsula, which contrasts strangely with their abundance in all other parts of the Oriental Region, including Ceylon; and their occurrence outside the Oriental Region only in Celebes.

The Leptaulacinae appear to be much rarer in the Indian Peninsula and Ceylon (from which countries only the two commonest and most widely distributed species are known) than in any other part of the Oriental Region.[1]

The distribution of the Aceraiinae and Gnaphalocneminae, in which asymmetrical forms occur, is of much greater interest.

The former subfamily occurs, usually in abundance, in all parts of the Oriental Region where any Passalids at all are to be found, excèpt the Andamans and Nicobars. The distribution of the different genera belonging to it is peculiar. In Ceylon we find the somewhat rare symmetrical species *Episphenus moorei*, which does not appear to live gregariously as only isolated examples ever seem to have been found; and the slightly asymmetrical, abundant, gregarious, and highly variable species *Episphenus comptoni*. In the Indian Peninsula we find two almost equally common but more markedly asymmetrical species of *Episphenus*, *E. indicus*, and *E. neelgherriensis*. The former has the anterior angles of the head prominent, and resembles *Episphenus comptoni* in its gregarious habits and its great variability in size; while the latter has the anterior angles of the head obtuse and not at all prominent, and resembles what little we know of the species of *E. moorei* in its less markedly gregarious habits and in that all specimens are of an approximately uniform size.

On the other side of the Gangetic Plain the symmetrical genus, *Tiberioides*, is found, as a rarity, in the north only. Throughout the whole of the E. Himalayas, Assam, Burma, Siam, Indo-China, the Malay Peninsula, and the Sunda and Philippine

[1] See also below, p. 330.

Islands we find the genus *Aceraius*, of which one species, *A. grandis*, resembles *Episphenus comptoni* and *Episphenus indicus* in its gregarious habits and its wide range of variability, resembling or rather exceeding the latter in the prominence of the anterior angles of its head, and resembling the former (if not the latter also) in being the most markedly asymmetrical species found in the region which it inhabits. Finally, in the greater part, if not the whole of this area, we find the genus *Ophrygonius*, apparently less common, and nearly related to the genus *Aceraius*.

It will be noticed that whenever one species is markedly more abundant than any of its allies inhabiting the same region, it is always found to be much more variable than them in size, and to be more markedly asymmetrical, in addition to which it may have the anterior angles of the head more prominent. Now asymmetry, and the prominence of the anterior angles of the head, are both of them peculiar characters which probably imply a high degree of specialization in their possessor; from which it will be seen that the dominant species of the sub-family *Aceraiinae*, in Ceylon and in the continental area east of the mouths of the Ganges, is in each case apparently the most highly specialized species of the sub-family found there, as well as being the most variable in size, and always gregarious in its habits. And it may be inferred that *Episphenus indicus*, which differs from *E. neelgherriensis* in having the anterior angles of the head prominent, in its very variable size, and in its somewhat more markedly gregarious habits, either is, or is likely to become, the dominant species of the subfamily in the Indian Peninsula, although at present it does not appear to be markedly more common than *E. neelgherriensis*.

The curious processes of the canthus in *Aceraius occulidens* suggest that this species, which is very closely allied to *A. grandis*, is perhaps even more highly specialized. If this is the case the former will presumably oust the latter, in due course, from its position as the dominant species of the genus. But it is also possible that the higher specialization indicated by these processes is not of an advantageous character, in which case *A. grandis* may be expected to hold its own until the appearance of some form better fitted to succeed it.

To explain the distribution of the Aceraiinae one must suppose that a migration of more and more highly specialized forms has taken place from the east towards the head of the Bay of Bengal and then south-westwards towards Ceylon.[1] With the exception of the one symmetrical genus *Tiberioides*, which has been able to hold its own in the Eastern Himalayas and the far east of Assam, the symmetrical or very slightly asymmetrical forms have been driven into Ceylon. There they have been cut off from further aggression, and so have been able to perpetuate their race, and even to produce one species, *Episphenus comptoni*, having all the biological and morphological characteristics of a dominant form except perhaps as regards the anterior angles of the head. Similarly the Indian Peninsula forms of the genus *Episphenus*, both of them more strongly asymmetrical than either of the Ceylon forms but with the

[1] The possibility of the migration having taken place in a reverse direction, the degree of specialization increasing in response to a fresh environment, is precluded by the occurrence of species allied to *Episphenus moorei* in Australia (see below, p. 315).

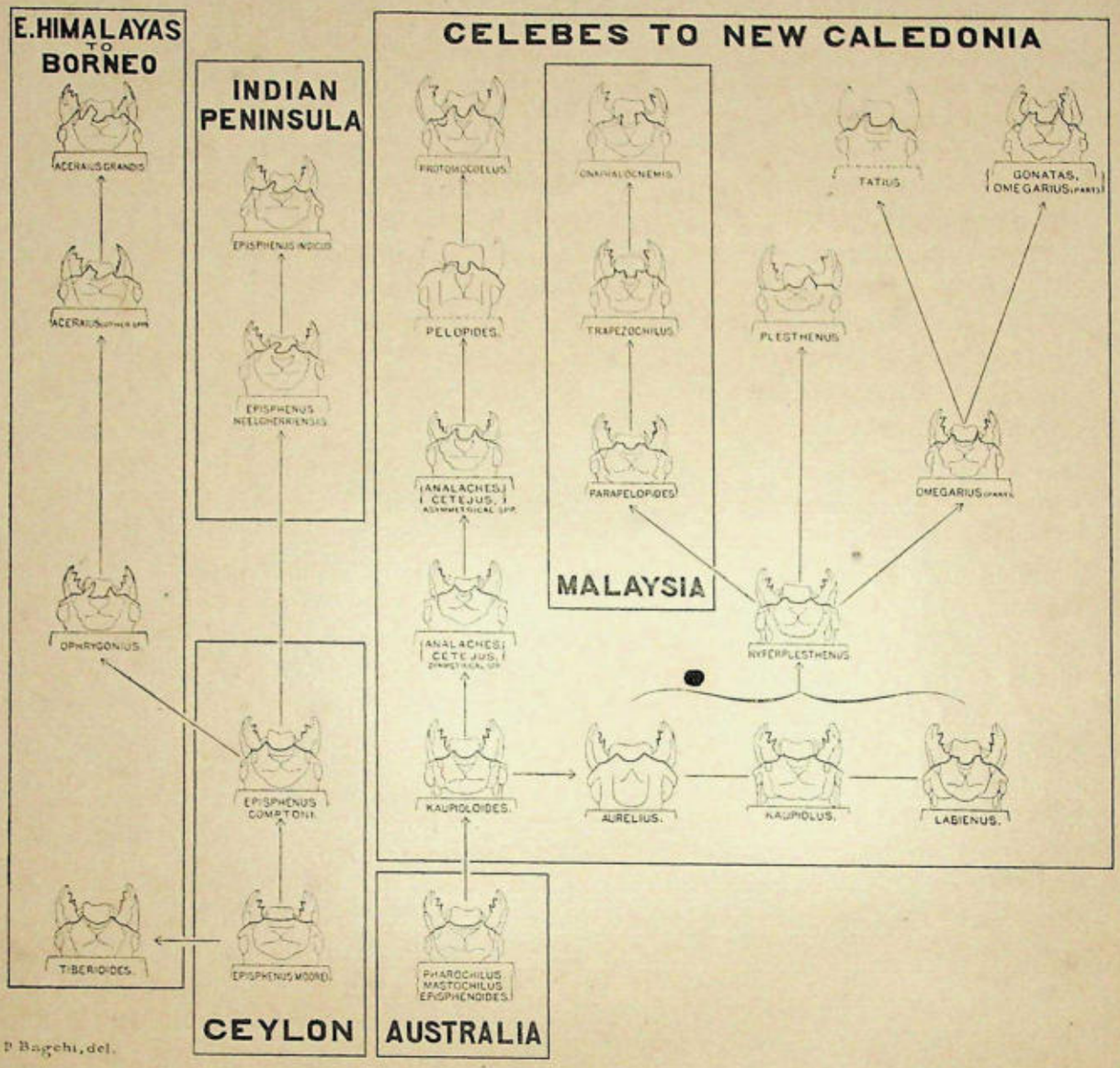
lowest terminal tooth still well developed on both mandibles and the anterior angles of the head even when prominent not asymmetrical, have been driven beyond the Gangetic Plain; but one of them has developed all the characteristics of a dominant form, except perhaps a higher degree of asymmetry than its allied competitor, although this competitor is still quite common. In the genera *Ophrygonius* and *Aceraius*, which inhabit the Oriental Region west of the Bay of Bengal, *Aceraius grandis* has alone developed all the characteristics of a dominant form. It is more abundant than any other species of either genus; its distribution is wider; and, with the exception of *A. occulidens*, it is structurally the most highly specialized member of the whole subfamily. It seems likely, moreover, to be the progenitor of two species, now apparently in course of evolution, one in the south and the other in the north, to which the names *A. grandis*, s. str. (with *rectidens* as a variety) and *A. grandis* sub-sp. *hirsutus*, have respectively been applied above.

The genus *Aceraius* is so completely united by transitional forms to the genus *Ophrygonius*, as to render its origin therefrom almost certain. In *Ophrygonius*, although the anterior margin of the head is asymmetrical the mandibles are symmetrical; whereas in all except a few (transitional) species of the *genus Aceraius*, the mandibles are also markedly asymmetrical; so it is quite in keeping with what has been said above of the great abundance of the most highly specialized *species* found in different parts of the Oriental Region, to find that the *genus Aceraius* is much more abundant than the *genus Ophrygonius* both as regards individuals and number of species; and that the somewhat isolated and symmetrical *genus Tiberioides*, which occurs only in the northern portion of the area inhabited by these genera, is less abundant than either. Many of these facts are illustrated and compared with similar ones relating to the Gnapholocneminae in text-fig. 7 (p. 314).

Although Palk Strait and the Gangetic Plain appear to have influenced the distribution of the Aceraiinae in a much more striking manner than has the line separating continental Asia from the East Indian Archipelago (including the Malay Peninsula), the influence of this line can also be seen. *Aceraius grandis* is the only species of the subfamily found on both sides of this line. The northern and southern races of this species occur one on each side of this line towards the west; but further east the northern race has established itself not only in Hainan and Formosa, but also in the Philippine Islands, whose fauna should presumably be allied rather to that of the Archipelago, and from which two representatives of this fauna—*Aceraius laevicollis* and *Aceraius borneanus*—have already been recorded.

The Gnaphalocneminae, most of which are asymmetrical, appear to hold much the same position in the fauna of the islands east of the Straits of Macassar as the Aceraiinae do in the countries west of it. But this zoogeographical boundary has not offered the same difficulties to their migration, as it has to that of the Aceraiinae; for one whole group of Gnaphalocneminae is found in, and perhaps confined to, the Oriental Region; and at least one species of the genus *Gonatas* occurs in the Sunda Islands.[1]

[1] *G. germari* and *naviculator* have been recorded; but all the specimens I have seen labelled with either of these names appear to me to belong to a single species.



TEXT-FIGURE 7.

Diagram illustrating the evolution of the different types of asymmetry found in the Aceraiinae and Gnaphalocneminae, as far as this can be done by reference to known genera, all of which are recent; and illustrating the geographical distribution of these genera. The only known exceptions to the distribution as shown here are:—(1) a species of *Episphenoides* which lives in New Guinea instead of Australia; (2) one or two species of *Gonatas* which occur in the Sunda Islands; (3) a species of *Gnaphalocnemis* which has been recorded from Amboina; and (4) the genus *Plesthenus*, whose anomalous distribution (in Australia and Celebes) calls for further study. The genus *Kaupioloides* is in some ways intermediate between the Australian genera and *Cetejus-Analaches* from New Guinea, in which position it is placed here. The head is, however, less perfectly symmetrical than in some species of the latter pair of genera; and its metasternum suggests the possibility of a closer relationship with *Protomocoelus* than is here indicated. The particular structures whose various modifications the diagram is designed to illustrate are shown by thickened lines. The figure of *Plesthenus* is from Kaup; those of *Pelopides* and *Tatius* are from Kuwert; that of *Aurelius* is partly from Kuwert, partly from memory; and that of the symmetrical species of *Cetejus-Analaches* entirely from memory.

The general nature of the evolution and distribution of this subfamily, together with that of the Aceraiinae, is shown in the accompanying figure (text-fig. 7). From this it will be seen that the forms of Gnaphalocneminae which come nearest to the most primitive of the Aceraiinae[1]—*Episphenus moorei* from Ceylon—are Australian; so it seems that in the Gnaphalocneminae also, the most primitive forms have been replaced by more highly specialized ones in the central parts of the Indo-Australian area, but have survived where they are cut off from aggression by some geographical barrier which the latter have as yet been unable to cross.

The only simple and symmetrical forms of Gnaphalocneminae found outside Australia are: (1) a single species—*pectinigera*, Heller—from New Guinea, of the otherwise purely Australian genus *Episphenoides*; and, (2) a few species of the closely allied genera *Cetejus* and *Analaches*. All the remaining extra-Australian symmetrical species are specialized in other ways. For instance, in the whole of the *Hyperplesthenus* group of genera, no member of which is very highly asymmetrical, and some of which are perfectly symmetrical, the lateral and intermediate areas of the metasternum are fused; and in addition, the central tubercle of *Aurelius*, and the antennae of *Labienus*, are of somewhat unusual form.

A comparsion of the geographical distribution of the Aceraiinae and Gnaphalocneminae with that of the Arachnid family Thelyphonidae, is not without interest. The Passalidae and Thelyphonidae (of the Oriental Region at least) inhabit the damp jungles of more or less hilly country; both families are absent from the Gangetic Plain; and in India the northwestern boundary of the geographical range of both is approximately the same, being dependent in both cases probably on climatic conditions. Finally, in the Thelyphonidae, as in the Aceraiinae and Gnaphalocneminae, we have a structural index to the degree of specialization found in different species, and find that species are most numerous and most highly specialized in the neighbourhood of Borneo and Celebes, and less numerous and less highly specialized the further one goes from these islands in any direction.[2] This seems to indicate a radial pressure of highly specialized on less specialized forms, resulting in a radial migration, one line of which especially—that in a westerly direction—follows very much the same course as appears to have been followed by the advance of more and more highly specialized forms of the Passalidae now under consideration.

The fact that this type of distribution is found in two such widely separated groups of Arthropods suggests that it may occur in a number of other groups also. And the peculiar richness of the fauna of the Malay Archipelago, which has long been known, and has contributed largely to the advancement of the hypothesis that insular conditions favour the rapid evolution of species, is evidence in favour of this suggestion. But when, as appears to be the case in the beetles now under discussion,

[1] *Episphenus moorei* appears to be more primitive than any species of the genus *Tiberioides*. For the latter, although equally symmetrical, differ from all other species of the subfamily in having the frontal tubercles less widely separated, and so probably form a divergent line of descent (see diagram).

[2] See J.A.S.B. (N.S.) VII (1911), Proceedings, pp. cxxiii-cxxv.

the more highly specialized species have been able to establish themselves on all the islands on one side or other of "Walllace's Line" and even in a few instances (*Gonatas* spp. and perhaps *Gnaphalocnemis tridens*) to establish themselves on both sides of this important boundary, it is difficult to see why more of them have not been able to cross it, and why Palk Strait and Torres Strait should have formed such serious obstacles to migration.

7. APPENDIX I.—A REVISED CLASSIFICATION OF THE ACERAIINAE.

In the key to the genera of Aceraiinae given on pp. 196–7 of the present paper the genera *Basilianus*, *Ophrygonius*, and *Aceraius* were defined in accordance with the views that had previously found general acceptance. Since that part of the paper went to the press, however, certain new species (all of them described above) have been submitted to me, which completely bridge the gaps between these three genera as there defined. I have therefore been compelled to reconsider the limits of the genera, and to adopt definitions more like those used in redefining the genera of Gnaphalocneminae (above, pp. 199–203). Indeed, the general course of evolution followed by the subfamilies Aceraiinae and Gnaphalocneminae respectively has proved to be very much the same (see diagram, p. 314); and the characters by which the Aceraiinae are distinguished from the Gnaphalocneminae as a whole, are probably of no greater importance than those by which certain groups of the latter subfamily are distinguished from one another. The majority of the genera of Gnaphalocneminae were known to me only through Kuwert's descriptions until after the outlines of the classification adopted above had been irrevocably fixed so far as this paper is concerned. Otherwise I would have reversed the positions of the Aceraiinae and Macrolininae, merging the former in the Gnaphalocneminae as the *Aceraius* group.

Not only do the genera *Basilianus* (old sense), *Ophrygonius* and *Aceraius* grade one into another, but the genera *Episphenus*, *Chilomazus*, and *Basilianus* do so also; for *Chilomazus comptoni* is even more variable than I at first supposed, and besides including specimens hardly more distinctly asymmetrical than *Episphenus moorei*, contains forms whose asymmetry is almost as great as that of the genus *Basilianus*, which they somewhat resemble in the structure of the anterior margin of the head.

Turning now to the structure of the mandibles in these three genera, the extent to which the dentition of the right mandible is reduced in any species is found to be correlated with the extent of the asymmetry of the head, in all cases except that of *Basilianus cantori*, a species in which the head is highly asymmetrical, but the mandibles scarcely more so than in the symmetrical species *Episphenus moorei*. In this it resembles *Ophrygonius inaequalis*, with which it is further connected, both stucturally and zoogeographically, by certain of the new species already referred to. The gap hitherto supposed to exist between *Basilianus cantori* and the genus *Aceraius* has likewise been filled; and the greatest gap that now remains in the Aceraiinae is that between *Basilianus cantori* from the Himalayas and Assam, and the species from

the Indian Peninsula with which it has hitherto been associated. In view of which I have found it necessary to transfer *B. cantori* to the genus *Ophrygonius*.

The monospecific genus *Chilomazus* is almost as closely related to the monospecific genus *Episphenus* on the one hand, and to the genus *Basilianus* on the other, as are the species *Basilianus neelgherriensis* and *B. indicus* to one another. Consequently, as a genus consisting of only four species cannot be regarded as inconveniently large, it seems best to unite all the species of Aceraiinae found in Ceylon and the Indian Peninsula in a single genus, for which the name *Episphenus* must be retained. The range of degrees of asymmetry found in this genus is very little greater than that found in each of the genera *Cetejus* and *Analaches*.

The species of Aceraiinae found on the other side of the Gangetic Plain are, however, much more numerous; and, although transitional forms exist, the majority either have almost symmetrical mandibles, or have both the lowest terminal and anterior lower teeth on the right side quite rudimentary, the former tooth being normal and the latter enlarged on the left side. The genus *Ophrygonius* must therefore be defined so as to include all species of the former class, and the genus *Aceraius* so as to include all species of the latter.

The latter genus appears to have been derived from the former in at least two different ways; for the transitional species described above under the names *Ophrygonius singapurae* and *Aceraius wallacei* seem to be allied to quite a different section of the genus *Aceraius* from that to which the transitional forms *Aceraius aequidens* and *A. minor* are allied.

Definitions, based on the structure of the mandibles, could be framed so as to include any of these four species in either genus; so I have thought it best to follow accepted definitions as far as possible, and to use the presence or absence of hair on the sides of the elytra as the crucial test, although *Aceraius wallacei* is transitional in this respect also, being much less hairy than most of the species belonging to the genus in which I have had to place it.

Four genera of Aceraiinae may then be recognized. They can be distinguished from one another as follows:—

1	Inner tubercles separated by a space $\frac{1}{3}$—$\frac{1}{2}$ as long as that separating outer tubercles	*Tiberioides*, Gravely, pp. 215 & 280.
	Inner tubercles separated by a space $\frac{2}{3}$—1 times as long as that separating outer tubercles	2.
2	Left outer tubercle acute, and little or no larger than right; or much larger and curved inwards, with its extremity rounded rather than truncate, and never angular on the outer side in front. Dentition complete in symmetrical species; lowest terminal tooth always present on both sides; right anterior lower tooth smaller than left in the more highly asymmetrical species.	*Episphenus*, Kaup, pp. 217 & 281.
	Left outer tubercle always larger than right, directed more or less inwards, truncate distally, outer angle of truncation distinct, forming a more or less forwardly directed apex to the tubercle; dentition complete, or both lowest terminal and anterior lower teeth reduced	3.

3	A little hair present on elytra at shoulders only; dentition always complete, left anterior lower tooth rarely enlarged.	*Ophrygonius*, Zang, pp. 224 & 284.
	Elytra hairy at sides also; right lowest terminal and anterior lower teeth almost always rudimentary; left anterior lower tooth almost always enlarged	*Acraius*, Kaup, pp. 228 & 286.

8. APPENDIX II.—KEYS FOR THE DETERMINATION OF SPECIES OF ORIENTAL PASSALIDAE.

In most of the following keys Oriental species only are dealt with. Of the seven genera occurring in both the Oriental and Australian Regions five (*Comacupes*, *Macrolinus*, *Gnaphalocnemis* [?], *Leptaulax* and *Trichostigmus*) are chiefly Oriental, and I have included all their species, basing my definitions of such as I have not seen[1] on the descriptions of previous writers. The genera *Aulacocyclus* and *Gonatas*, on the other hand, are found mostly in the Australian Region, and as I am unable to give any revised definitions of their species, only the Oriental forms are included in the keys.

Genus Comacupes, Kaup.

1	Mesosternum strongly punctured all over, abdominal sterna with at least a few hair-bearing punctures in fresh specimens..	2.
	Mesosternum unpunctured except at sides, abdomen unpunctured and hairless	*C. foveicollis*, p. 267.
2	Lower margin of overhanging portion of central tubercle of head usually rather long, always horizontal, anterior part of upper margin descending obliquely to meet it in a more or less acute angle; upper surface of same tubercle usually more or less distinctly grooved longitudinally, or excavate	3.
	Lower margin of overhanging portion of central tubercle of head short, or ascending obliquely to meet upper margin which is always horizontal; tubercle usually truncate or concave anteriorly, not sharply pointed, narrower, keeled or rounded above	5.
3	Central tubercle pedunculate (almost as in *Aulacocyclus*) ..	*C. basalis*, p. 267.
	Central tubercle not pedunculate	4
4	Central tubercle broad and strongly excavate above ..	*C. cavicornis*, pp. 204 & 268.
	Central tubercle narrow, at most longitudinally grooved above	*C. stoliczkae*, pp. 206 & 268.
5	Whole anterior end of central tubercle raised well above supra-orbital ridges, not truncate or concave in front	*C. masoni*, pp. 207 & 268.
	Central tubercle less elevated, truncate or concave in front, very variable	*C. cyclindraceus*, pp. 207 & 269.

[1] Several species not seen in time for inclusion in the descriptive part of this paper (part 4) are redefined here from personal observation. The only species not so defined are those marked with an asterisk (*) in part 6.

Genus **Taenioers**, Kaup.

1	Upper surface of central tubercle about twice as long as broad, flat, punctured, bordered by very distinct horse-shoe-shaped ridge which is open in front	*T. bicanthatus*, pp. 208 & 270.
	Upper surface of central tubercle relatively broader as a rule, less flattened, unpunctured, marginal ridge often indistinct or absent across middle-line behind as well as in front	2.
2	Anterior tibiae very broad	*T. platypus*, p. 270.
	Anterior tibiae slenderer	3.
3	Anterior margin of canthus meeting side of head a considerable distance behind anterior angle; external angle of canthus obtuse	*T. pygmaeus*, pp. 209 & 271.
	Anterior margin of canthus meeting side of head a very short distance behind anterior angle; external angle of canthus sharper	*T. bicuspis*, pp. 210 & 272

Genus **Aulacocyclus**, Kaup.

1	Apical portion of central tubercle not very strongly bent over forwards, directed a little upwards rather than downwards, the upper margin straight	2.
	Apical portion of central tubercle more strongly bent over forwards, never upwardly directed, at least the extreme distal portion of the upper margin bent a little downwards	3.
2	Dorsal grooves of elytra unpunctured	*A. rosenbergii*, p. 274.
	Dorsal grooves of elytra very distinctly punctured, as in the the two following species	*A. dilatus*, p. 276.
3	Central tubercle as seen from above not or scarcely broader in front than behind	4.
	Central tubercle seen from above much broader in front than behind	*A. andrewsi*, p. 211 & 275.
4	Apical portion of central tubercle very short, not bent downwards as a whole	*A. aruensis*, p. 277.
	Apical portion of central tubercle much longer, very slightly but distinctly bent downwards as a whole	*A. parryi*, p. 276.

Genus **Ceracupes**, Kaup.

1	Apex of horn formed by fusion of central tubercle with anterior margin of head bifid	2.
	Apex of this horn acute	*C. austeni*, pp. 212 & 278.
2	Upper surface of this horn roughly parallel-sided throughout ..	*C. arrowi*, p. 278.
	Uper surface of this horn much broader in front than behind	*C. fronticornis* pp. 212 & 277.

Genus **Cylindrocaulus**, Fairmaire.

Only one species, *C. bucerus*, p. 279.

Genus **Auritulus**, Zang.

Only one species, *A. patalis*, p. 279.

Genus Pleurarius, Kaup.

I have not seen a specimen of *P. pilipes*, and can find nothing in Kaup's description and figure by which to separate it from the Indian species. *P. pilipes*, from Sumatra (above, p. 279), and *P. brachyphyllus*, from India (above, pp. 213 and 280), are the only species of the genus that have yet been described.

Genus Tiberioides, Gravely.

1	Lateral grooves of elytra narrow, normally punctured	2.
	Lateral groves of elytra broad, their punctures transversely linear	*T. kuwerti*, pp. 215 & 280.
2	Mentum with a protuberance on anterior margin, somewhat as in *Episphenus comptoni*, and a strong transverse ridge a little further back	*T. borealis*, p. 281.
	Mentum without any such ridge or protuberance	*T. austeni*, pp. 216 & 281.

Genus Episphenus, Kaup.

1	Anterior margin of head symmetrical; anterior margin of mentum not depressed or grooved	*E. moorei*, pp. 217 and 281.
	Anterior margin of head more or less asymmetrical; anterior margin of mentum more or less depressed or grooved	
2	Anterior margin of head not very strongly asymmetrical as a rule; anterior margin of mentum strongly grooved on either side of a strong median tubercle (occasionally paired) ..	*E. comptoni*, pp. 218 & 281.
	Anterior margin of head strongly asymmetrical; mentum without any strongly marked tubercle	3.
3	Anterior angles of head not prominent	*E. neelgherriensis*, pp. 222 & 283.
	Anterior angles of head more or less prominent	*E. indicus*, pp. 220 & 282.

Genus Ophrygonius, Zang.

1	At least five well developed and pubescent antennal lamellae	2.
	Antennal lamellae very short, only four of them pubescent ..	*O. inaequalis*, pp. 227 & 285.
2	Anterior lower tooth of both mandibles normal, conical and acute	3.
	Anterior lower tooth of both mandibles very broad, more obtuse, flattened dorso-ventrally	*O. singapurae*, pp. 226 & 285.
3	Left outer tubercle moderately stout, directed more or less forwards	*O. cantori*, pp. 224 & 284.
	Left outer tubercle very slender, directed strongly inwards ..	*O. birmanicus*, pp. 226 & 285.

Genus Aceraius, Kaup.

Many of the characters by which the species of this genus are distinguished one from another are somewhat variable even in fresh specimens, and are very often modified by friction. When a series of each species is available for reference their determination is not very difficult; but when single specimens are to be determined the difficulty is often great, and size and locality will sometimes be found to afford a simpler clue to their identity than this key. The full range of the variation that I

have seen in each species has been carefully noted in the descriptions given in the more extended account of the genus (above pp. 228–240).

1	Upper tooth of both mandibles distinct; lowest terminal tooth of right mandible rudimentary or absent; anterior lower tooth of right mandible minute or absent, that of left mandible always very large	2.
	Upper tooth of both mandibles obsolete; lowest terminal tooth of both mandibles normal; anterior lower tooth of right mandible well developed, that of left side not always abnormally large	18.
2	No convexity of upper margin of left mandible, behind base of hinder margin of simple or bifid upper tooth; this margin concave, straight, or convex the whole way from tip of tooth backwards (see figs. 26*a*, 27*a*, 28*b*, 29)	3.
	Upper tooth of left mandible always simple, set in a hollow in front of a convexity of the upper margin from which it is distinctly separated at base (see fig. 25*a*, pl. xii; & 4C, p. 234)	14.
3	Upper tooth of left mandible very variable; a small denticle sometimes present below the apex (figs. 28*a*, 32), but the apex itself not bifid (figs. 26*a*, 27*a*, 28, 29, 30, 32, 33) except sometimes in species in which the anterior angles of the head are very distinctly prolonged forwards (fig. 28*b*)	4.
	Anterior angles of the head obtuse, never prolonged forwards; apex of upper tooth of left mandible always more or less distinctly bifid in unworn specimens (see especially fig. 31)	10.
4	Right outer tubercle simple, elongate, acute (figs. 26, 32, 33); anterior angles of head truncate or at most moderately prolonged	5.
	Anterior angles of head at least moderately prolonged; right outer tubercle usually shorter, truncate or rounded, sometimes divided into two separate tubercles of which the outer one or both may be more or less elongate and acute	8.
5	All six lamellae of antennae very long and slender; inner margin of right outer tubercle parallel to axis of body at base; anterior angles of head not prominent	*A. wallacei*, pp. 228 & 286.
	Proximal lamellae of antennae shorter; inner margin of right outer tubercle oblique throughout	6.
6	Apex of right outer tubercle truncate or imperfectly bifid in profile, the suture distinctly bent downwards; anterior angles of head not prominent; mentum punctured sparsely or not at all in middle (left upper tooth very variable)	*A. perakensis*, pp. 229 & 287.
	Apex of right outer tubercle simply pointed in profile, suture not bent downwards; anterior angles of head more or less distinctly prominent; mentum more or less strongly punctured throughout	7.
7	Anterior angles of head not very prominent; tip of right outer tubercle as in *A. perakensis*, not bent outwards (fig. 33) ..	*A. möschleri*, pp 229 & 287.
	Anterior angles of head more prominent; tip of right outer tubercle bent somewhat abruptly outwards	*A. illegalis*, pp. 230 & 287.

8	Canthus without any upwardly directed tubercle	9.
	A stout erect tubercle arising from dorsal surface of canthus immediately in front of eye	*A. occulidens*, pp. 234 & 290.
9[1]	At most 34 mm. long; anterior angles of head scarcely more prominent than in *A. illegalis*, somewhat variable; apparently confined to the Malay Peninsula and Archipelago, and the Philippines	*A. laevicollis*, pp. 230 & 287.
	At least 33 mm. long, specimens from the Malay Peninsula and Archipelago always much bigger than this; anterior angles of head often strongly produced forwards, especially in small specimens	*A. grandis*[2], pp. 231 & 288.
10	Specimens at least 43 mm. long; right outer tubercle rounded or obsolete except in one species always over 47 mm. long	11.
	Specimens at most 40 mm. long; right outer tubercle always more or less distinct and pointed	13.
11	Right outer tubercle distinct; ridge between lateral and intermediate areas of metasternum obtuse, rough; tenth rib of elytra punctured and hairy anteriorly	*A. laniger*, pp 234 & 290.
	Right outer tubercle more or less obsolete; ridge between lateral and intermediate areas of metasternum acute, polished; tenth rib of elytra usually hairless and unpunctured	12.
12	Supra-orbital ridges and inner tubercles normal; right outer tubercle not completely absent	*A. kuwerti*, pp. 235 & 290.
	Supra-orbital ridges with the apical angle very strongly developed, and situated on inner side of, rather than behind, the anterior truncation; left inner tubercle situated on inner side of base of left outer tubercle; right outer tubercle missing ..	*A. tricornis*, pp. 235 & 290.

[1] These distinctions are much more definite in reality than might be supposed. Out of the several hundred specimens I have examined I have only been in doubt as to the identity of one; and as this was from Tonkin, where *A. grandis* is known to occur not infrequently, and *A. laevicollis* has never been found, it must I think have belonged to the former species.

[2] Occurring under three (? or four) imperfectly differentiated forms:—

A. Northern race, confined to continental Asia north of the Malay Peninsula, the Philippines, Formosa, etc. Seventh rib of elytra usually strongly punctured, rarely without punctures; hair on elytra always quite short in specimens from Assam and the Himalayas, inclined to be longer in specimens from Burma and Tonkin; shape of head very variable — sub-sp. *hirsutus*, Kuwert.

B. Southern race, confined to the Malay Peninsula and Sunda Islands. Seventh rib of elytra never punctured; hair very variable in length, usually longer than in the northern race. Occurring in two forms:—

a. Anterior angle of left side of head at least moderately prolonged and curved inwards .. .. — *A. grandis*, Burmeister, s. str.

b. Anterior angle of left side of head at most moderately prolonged, directed outwards or forwards . — var. *rectidens*, Kuwert.

?C. Chinese race with elytra like those of the southern race .. — sub-sp. *chinensis*, Kuwert

[Mr. Arrow tells me that Burmeister's type resembles *rectidens*; in this case the form here and throughout this paper called *grandis*, s. str., becomes var. *addendus*, Kuwert.]

13	At least 34 mm. long; very variable in structure; right outer tubercle simply pointed in profile in unworn specimens; scars on mesosternum almost always distinct	*A. laevimargo*,[1] pp. 238 & 291.
	At most 32 mm. long; less variable; right outer tubercle slightly truncate in profile in perfectly unworn specimens; scars on mesosternum obsolete	*A. pilifer*, pp. 235 & 291.
14	Posterior part of tenth and whole of eighth ribs of elytra unpunctured	15.
	Seventh to tenth ribs of elytra (inclusive) punctured throughout	*A. borneanus*, pp. 238 & 292.
15	Convexity of upper margin of left mandible very high and strongly curved—usually much higher than in any other species; left outer tubercle rather slender; right outer tubercle more or less truncate in profile	*A. alutaceosternus*, pp. 236 & 291.
	Convexity of upper margin of left mandible moderately high and strongly curved; left outer tubercle somewhat stouter; right outer tubercle variable	16.
16	Free portion of left outer tubercle distinctly longer than broad; right outer tubercle often very broadly bifid in profile ..	*A. helferi*, pp. 238 & 292.
	Free portion of left outer tubercle more or less square; right outer tubercle not *very* broadly bifid in profile	17.
17	Right outer tubercle distinctly bifid in profile	*A. assamensis*, pp. 237 & 292.
	Right outer tubercle at most imperfectly bifid in profile ..	*A. himalayensis*, pp. 236 & 292.
18	Anterior lower tooth of left mandible very large, as in all preceding species of the genus, much larger than that of left mandible; posterior part of tenth and whole of eighth ribs of elytra unpunctured	*A. minor*, pp. 240 & 293.
	Anterior lower tooth of left mandible scarcely larger than that of right; seventh to tenth ribs of elytra (inclusive) somewhat sparsely punctured throughout	*A. aequidens*, pp. 240 & 293.

Genus **Macrolinus**, Kaup.

1	Inner tubercles, and anterior part or whole of frontal ridges, obsolete	2.
	Frontal ridges complete and well developed, inner tubercles more or less distinct	3.
2	Apex of central tubercle approximately rectangular in profile, directed upwards, not overhanging	*M. urus*, p. 294.
	Apex of central tubercle acute, directed forwards, somewhat overhanging	*M. duivenbodei*, p. 294.
3	Ridge joining inner tubercles separated from anterior margin of head throughout its whole length by a more or less concave surface	4.
	Ridge joining inner tubercles closely approximated to anterior margin of head either in middle or throughout	6.
4	Lateral grooves of elytra narrow, punctures normal	5.
	Lateral grooves of elytra broad, punctures transversely linear	*M. sikkimensis*, pp. 243 & 294.

[1] Or the slightly larger *A. perakensis* (pp. 229 & 287) in which the upper margin of the left mandible is very variable and may be indistinguishable from that typical of the section of the genus to which *A. laevimargo* belongs.

5	Outer tubercles slender in profile, truncate; ridge joining inner tubercles concave	*M. nicobaricus*, pp. 241 & 294.
	Outer tubercles stouter and distinctly bifid in profile, ridge joining inner tubercles straight	*M. andamanensis*, pp. 242 & 294.
6	Inner tubercles situated distinctly behind anterior margin of head	7.
	Inner tubercles situated on (or vertically above) anterior margin of head	9.
7	Grooves of elytra coarsely punctured, lateral grooves almost as broad as intervening ridges, their punctures very coarse indeed	*M. crenatipennis*, pp. 244 & 295.
	Grooves of elytra less coarsely punctured, lateral grooves much narrower than intervening ridges	8.
8	Ridge between inner tubercles convex, evenly curved throughout; anterior angles of pronotum strongly punctured ..	*M. rotundifrons*, pp. 244 & 295.
	Ridge between inner tubercles straight throughout almost its whole length; anterior angles of pronotum unpunctured ..	*M. waterhousei*, pp. 245 & 295.
9	Third lamella of antennae distinctly shorter than fourth; median groove of pronotum distinct, complete	*M. suliciperfectus*, p. 296.
	Third lamella of antennae not distinctly shorter than fourth; median groove of pronotum obsolete	10.
10	Tip of second lamella not reaching line joining tips of first and third when antenna is furled	*M. weberi*, pp. 245 & 296.
	Tips of all six lamellae arranged in a straight line when antenna is furled	*M. latipennis*, pp. 245 & 296.

Genus Parapelopides, Zang.

Only one species, *P. symmetricus*, pp. 246 and 297.

Genus Trapezochilus, Zang.

Only one species, *T. dorsalis*, pp. 247 and 297.

Genus Gnaphalocnemis, Heller.

1	Left outer tubercle consisting of a single, somewhat slender, obliquely truncate process; right outer tubercle consisting of a similar but broader and slightly bifid inner process, together with smaller pointed outer and middle processes ..	*G. simplex*, pp. 248 & 298.
	Both tubercles consisting of three denticles more or less fused together, the middle one sometimes obsolete	2.
2	Lateral grooves of elytra all narrow, simply punctured ..	*G. burmeisteri*, pp 249 & 298.
	Grooves 5-7 of elytra more or less broad; each containing a polished flattened band which is marked by a single row of punctures, and defined on either side by a more less distinct roughened line, with which the punctures may be to some extent confluent	3.

3	Grooves 5-7 of elytra somewhat variable in width; the posterior part of groove 8 rarely wider than the anterior part, never as wide as groove 7	*G. monticulosus*, pp. 249 & 298.
	Grooves 5-7 of elytra always very broad; the posterior part of groove 8 like them	*G. tridens*, pp. 250 & 299.

It is possible that "*Pelopides*" *gravidus*, Kuwert, whose position is uncertain, may belong to this genus. It differs from all the species included in the key in having the left outer tubercle more strongly developed than the right.

Genus **Gonatas**, Kaup.

Only two species of this genus are recorded from the Oriental Region. I have only seen one of them.

1	Left mandible less elongated and more curved; lamellae of antennae longer and slenderer	*G. germari*, pp. 250 & 301.
	Left mandible longer and less curved; lamellae of antennae shorter and stouter	*G. naviculator*, p. 301.

Genus **Leptaulax**, Kaup.

1	Depressed surface of two or three outermost grooves of elytra dull, the sculpturing somewhat worn-looking	2.
	Elytra polished throughout	4.
2	A more or less distinct polished tubercle formed out of each of the transverse ridges in lateral grooves of elytra ..	*L. beccarii*, pp. 251 & 302.
	No such tubercles present	3.
3	Pronotum flatenned, densely punctured laterally, sides practically straight	*L. humerosus*, pp. 251 & 302.
	Pronotum convex; punctured only in marginal groove, in and close round scars, and (usually) in anterior angles; sides distinctly curved	*L. anna*, p. 303.
4[1]	Inner tubercles at most twice as far from one another as from outer tubercles; puncturing of lateral grooves of elytra somewhat variable, but normally transverse to a marked degree in all species; intermediate areas of metasternum closely punctured, unpunctured band along outer margin absent or quite narrow	5.
	Inner tubercles at least twice as far from one another as from outer tubercles; puncturing of lateral grooves of elytra not markedly transverse; intermediate areas of metasternum often less closely punctured, and always with an unpunctured band along the outer margin	8.
5	Inner and outer tubercles approximately equal, the former at most twice as far from one another as from the latter	6.
	Inner tubercles much longer than outer, the later almost obsolete; the former at least twice as far from one another as from the latter	*L. macassariensis*, pp. 256 & 305.

[1] I have no specimens of *L. novaeguineae*, *L. obtusidens*, or *L. glaber* before me, and cannot be certain that these characters are correctly noted here in their case.

6	Pronotum unpunctured, except in scars and marginal grooves	*L. timoriensis*, p. 303.
	Sides of pronotum more or less thickly covered with strong punctures .. .. 7.	
7[1]	Central area of metasternum unpunctured	*L. dentatus*, pp. 252 & 303.
	At least a few strong punctures on central area of metasternum	*L. cyclotaenius*, pp. 255 & 305.
8	Puncturing of abdominal sterna very variable; punctures, when present, of the usual type .. .. 9.	
	Abdominal sterna covered all over with somewhat obscure, broad, shallow punctures	*L. planus*, pp. 260 & 310.
9	Posterior intermediate areas of metasternum punctured .. .. .. 10.	
	Posterior intermediate areas of metasternum unpunctured ..	*L. roepstorfi*, pp 260 & 309.
10[1]	Central part of mesosternum sharply defined on each side by a pair of ridges which, starting from the anterior angles, extend in a straight line backwards and a little outwards till close to the posterior margin, where they curve strongly outwards; the whole of the mesosternum outside these lines depressed and granular; only the central part smooth	*L. anipunctus*, pp. 256 & 306.
	Mesosternal scars smaller, not occupying the whole of the sides of the mesosternum .. .. 11.	
11[2]	Lateral grooves of elytra moderately broad, punctures slightly transverse	*L. novaeguineae*, p. 306.
	Lateral grooves of elytra narrower, punctures rounder .. .. .. 12.	
12	Frontal ridges not reaching anterior margin of head .. .. .. 13.	
	Frontal ridges reaching anterior margin of head	*L. bicolor*, pp 257 & 307.
13	Posterior intermediate areas of metasternum finely punctured in inner angle; elytra uniformly coloured	*L. obtusidens*, p. 307.
	Posterior intermediate areas of metasternum strongly and confusedly punctured; elytra reddish in front and black behind	*L. glaber*, p. 307.

Genus **Trichostigmus**, Kaup.

1	About 24 mm. long; a few punctures in anterior angles of pronotum; marginal groove of pronotum broad and deep and coarsely punctured	*T. thoreyi*, Kaup; pp. 261&310.
	About 17 mm. long; surface of pronotum unpunctured except close to scars; marginal groove very fine or almost obsolete ..	*T. ursulus*, Schaufuss; p. 310.

9. APPENDIX III.—THE GENUS *TARQUINIUS*, AND A REMARKABLE NEW GENUS FROM NEW GUINEA.

Since writing the earlier part of this paper, I have received for examination a very remarkable Passalid from New Guinea. Although this insect is not from the Oriental Region, it may conveniently be described in the present paper; for it will have to be made the type of a new genus, whose position in the classification of Indo-Australian genera outlined above is of peculiar interest. It appears, moreover, to

[1] It is quite possible that this character is of less value than in this case it at present seems to be, and that these two species are not really distinct.

[2] This distinction is by no means a satisfactory one; but the position of *L. novaeguineae*, as explained above (p. 306), has not yet been properly determined.

throw light on the position of that most aberrant of all Indo-Australian Passalids, *Tarquinius paradoxus*, Kuwert, concerning which I have not hitherto dared to hazard an opinion.

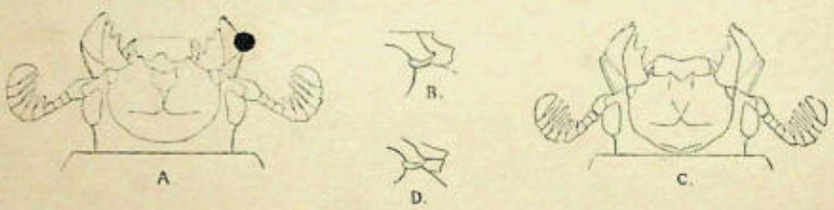
Pseudepisphenus, n. gen.

Lamellae of *antennae* six in number, all moderately long. *Mandibles* as in *Tarquinius*: symmetrical, the groove between the upper and middle terminal teeth very sharply defined on the lower side, branched just above the external angle of the mandible, the upper and more conspicuous branch extending obliquely across the externo-dorsal surface to end in the upper tooth which is obtuse and set very far back; remaining teeth normal. *Mentum* as in *Episphenus*: primary scars absent; secondary scars small and confined to anterior margin. Left outer tubercle of *head* composed of two widely separated parts, of which only the outermost is represented on the right side. Lateral and intermediate areas of *metasternum* distinct.

Pseudepisphenus perplexus, n. sp.

Text-fig. 8, A & B.

Described from a single specimen collected by Mr. A. F. R. Wollaston during the Utakwa River Expedition in Dutch New Guinea, and preserved in the British Museum.



TEXT-FIGURE 8.

A. *Pseudepisphenus perplexus*, head × 4.
B. Do. front of head from side × 8.
C. *Tarquinius paradoxus*, head × 4.
D. Do. front of head from side × 8.

Length 24 5 mm. The lamellae of the *antennae* are moderately long and slender, the last three much longer than the first three. The *labrum* is punctured and hairy, its anterior margin is practically straight, its angles are rounded and the left one is distinctly more prominent than the right. The general form of the *mandibles* has been described in defining the genus; it is unlike that found in any other Passalid known to me except *Tarquinius paradoxus*, Kuwert; the external angle is, however less pronounced than in that species, as is also the lateral keel behind it, which is only indicated by a fine groove just above the outer margin; the anterior lower teeth, too, are somewhat shorter and stouter, and that on the left mandible is no larger than that on the right. The *mentum* is extraordinarily like that of *Episphenus indicus*, and in the single specimen before me I can find no characters by which it can be distinguished. The *head* is highly polished, and entirely smooth except for a few punctures in front of the parietal ridges. Its general form is shown in

text-figs. 8A & B. The right outer tubercle is very deep and broadly truncate as seen from the side. The outer portion of the left outer tubercle is exactly like it; but between this and the middle-line is a large rounded process which does not occur on the right side. The surface of the head between the outer tubercles and the supraorbital ridges is more or less level, not excavate. The apical angles of the supraorbital ridges are very distinct, of about 120°, and slightly peaked. The *pronotum* is unpunctured except in the marginal groove and in the small, round, hairless scars. The marginal groove is broadly incomplete before and behind; but the median groove, which is deeply impressed, is practically complete. The *plates of the lower side* of the prothorax bear punctures and hair distributed as usual in the family, but not so thickly or extensively as sometimes. The *scutellum* is very indistinctly punctured all over; the *mesothoracic episterna* are coarsely punctured above and along the anterior margin; the *mesosternum* is highly polished throughout, except in the deeply impressed semi-lunar scars, and even these are scarcely dull. The lateral areas of the *metasternum* are narrow, parallel-sided and slightly roughened; they are very sharply separated from the anterior and posterior intermediate areas, which are broadly continuous with one another, and are coarsely punctured except along their outer margins. The *posterior coxae* are smooth. The scars of the *abdominal sterna* are more or less roughened and punctured. The *elytra* are hairless, and are unpunctured except in the grooves, of which the lateral are much more coarsely punctured than the dorsal, their punctures being, however, scarcely transverse.

The systematic position of this form is somewhat difficult to determine. The structure of the anterior margin of the head at once suggests relationship with the subfamily Gnaphalocneminae; and the Aceraiine form of mentum seems to place it near the genus *Hyperplesthenus*. In *Hyperplesthenus* and all other genera of the group to which it belongs, however, the lateral and intermediate areas of the metasternum are fused, whereas in *Pseudepisphenus* no trace of any such fusion is found; and all known species of the *Hyperplesthenus* group are much larger insects than *Pseudepisphenus perplexus*.

In size and general appearance, *Pseudepisphenus* resembles rather the *Protomocoelus* group, the simpler members of which have, like it, a metasternum of the ordinary type. The possibility of the absence of primary scars from the mentum in this group has been pointed out above (p. 194, footnote); and it is quite likely, I think, that in *Pseudepisphenus* we have a case in point.

Although the precise systematic position of *Pseudepisphenus* is open to this much doubt, its asymmetry and consequent obvious connection with some group of the Gnaphalocneminae are of great interest on account of its apparent affinity, on the other hand, with the aberrant genus *Tarquinius*. The peculiar structure of its mandibles is essentially the same as that found, so far as I know, in *Tarquinius* alone of all Indo-Australian Passalidae. The chief difference between the mandibles of the two genera lies in the fact that the peculiar external keel is more strongly emphasized in

Tarquinius than in *Pseudepisphenus*, i.e. that the peculiarities which have appeared in *Pseudepisphenus* tend to be accentuated in *Tarquinius*. Quite in keeping with this is the fact that the scars on the mentum, of which the primary pair has disappeared and the secondary is small in *Pseudepisphenus*, have completely disappeared in *Tarquinius*. And the outer tubercles of *Tarquinius* very closely resemble the right outer tubercle of *Pseudepisphenus* and that part of the left which is symmetrical with it—all that is required to produce a head shaped like that of *Tarquinius* from that of *Pseudepisphenus*, is a shift forwards of the inner tubercles to the anterior margin, where that of the left side would replace the asymmetrical inner portion of the left outer tubercle. The outer tubercles in the Leptaulacinae, on the other hand, are simple and more or less acute; and the Leptaulacinae are the only known Indo-Australian forms to which *Tarquinius* bears even a superficial resemblance. It is further separated from them by the presence of six well-developed lamellae on each antenna instead of only three, by the structure of its mandibles, and by the absence of scars from the mentum.

The differences between the Aceraiinae and Gnaphalocneminae seemed very great, so long as my knowledge of the latter subfamily was practically confined to the information I could glean from previous authors. The Aceraiinae are, undoubtedly, somewhat isolated from a geographical point of view; and the separation has been a convenient one for the purposes of the present paper. That their recognition as a distinct subfamily on anatomical grounds is less easy to justify than it at first appeared to be, and that it may have to be abandoned, has already been suggested in Appendix I. If *Tarquinius* is also to be included in the Gnaphalocneminae, it is difficult to see why the Macrolininae and perhaps also the Pleurariinae and even the Leptaulaci..ae should not be included as well. Whether these several series are to rank as subfamilies or as groups, is purely a question of convenience; and it cannot be satisfactorily settled by one who has no special knowledge of African and American forms.

Pseudepisphenus and *Tarquinius* appear to have originated from an asymmetrical ancestor within some group of the *Gnaphalocneminae* as defined at the beginning of this paper. There is no reason to suppose that they have had a separate ancestry from symmetrical forms, as is the case with the Aceraiinae. It is, however, impossible to include them in the Gnaphalocneminae without redefining that subfamily. This I could not do without either splitting it up into groups, or else enlarging it to some extent and thus raising the larger issues referred to in the preceding paragraph; and these I am not in a position to deal with. For the present, therefore, it seems best to regard the genera *Pseudepisphenus* and *Tarquinius* as constituting a distinct subfamily Tarquiniinae, distinguished from all others by the strong groove which extends from the upper tooth to the outer angle of both mandibles.

The genera *Pseudepisphenus* and *Tarquinius* may be separated thus:—

Inner tubercles situated behind anterior margin of head; outer tubercles asymmetrical .. .. *Pseudepisphenus*, Gravely.

Inner tubercles situated on anterior margin of head as in *Leptaulax*; outer tubercles symmetrical .. .. .. *Tarquinius*, Kuwert.

The evolution of a symmetrical *Leptaulax*-like form from an asymmetrical ancestor, suggests that the union of the inner tubercles with the anterior margin of the head represents an even higher degree of specialization than does the asymmetrical condition. The extraordinarily wide distribution and exceptional variability of the two dominant species of *Leptaulax* tend to support this suggestion. From which it may be inferred that the Leptaulacinae are of comparatively recent origin, and that their scarcity in the Indian Peninsula and Ceylon is due to the fact that they have not yet had time fully to establish themselves there.

Whether the high degree of specialization thus indicated in *Tarquinius* will prove sufficiently advantageous to its possessor to enable it to become a dominant form remains to be seen. At present the only known species of the genus appears to be extremely rare.

Before finally leaving the question of the many different forms assumed by different species of Gnaphalocneminae and their allies, a further aspect may be emphasized of the fact that in *Pseudepisphenus perplexus* we have a species, obviously of Australian and not Oriental extraction, whose mentum is indistinguishable from that of an Oriental species. Its Australian ancestry is indicated, apart from zoogeographical considerations, only by the form of the anterior margin of the head, and this is the only structural indication of such ancestry that we could expect to find in a species with a mentum of this form.

If one species of Australian ancestry has such a mentum, there is no reason why another should not have it also; and the alteration needed in the form of the anterior margin of the head of many Gnaphalocneminae to make them resemble the Aceraiinae in this respect also, is no greater, and would be no more remarkable, than the alteration that appears to have taken place in the evolution of *Tarquinius*. Two so-called species, "*Laches*" *infantilis* and *puerilis*, Kaup, which I have been unable to distinguish from *Episphenus neelgherriensis*, are recorded from Vanicoro (Santa Cruz Islands) and the Aru Islands respectively. In the absence of any confirmation of these records since the "species" were first described in 1871, the probability is, as pointed out above (p. 284), that they are incorrect. Should either or both of them be confirmed, however, convergence would, I consider, offer a much more plausible explanation of such anomalous distribution, than migration in a manner utterly at variance with that otherwise adopted throughout the Aceraiinae. It is, moreover, by no means improbable that species may yet be found in Australian islands which, though really allied to some group of Gnaphalocneminae, and distinct from any known species of Aceraiinae, have, nevertheless, the characters of the latter rather than of the former subfamily.

10. APPENDIX IV—SUPPLEMENTARY CATALOGUE OF SPECIMENS IN THE INDIAN MUSEUM COLLECTION.

Largely as a result of work done in European museums while the earlier parts of this paper were going through the press the following additions have recently been made to the Indian Museum collection.

Subfamily *AULACOCYCLINAE.*

Genus **COMACUPES**, Kaup.

Comacupes cylindraceus (Perty).

Regd. No.	$\frac{6294}{20}$-$\frac{6312}{20}$	Telom, S. Perak, 4000 ft.	Oxford Museum.

Comacupes foveicollis, Kuwert.

Regd. No.	$\frac{7295\text{-}6}{20}$	Baram R., Sarawak	British Museum.

Genus **TRISTORTHUS**, Kuwert

Tristorthus tricuspis (Kaup).

Regd. No.	$\frac{4560}{20}$	Yahoué, New Caledonia	K. Zool. Mus., Berlin.

Genus **TAENIOCERUS**, Kaup.

Taeniocerus platypus, Kaup.

Regd. No.	$\frac{4372\text{-}4}{20}$	Deli, N.E. Sumatra	K. Zool. Mus., Berlin.

Genus **AULACOCYCLUS**, Kaup.

Aulacocyclus deyrollei, Kaup.

Regd. No.	$\frac{4454}{20}$	Ballarat Dist., Victoria	Deutsches Entom. Mus.

Aulacocyclus sp.

Regd. No.	$\frac{880}{1}$	Australia	?

Genus **CERACUPES**, Kaup.

Ceracupes arrowi, Heller.

Regd. No.	$\frac{4443}{20}$	Kosempo, Formosa	Deutsches Entom. Mus.

Genus **PURITULUS**, Zang.

Auritulus patalis, Lewis.

Regd. No.	$\frac{4777\text{-}8}{20}$ (*cotypes*)	Yuyama, Japan	British Museum.

Subfamily *ACERAIINAE.*

Genus **OPHRYGONIUS**, Zang.

Ophrygonius cantori subsp. **convexifrons**, Zang.

Regd. No.	$\frac{7283\text{-}92}{20}$	Sin Lum, Bhamo, 6000 ft.	British Museum.
,,	$\frac{7293\text{-}4}{20}$	Bhamo	,,

Ophrygonius inaequalis (Burmeister).

Regd. No.	$\frac{4775}{20}$	Singapore	British Museum.
,,	$\frac{4776}{20}$	Penang	,,

Genus ACERAIUS, Kaup.

Aceraius perakensis, Kuwert.

Regd. No.	$\frac{4382}{20}$	Taiping, 4000–4500 ft.	K. Zool. Mus., Berlin.
,,	$\frac{6213}{20}$	Telom, S. Perak, 4000 ft.	Oxford Museum.

Aceraius laevicollis (Illiger).

Regd. No.	$\frac{4386\text{-}7}{20}$	W. Sumatra ("Bandar Buat b. Padang Schoede S. G.")	K. Zool. Mus., Berlin.
,,	$\frac{4388}{20}$	Delhi, Sumatra	,,
,,	$\frac{4444}{20}$	Java	Deutsches Entom. Mus.
,,	$\frac{4385}{20}$	Bandjermasin	K. Zool. Mus., Berlin.
,,	$\frac{4445}{20}$	S. Palawan	Deutsches Entom. Mus.
,,	$\frac{4389}{20}$	Luzon	K. Zool. Mus., Berlin.

Aceraius grandis (Burmeister), s. str.

Regd. No.	$\frac{4393}{20}$	Sumatra	K. Zool. Mus., Berlin.
,,	$\frac{4447}{20}$	Tengger Mountain, Java	Deutsches Entom. Mus.
,,	$\frac{4390}{20}$ $\frac{4392}{20}$	Java	K. Zool. Mus., Berlin.
,,	$\frac{4448}{20}$		Deutsches Entom. Mus.
,,	$\frac{4391}{20}$	Bandjermasin	K. Zool. Mus., Berlin.

A. grandis var. rectidens, Kuwert.

Regd. No.	$\frac{4384}{20}$	Deli, Sumatra	K. Zool. Mus., Berlin.
,,	$\frac{4383}{20}$	Java	,,
,,	$\frac{4446}{20}$ (*A. Magnus*, Kuwert det.)	?	Deutsches Entom. Mus.

A. grandis subsp. hirsutus, Kuwert.

Regd. No.	$\frac{4459}{20}$	Catchin Cauri	Deutsches Entom. Mus.
,,	$\frac{4396\text{-}8}{20}$	Mt. Mauson, 2–3000 ft. Tonkin	K. Zool. Mus., Berlin.
,,	$\frac{4449}{20}$	Tonkin	Deutsches Entom. Mus.
,,	$\frac{4399\text{-}4400}{20}$	Hainan	K. Zool. Mus., Berlin.
,,	$\frac{4408}{20}$	Fuhosho, S. Formosa	,,
,,	$\frac{4453}{20}$	Kosempo, Formosa	Deutsches Entom. Mus.
,,	$\frac{4406\text{-}7}{20}$ $\frac{4460}{20}$	Polisha, Formosa	K. Zool. Mus., Berlin.
,,	$\frac{4451\text{-}2}{20}$ $\frac{4458}{20}$	Sokutsu, Formosa	Deutsches Entom. Mus.

Aceraius kuwerti, Zang.

Regd. No.	$\frac{4441}{20}$	Mt. Kina-Balu, c. 5000 ft.	Deutsches Entom. Mus.
,,	$\frac{4442}{20}$	?	,,
,,	$\frac{5712}{20}$ [1]	Mt. Kina-Balu, 4500 ft.	Sarawak Museum.

Aceraius laevimargo, Zang.

Regd. No.	$\frac{4435\text{-}6}{2}$	Mt. Kina-Balu, c. 5000 ft.	Deutsches Entom. Mus.

Aceraius pilifer (Percheron).

Regd. No.	$\frac{4470}{20}$	Preanger, Java, 4000–6000 ft.	Hamburg Museum.
,,	$\frac{4401\text{-}4}{20}$	Tjibodas, c. 5000 ft.	K. Zool. Mus., Berlin.
,,	$\frac{4471\text{-}3}{20}$	Tjibodas	Hamburg Museum.
,,	$\frac{5598}{20}$	Borneo	H. E. Andrewes.
,,	$\frac{5713}{20}$ [1]	Mt. Kina-Balu, 4500 ft.	Sarawak Museum.

Aceraius helferi, Kuwert.

Regd. No.	$\frac{7279\text{-}81}{20}$	Sin Lum, Bhamo, 6000 ft.	British Museum.
,,	$\frac{7282}{20}$	Rangoon	,,

Aceraius borneanus, Kaup.

Regd. No.	$\frac{4438\text{-}40}{20}$	Mt. Kina-Balu, c. 6000 ft.	Deutsches Entom. Mus.
,,	$\frac{4437}{20}$	S. Palawan	,,

Aceraius minor, Gravely.

Regd. No.	$\frac{4405}{20}$ (*cotype*)	Taiping, 4000–5000 ft.	K. Zool. Mus., Berlin.
,,	$\frac{6214\text{-}6}{20}$	Telom, S. Perak, 4000 ft.	Oxford Museum

Subfamily *MACROLININAE.*

Genus **MACROLINUS**, Kaup.

Macrolinus crenatipennis, Kuwert.

Regd. No.	$\frac{4375}{20}$ (*cotype* [2])	Ceylon	K. Zool. Mus., Berlin.

Macrolinus sulciperfectus, Kuwert.

Regd. No.	$\frac{4376}{20}$ (*cotype*)	Bonthain, Celebes	K. Zool. Mus., Berlin.

Subfamily *GNAPHALOCNEMINAE.*

Genus **EPISPHENOIDES**, Kuwert.

Episphenoides quaestionis (Kuwert).

Regd. No.	$\frac{4431}{20}$	Sidney	Deutsches Entom. Mus.

[1] Larva, pupa and adult in spirit.

[2] Kuwert says that he only saw one specimen; but he gives the lengths of two.

Genus **MASTOCHILUS**, Kaup.

Mastochilus polyphyllus (MacLeay).

Regd. No. $\frac{4355}{20}$ Australia K. Zool. Mus., Berlin.

Genus **PHAROCHILUS**, Kaup.

Pharochilus sp.

Regd. No. $\frac{898}{1}$ Australia ?

Genus **KAUPIOLOIDES**, Gravely.

Kaupioloides trigonophorus (Zang).

Regd. No. $\frac{4423}{20}$ Toricelli Mts., Kaiser Wilhelmsland Deutsches Entom. Mus.

Genus **CETEJUS**, Kaup.

Cetejus grabowskyi, Kuwert.

Regd. No. $\frac{4358\ 9}{20}$ Stephansort, Kaiser Wilhelmsland K. Zool. Mus., Berlin.

Genus **PROTOMOCOELUS**, Zang.

Protomocoelus heynei (Kuwert).

Regd. No. $\frac{4356\text{-}7}{20}$ Kaiser Wilhelmsland, New Guinea K. Zool. Mus., Berlin

Genus **KAUPIOLUS**, Zang.

Kaupiolus moluccanus (Percheron).

Regd. No. $\frac{4424}{20}$ Moluccas Deutsches Entom. Mus.

Kaupiolus compergus (Boisduval).

Regd. No. $\frac{4561}{20}$ Kapaur, Dutch New Guinea K. Zool. Mus., Berlin.

Genus **LABIENUS**, Kaup.

Labienus, sp.

Regd. No. $\frac{4563}{20}$? K. Zool Mus., Berlin.

,, $\frac{4564}{20}$ Bukana, Huon Gulf, German New Guinea ,, ,,

Genus **HYPERPLESTHENUS**, Kuwert.

Hyperplesthenus gracilis (Heller).

Regd. No. $\frac{4425}{20}$ (*cotype*) Toricelli Mts. Kaiser Wilhelmsland Deutsches Entom. Mus.

Genus **PARAPELOPIDES**, Zang.

Parapelopides symmetricus, Zang.

Regd. No. $\frac{4426}{20}$ Mt. Kina-Balu, c. 5000 ft. Deutsches Entom. Mus.

Genus **TRAPEZOCHILUS**, Zang.

Trapezochilus dorsalis (Kaup).

Regd. No.	4380-1/20	Taiping, 4500–5000 ft.	K. Zool. Mus., Berlin.
,,	6217/20	Bukit Besar, 2500 ft.	Oxford Museum.
,,	6218-24/20	Telom, 4000 ft.	
,,	4432-4/20	Deli, Sumatra	Deutsches Entom. Mus.

Genus **GNAPHALOCNEMIS**, Heller.

Gnaphalocnemis burmeisteri (Kaup).

Regd. No.	4427/20	Padang, W. Sumatra	Deutsches Entom. Mus.
,,	4423/20	Deli, Sumatra	,,
,,	4365/20	Peinau, Sumatra	K. Zool. Mus., Berlin.
,,	4366/20	Kepahiang	,,

Gnaphalocnemis monticulosus (Smith).

Regd. No.	4367/20	Deli, Sumatra	K. Zool. Mus., Berlin.
,,	4368/20	Sumatra	,,
,,	4369/20	Sarawak	,,

Gnaphalocnemis tridens (Wiedemann).

Regd. No.	4429/20	Java	Deutsches Entom. Mus.
,,	4430/20	Asia	,,
,,	4370-1/20	Tjibodas, Java	K. Zool. Mus., Berlin.

Genus **OMEGARIUS**, Kuwert.

Omegarius minimus, Kuwert.

Regd. No.	4394/20	Samberi, Dutch New Guinea	K. Zool. Mus., Berlin.
,,	4395/20	Kaiser Wilhelmsland, New Guinea	,,
,,	4474-5/20	N. Bucht Squally I., New Britain	Hamburg Museum.

Subfamily *TARQUINIINAE*

Genus **TARQUINIUS** Kuwert.

Tarquinius parodoxus, Kuwert.

Regd. No.	4422/20	Wandesi, New Guinea	Deutsches Entom. Mus.

Subfamily *LEPTAULACINAE*.

Genus **LEPTAULAX**, Kaup.

Leptaulax humerosus, Kuwert.

Regd. No.	4455/20	W. Sumatra	Deutsches Entom. Mus.
,,	4456/20	Ardjoeno, Java	,,
,,	4457/20	Tengger Mountain, Java	,,

Leptaulax anna, Zang.

Regd. No.	4409/20 (*cotype*)	Sumbawa	Hamburg Museum.

Leptaulax timoriensis (Percheron).

Regd. No.	4411/20	Timor	K. Zool. Mus., Berlin.

L. dentatus (Fabricius) s. str.

Regd. No.	4412/20	Mt. Mauson, 2000–3000 ft.	K. Zool. Mus., Berlin.
,,	4461/20	Fuhosho, Formosa	Deutsches Entom. Mus.
,,	4463/20	Polisha, Formosa	,,
,,	4460/20 4462/20 4464/20	Sokutsu, Formosa	,,

L. dentatus, var. glabriventris, Gravely.

Regd. No.	4414/20	Deli, Sumatra	K. Zool. Mus., Berlin.

Leptaulax cyclotaenius subsp. himalayae, Kuwert.

Regd. No.	4410/20	Mt. Mauson, 2000–3000 ft.	K. Zool. Mus., Berlin.

Leptaulax bicolor Fabricius) s. str.

Regd. No.	4415-6/20 4420/20	Mt. Mauson, 2000–3000 ft.	K. Zool. Mus., Berlin.
,,	4465-6/20	Kosempo, Formosa	Deutsches Entom. Mus.
,,	4467-8/20	Polisha, Formosa	,,
,,	4417-8/20	Taiping, 4000–5000 ft.	K. Zool. Mus., Berlin.
,,	4459/20	St. Rambé, Sumatra	Deutsches Entom. Mus.
,,	4476-7/20	Preanger, Java, 4000–6000 ft.	Hamburg Museum.
,,	4419/20 4421/20	Tjibodas, c. 5000 ft.	K. Zool. Mus., Berlin.
,,	4478-9/20	Tjibodas, Java	Hamburg Museum.
,,	4480-1/20	Banguey Island	,,

Leptaulax bicolor var. vicinus (Percheron).

Regd. No.	4758-63/20	Mt. Kina-Balu, 4500 ft.	Sarawak Museum.

II.—SUMMARY AND CONCLUSIONS.

1. *Classification.*

The Indo-Australian Passalidae have been divided into two main sections (pp. 191–192). The first section contains the Aulacocyclinae of Kuwert, together with *Cylindrocaulus* and *Auritulus* It has been regarded as a single subfamily, but the two last-named genera and *Ceracupes* may ultimately have to be regarded as belonging to a different subfamily from the rest (p. 192). It contains eight genera (pp. 192-193). The second section has been subdivided into the *Pleurarius*, *Aceraius*, *Macrolinus*,

Kaupioloides, *Protomocoelus*, *Hyperplesthenus*, *Gnaphalocnemis*, *Plesthenus*, *Gonatas*, *Tarquinius* and *Leptaulax* groups. Of these groups the first three and the last two appear to be of most importance, and have been provisionally ranked as subfamilies, the remainder being put together into a single subfamily which takes its name from the genus Gnaphalocnemis. Their rank cannot be finally settled without reference to American and African species (pp. 193-4, 199 and 329). The genera and Oriental species of all of them have been redefined (pp. 107, 199–204, 317–8, 329 and 318–326).

2. *External Morphology and Taxonomy.*

The pair of tubercles situated in the Pleurariinae, Aceraiinae, Macrolininae and Gnaphalocneminae, between the central tubercle of the head and the processes of the anterior margin, have been shown to be homologous with the inner pair of marginal processes found in the Leptaulacinae; and the terms *inner* and *outer tubercles* have been consequently applied to the two pairs of processes found in all members of the second section of the family (pp. 184–185). The use of these terms does not commit one to any definite system of interpretation of the homologies of the head; which is advantageous, inasmuch as there is reason to believe that the whole of the upper surface of the anterior part of the head between the supra-orbital ridges and in front of the [illegible]ontal ridges is frons, the whole of the clypeus being doubled beneath this out of sight; in which case these tubercles are not really processes of the clypeus as they have hitherto been called (p. 185).

Apart from this no criticism of the accepted homologies of different parts of the body has been found necessary; but considerable changes have been made in the taxonomic values assigned to different parts (pp. 179–191), and it has been found necessary to use all characters with much greater caution than has often been the case in the past. As a result of this it has been found possible to define species with a considerable degree of precision. Five species, however, stand out from all the rest by reason of their remarkable variability, in size especially; and certain structural variations are corellated with variation in size, much as in the Lucanidae (pp. 262–265). These species are *Episphenus comptoni*, *Episphenus indicus*, and *Aceraius grandis* which appear respectively to be the dominant species of Aceraiinae in each of the three divisions of the Oriental Region in which they occur; and *Leptaulax dentatus* and *Leptaulax bicolor* which are the dominant species of Leptaulacinae throughout the whole of this region (pp. 311–313).

In the Aceraiinae and Gnaphalocneminae, the two subfamilies in which markedly asymmetrical forms are found, the degree of asymmetry attained by a species appears to be an index of the degree of specialization attained: and the dominant species of a region is always the most markedly asymmetrical species found there (p. 312[1]).

The nature of the asymmetry is somewhat different in different groups, and the asymmetrical condition appears to have been evolved more or less independently in each of them (fig. 7, p. 314). The evolution of a symmetrical *Leptaulax*-like form,

[1] As regards the Gnaphalocneminae see Gravely, 1914 (*b*).

Tarquinius, from an asymmetrical ancestor allied to the Gnaphalocneminae, suggests that the union of the inner tubercles with the anterior margin of the head indicates an even higher degree of specialization than does the asymmetrical condition (p. 330).

3. *Geographical distribution.*

The material examined during the preparation of this paper does not enable me to discuss the relation borne by Indo-Australian Passalidae to members of the family found in Africa or America; but it seems by no means improbable, from Kuwert's account of the family, that all the seven subfamilies described, with the possible exception of the Leptaulacinae, will prove to be confined to the Indo-Australian Region, China and Japan (p. 194).

With the exception of the Pleurariinae, Aceraiinae and Tarquiniinae all these subfamilies occur on both sides of the Straits of Macassar, but the Aulacocyclinae and Gnaphalocneminae are much more strongly represented east of these straits, and in the eastern parts of the Oriental Region, than they are further west; while with the Macrolininae the reverse is the case (pp. 311 & 313).

The discontinuous distribution of the genus *Aulacocyclus* suggests that the Aulacocyclinae were once more abundant towards the west than they are now. Although the Macrolininae are well represented in Ceylon, they appear to be absent from the Indian Peninsula. The Pleurarariinae occur only in the Indian Peninsula and Sumatra, which discontinuous distribution suggests that they are probably the remnants of a once more extensive group. The Leptaulacinae are centred in the East Indian Archipelago. Only the dominant species seem to have established themselves in India and Ceylon, and these are less common there than elsewhere (p. 311).

The distribution of the Aceraiinae and Gnaphalocneminae, the two subfamilies in which asymmetrical species are found, is of much greater general interest. It appears to have been greatly influenced by the following zoogeographical boundaries:—Palk Strait, the Gangetic Plain (in which Passalids seem unable to live—pp. 310–1) the Straits of Macassar, and Torres Strait. Of these the Straits of Macassar are by far the most important, for no group of either subfamily is found in any abundance on more than one side of them. It is therefore somewhat surprising to find that this is the only one of the above-mentioned boundaries, which any species of these subfamilies has succeeded in crossing (pp. 313 & 315–6). Another boundary of some importance is that separating the East Indian Archipelago—including the Malay Peninsula and presumably also the Philippines—from continental Asia (p. 313).

The occurrence of different degrees of asymmetry in different species of Aceraiinae probably affords an index to the degrees of specialization to which they have severally attained, and its correlation with locality is very evident. It is concluded that a migration has taken place westwards towards the head of the Bay of Bengal and then south-westwards towards Ceylon, the less specialized forms being constantly displaced by their more specialized allies (pp. 311–314). It may further be pointed out that although neither of the two most highly asymmetrical species of the genus *Episphenus* have been able to cross over from India to Ceylon, and the genus *Aceraius*

has been unable to cross the Gangetic Plain, the latter genus has had no difficulty in occupying the Sunda and Philippine Islands, as well as a large part of the Asiatic mainland.

The evolution and migration of different forms of Gnaphalocneminae seems to have followed lines similar to those followed by the Aceraiinae, the most primitive forms again being driven out from the Archipelago—in this case eastwards to Australia instead of westwards towards Ceylon. As a result of this, the most closely related (symmetrical) forms of the two subfamilies are found only in two widely separated countries on the periphery of Indo-Australian area, the intervening countries being inhabited by more highly specialized forms most of which are asymmetrical (pp. 313–315).

4. *The Dominant Species.*

Five Oriental species stand out from all others on account of their extraordinary variability in size. Three of these belong to the Aceraiinae, and two to the Leptaulacinae (p. 262).

Of the first three, one (*Episphenus comptoni*) is confined to Ceylon, one (*Episphenus indicus*) to the Indian Peninsula, and one (*Aceraius grandis*) to the rest of the Oriental Region. Each of them differs from the species of Aceraiinae with which they are geographically associated in that they are more abundant, more highly asymmetrical, and always markedly gregarious; but these distinctions are much less pronounced in *Episphenus indicus*, than in the other two. *Aceraius grandis*, in addition to these distinctions, is by far the most widely distributed member of its genus. It has further been pointed out, that of the three genera of Aceraiinae inhabiting the country east of the Ganges, *Aceraius*, which is the most markedly asymmetrical, is also the most numerous both in species and in individuals; *Ophrygonius*, which differs from *Aceraius* principally in having symmetrical mandibles, comes next, and is perhaps equally widely distributed; *Tiberioides*, in which the head is symmetrical as well as the mandibles, being the smallest and scarcest genus of the three (pp. 311–313).

No asymmetrical species of Leptaulacinae are known; but there is reason to suppose that the structure of the head found throughout this subfamily indicates an even higher degree of specialization than does asymmetry (p. 330). It is therefore not surprising to find that the two variable species, both of which are gregarious, and much more abundant than any other species of the subfamily, are even more widely distributed than any of the dominant species of Aceraiinae, both of them being found in all subregions of the Indo-Australian area in which Passalids of any kind occur.

5. *Habits.*

Such information as I have been able to gather together concerning the habits of Oriental Passalidae is recorded above under the descriptions of the several species (*Taeniocerus bicuspis*, p. 211; *Pleurarius brachyphyllus*, p. 215; *Tiberioides austeni*, pp. 216–7; *Episphenus comptoni*, pp. 219–220; *Episphenus indicus*, p. 222; *Episphenus neelgherriensis*, p. 223; *Aceraius grandis*, sub-sp. *hirsutus*, p. 233; *Aceraius helferi*,

p. 238; *Macrolinus sikkimensis*, p. 243; *Macrolinus rotundifrons*, p. 245; *Leptaulax dentatus*, p. 255; *Leptaulax bicolor*, pp. 258-9; and *Leptaulax roepstorfi*, p. 260). This information, as far as it goes, confirms Arrow's belief that the habits of Oriental forms would be found to resemble those of the American forms described by Ohaus, on which Arrow found himself compelled to base the account of the habits of the family in the introduction to his account of the Indian Lamellicornia in the "Fauna of British India" series.

It has been found that different species differ somewhat in their habits one from another in various ways. Probably adults of nearly all species live in decaying wood in pairs with their young; but whereas in certain species large numbers of such families are commonly found in a single log, so closely associated with one another that it is often impossible to separate out the individuals belonging to any single pair, in others each family forms an isolated group. All the five dominant species are gregarious.

Leptaulax roepstorfi, one of the smallest and most markedly flattened of the Oriental representatives of the family, inhabits natural cracks in hard logs, into the depths of which it penetrates. Most species burrow nearer the surface, and the Leptaulacinae, most of which are much flattened, appear to burrow as a rule even closer to the bark than do the Aceraiinae, which are less flat. One at least (*Leptaul[illegible] dentatus*) of the two dominant species of Leptaulacinae is, moreover, only found in very rotten wood; whereas the dominant representative of the Aceraiinae in Assam and the adjoining country, *Acerains grandis* sub-sp. *hirsutus*, as well as the only other member of the genus whose habits have been studied (*A. helferi*) are only found in wood of a very much tougher consistency. On the other hand, the Aceraiinae inhabiting the Indian Peninsula (*Episphenus indicus* and *neelgherriensis*) appear to live in quite rotten wood, which may perhaps help to account in some measure for the apparent scarcity of Leptaulacinae in that area, where probably at most not more than half a dozen separate colonies have yet been noticed. *Episphenus neelgherriensis* has been found under stones as well as in rotten wood; and *Macrolinus rotundifrons* has been found among decaying vegetable refuse.

Reproduction appears to be retarded or arrested during dry cold weather (p. 223).

VIII.—LIST OF PUBLISHED PAPERS DEALING WITH PASSALIDAE BELONGING TO GENERA FOUND IN THE ORIENTAL REGION.

Papers marked with an asterisk (*) are not available in Calcutta.

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* 1800. Illiger, K. "Vierzig neue Insecten aus der Hellwigischen Sammlung in Braunschweig" Wiedemann Archiv für Zool. u. Zoot. (Berlin and Brunswick 1800) I (2), pp. 103-150, and II, pp. 229-230.

* 1800. Erichson in Wiedemann Archiv für Zool u. Zoot. I (1800).

1801. Fabricius, J. C. "Systema Eleutheratorum II" (Kiliae, 1801), pp. 255-6.
1801. Weber, F. "Observationes Entomologica" (Kiliae, 1801).
* 1806-17. Schönherr, C. J "Synonymia Insectorum, oder: Versuch einer Synonymie aller bisher bekanten Insecten; nach Frabricii Systema Eleutheratorum geordnet" (Stockholm, 1806-17).
1823. Wiedemann, C. R. "Zweihundert neue Käfer von Java, Bengalen, und dem Vorgebirge der Gutten-Hoffnüng." Zool. Mag. II (1), p. 109.
1826. MacLeay, W. S. "Catalogue of Insects collected by Captain King, R.N." Appendix to P. P. King's "Narrative of a Survey of the Intertropical and Western Coasts of Australia performed between the years 1818 and 1822." Vol. II (London, 1826).
* 1826. Sturm, J. "Catalog meiner Insecten-Sammlung," I (Nürnberg, 1826).
* 1831. Perty. "Obs. Nonnulae Coleopt. Indiae Orientalis."
1835. Boisduval, J. B. A. D. de. "Faune Entomologique de l'Ocean Pacifique. II. Coléoptère et autres Ordres" in "Voyage de l' Astrolobe ....pendent....1826-9 sous le commandent de M. J. Dumont d'Urville etc."
1835. Percheron, A. "Monographie des Passales (Paris, 1835).
* 1837. Dejean, P. F. M. A. "Catalogue de la Collection de Coléoptères de M. le Baron Dejean," 3 ed. (Paris, 1837), pp. xiv, 503.
1841. Percheron, A. "Révision critique et Supplément á la Monographie du Genre Passale, première partie." Mag. Zool., Insectes, 1841. Pl. lxvii-lxix.
1842. Westwood, J. O. "Insectorum novarum Centuria." Ann. Mag. Nat. Hist. VIII, 1842, pp. 123-125.
1843. Guérin Méneville, F. E. "Animaux Articulés" in "Souvenirs d'un Voyage dans l'Inde executé de 1834 á 1839 par M. Adolphe Delessert," Pt. II (Paris 1843), pp. 33-98.
1844. Percheron, A. "Monographie des Passales, Second Supplement." Mag. Zool., 1844, pl. cxxxiv-cxxxv.
* 1845. Hope, F. W. A. (Westwood) "A Catalogue of the Lucanoid Coleoptera in the collection of....F. W. Hope, etc." (London, 1845), p. 31.
1847. Burmeister, H. "Handbuch der Entomologie," V (Berlin, 1847), pp. 461-519.
1850. Castelnau, F. L. de L. de. "Histoire Naturelle des Animaux Articulés." Insectes Coléoptères par M. le Compte de Castelnau, II (Paris 1850), pp. 178-9.
1852. Smith, F. "Nomenclature of Coleopterous Insects in the Collection of the British Museum. Pt. VI Passalidae" (London, 1852).
1855. Montrouzier, le Père "Essai sur la Faune de l'Ile de Woodlark ou Moiou." Ann. Sci. Phys. et Nat. d'Agric. et d'Industrie (Soc. Imp. d'Agric. etc. de Lyon, 1855) VII (1), pp. 1-114.

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1862. Fauvel, A. "Coléoptères de la Nouvelle-Calédonie recueilles par M. E. Déplanche 1858-60." Normandie, Soc. Linn. Bull. VII, pp. 120-185.

1867. Redtenbacher, L. "Coleoptera" in "Reise der Österreichen Fregatte 'Novara'; Zool. II" (Vienna, 1867), 249 pp., 5 pl.

1868. Gemminger and Harold. "Catalogus Coleopterorum" II (Munich, 1868), pp. 968-972.

1868. Kaup, J. (*a*) "Prodromus zu einer Monographie der Passaliden." Coleopterologische Hefte, III, 1868, pp. 4-32.

(*b*) Ditto. Coleopterologische Hefte, IV, 1868, pp. 1-7.

1869. Kaup, J. Ditto. Coleopterologische Hefte, V, pp. 38-40.

1871. Kaup, J. "Monographie der Passaliden." Berlin Ent. Zeitschr. 15 Jahrg. Supplement, 125 pp., pl. iii–vii.

* 1871. MacLeay, W. "Notes on a Collection of Insectes from Gayndah (Coleoptera) pt. III." Trans. Ent. Soc., N. S. Wales II, 1871, pp. 159-205.

1873. Stoliczka, F. "A contribution towards a Monograph of the Indian Passalidae." J.A.S.B. XLII (II), 1873, pp. 149-162.

1877. Kirsch, T. (*a*) "Neue Käfer aus Malacca." Mitt. K. Zool. Mus. Dresden, I, 1877, pp. 27-58.

(*b*) "Beitrage zur Kenntniss der Coleopteren-Fauna von Neu Guinea." Mitt. K. Zool .Mus. Dresden, II, 1877, pp. 135-161.

* 1880. Fairmaire, L., in Le Naturaliste, 1880, p. 164.

1883. Lewis, G. "Lucanidae of Japan." Trans. Ent. Soc. London, 1883, pp. 333-342, pl. xiv.

1884. Wystmann, P. "Catalogue Systématique des Passalides." Ann. Civ. Mus. Genova, (2a) I (XXI) 1884, pp. 326-348.

1885. Schaufuss, L. W. "Beitrage zur Fauna der Niederlandischen Besitzungen auf den Sunda-Inseln." Horae Soc. Ent. Ross. XIX 1885, pp. 183-209.

1887. Fairmaire L. "Coleopteres de l'Intérieure de la Chine." Ann. Soc. Ent. Belg. XXXI, 1887, pp. 87–136.

* 1890. Kuwert, A. "Die Passaliden und ihr Monographie von Kaup." Soc. Ent. V, 1890, pp. 1, 9, and 17.

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1896. Blackburn, T. "New Genera and species of Australian Coleoptera, XX." Trans R. Soc. S. Australia XX, pp. 233-259.

1896. Heller, K. M. "Neue Käfer von Celebes." Abh. u. Ber d. K. Zool. u. Anthr.-Ethn. Mus. zu Dresden, VI, 1896–7 (3), 24 pp., 1 pl.

1896. Kuwert, A. "Die Passaliden dichotomisch bearbeitet" Novit. Zool. III, 1896, pp. 209-230, pl. v–vii.

1897. Kuwert, A. Ditto. IV, 1897, pp. 274-306.

1898. Kuwert, A. Ditto. V, 1898, pp. 137-205 and 259-349.

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1903. Fauvel, A. "Faune Analytique des Coléoptères de la Nouvelle Calédonie." Rev. Ent. franc. XXII, 1903, pp. 203-378.

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(*b*) "Bemerkungen zur Alteren Passaliden-Litteratur." Deutsche Ent. Zeitschr., 1903, pp. 417-420.

1904. Zang, R. (*a*) "Parapelopides und Ophrygonius, zwei neue Gattungen der Passaliden (Coleoptera)." Zool. Anz. XXVII, 1904, pp. 694-701, 3 text-figs.

(*b*) "Ueber einige Passaliden," Tijdscht. v. Ent. XLVII, pp. 181-5.

1905. Zang. R. (*a*) Numerous papers in Deutsche Ent. Zeitschr. for 1905.

(*b*) "Anderung in der Nomenclatur der Passaliden (Coleoptera)." Zool. Anz. XXIX, 1905, pp. 154-5.

(*c*) "Passalidarum Synonymia. Kritische Revision der von Kuwert und anderen Autoren aufgestellten Gattungen und Arten." Notes Leyden Mus. XXV, 1905, pp. 221-232.

(*d*) "Zwei neue Passaliden aus den Gattungen Comacupes, Kp., und Aceraius, Kp." Notes Leyden Mus. XXV, 1905, pp. 233-8.

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1913. Gravely, F. H. "Preliminary Account of a revised classification of Indo-Australian Passalidae." J.A.S.B. VIII, 1912 (1913), pp. 403–7.

1914. Gravely, F. H. (*a*) "H. Sauter's Formosa-Ausbeute—Passalidae." Supplementa Entomologica III, 1914, pp. 30–32.

(*b*) "The Evolution and Distribution of certain Indo-Australian Passalidae, J.A.S.B. (In the Press).

13. INDEX.

All names treated as synonyms in pt. 6 of this paper are printed in italics. Page numbers which refer to a key, to a full description, to synonymy, or to a figure, are printed in ordinary type; other numbers are in bold face.

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Episphenus	**189**, **194**, 196, 217 etc., 281 etc., **311-3**, 314, **315**, **316**, 317, 320, **330.**
Eriocnemis	297, 298.
errans (Aulacocyclus)	275.
eschscholtzi (*Leptaulacides*, Leptaulax)	307–8.
evidens (Leptaulax)	308.
exterris (Leptaulax)	303.
faberi (*Eriocnemis*)	298.
felderi (*Comacupes*, Tristorthus)	**267.**
filius (*Analaches*)	283.
flachi (*Chilomazus*, Episphenus, *Laches*) ..	219, 281.
flachii (*Laches*)	281.
foveicollis (Comacupes)	267, 318, **331.**
foveipunctatus (Aulacocyclus)	274.
fraternus (Macrolinus)	296.
fratricornis (Aulacocyclus)	274.
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fronticornis (Ceracupes)	278.
fruhstorferi (*Laches*)	281.
fruhstorferi (*Leptaulacides*)	308.
furcicornis (*Passalus*)	275.
gelon (*Eriocnemis*, Plesthenus)	298.
geminatus (Leptaulax)	303, 306.
geminus (Leptaulax)	308.
generosus (*Phraortes*)	297.
germari (*Aceraius*, Gonatas)	250, 301, 313, 325.
glaber (*Leptaulacides*, Leptaulax)	307, 326.
glabricollis (Leptaulax)	303.
glabriusculus (Aulacocyclus)	276.
glabriventris (Leptaulax)	255, 303, 336.
Gnaphalocneminae	191, 194, 195, 197-203, 246 etc., 297 etc., 313-6, 333.
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Gnaphalocnemis group	199, 202.
Gonatas	203, 250 etc., 299 etc., 313, 314, 318, 325.
Gonatas group	199, 201.
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gracilis (Hyperplesthenus, *Labienus*)	202, 334.
grandis (Aceraius, *Passalus*)	181, 231, 262-265, 288, 312-3, 314, 322, 332.
gravidus (Pelopides)	201, 203, 298.
hansemanni (Leptaulax)	306.
helferi (Aceraius)	238, 292, 323, 333.
Heterochilus	195, 286.
heynei (Protomocoelus)	334.
himalayae (Leptaulax)	256, 305, 336.
himalayensis (Aceraius)	236, 292, 323.
hirsutus (Aceraius)	180, 181, 231, 263, 288, 322, 332.
humerosus (Leptaulax)	251, 262, 302, 325, 335.
humerosus (Leptaulax)	302, 303.
Hyperplesthenus	194, 202, 314, 315, 328, 334.
Hyperplesthenus group	199, 201.
ignotus (*Eriocnemis*)	299.
illegalis (Aceraius)	230, 287, 321.
imitator (Taeniocerus)	270.
impar (Hyperplesthenus)	202.
inaequalis (*Aceraius*, *Basilianus*, Oprygonius, *Passalus*)	227, 285, 320, 332.
inaequalis (*Bassilianus*)	283.
incidens (Aceraius)	293.
incipiens (Leptaulax)	307-8.
indicus (*Basilanus*, Epishenus)	220, 262-265, 282, 311-2, 314, 320.
indicus (Leptaulax)	303.
infantilis (*Aceraius*, *Analaches*, *Epilaches*, *Laches*) ..	283, 330.
innocuus (*Passalus*)	307.

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insignis (Leptaulax)	303.
insipiens (Leptaulax)	308.
interponendus (Leptaulax)	303.
interrogationis (*Basilianus*)	284.
javanus (Macrolinus)	296.
kaupi (Aulacocyclus)	275.
kaupii (Aceraius)	292.
Kaupioloides	200, 314, 334.
Kaupioloides group	199, 200.
Kaupiolus	202, 314, 334.
Kaupiolus group	198.
kuwerti (Aceraius)	235, 290, 322.
kuwerti (Tiberioides, *Tiberius*)	215, 226, 280, 320, 332.
Labienus	191, 202, 314, 315, 334.
Laches	195, 281, 330.
laevicollis (Aceraius, *Passalus*)	230, 287, 313, 322, 332.
laevicollis (Aceraius)	293.
laevicornis (*Aulacocyclus*, Comacupes)	181, 205, 268.
laevimargo (Aceraius)	235, 291, 323, 333.
langier (Aceraius)	234, 290, 322.
latericulptus (*Passalus*)	299.
latipennis (Macrolinus)	245, 296, 324.
Leptaulacides	203, 204, 302.
Leptaulacinae	191, 194, 199, 203-204, 251 etc., 302 etc., 311, 329, 335-6.
Leptaulax	181, 185, 189, 191, 203, 204, 251 etc., 302 etc., 318, 325-6, 330, 335-6.
luzonicus (Aceraius)	287.
macassariensis (Leptaulax)	256, 305, 325.
Macrolininae	194-195, 197, 240 etc., 293 etc., 311, 329, 333.
Macrolinus	181, 197, 240 etc., 293 etc., 318, 323, 333.
magnus (Aceraius)	288.
major (Gonatas)	300.
malaccae (Leptaulax)	307–8.
malitiosus (Leptaulax)	303.
manillae (Leptaulax)	307.
marginepunctatus (*Passalus*)	296.
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masoni (Comacupes)	269.
Mastachilus	195.
mastersi (Aulococyclus, *Taeniocerus*)	193, 273.
Mastochilus	178, 195, 200, 314, 334.
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medius (Leptaulax)	307–8.
meyeri (Aceraius)	287.
minimus (Omegarius)	335.
minor (Aceraius)	240, 293, 317, 323, 333.

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mixtus (Leptaulax)	303.
mniszechi (*Eriocnemis*, Gnaphalocnemis) ..	299.
moeschleri (Aceraius)	287.
molossus (Aceraius)	288.
moluccanus (Kaupiolus)	334.
monticulosus (*Aceraius*, *Eriocnemis*, Gnaphalocnemis, *Passalus*)	249, 298, 325, 335.
moorei (Episphenus)	217, 281, 311, 312, 315, 320.
morator (Leptaulax)	306.
möschleri (Aceraius)	229, 287, 321.
nanus (Aceraius)	293.
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neelgherriensis (*Aceraius*, *Basilianus*, Episphenus, *Passalus*)	222, 270, 283, 311, 314, 320, 330.
neelgherriensis (*Aceraius*, *Basilianus*)	282.
Neleus	191.
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nicobaricus (Aceraius)	291.
nicobaricus (Macrolinus)	241, 294, 324.
nietneri (*Leptaulacides*)	308.
nikobaricus (*Passalus*)	291.
nobilis (*Phraortes*, Trapezochilus)	247, 297.
novaebritanniae (Gonatas)	300.
novaeguineae (Letaulax)	306, 326.
obtusidens (Leptaulax)	307, 326.
occulidens (Aceraius)	234, 290, 312-3, 322.
oculitesselatus (*Heterochilus*)	286.
Ocythoe	298.
Omegarius	203, 314, 335.
Ophrygonius	196, 224 etc., 284 etc., 311, 312-3, 314, 316-7, 318, 320, 331.
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palawanus (Aceraius)	288.
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papuanus (*Letpaulacides*)	308.
paradoxus (Tarquinius)	327, 335.
parallelipennis (Macrolinus)	296.
parallelogrammifrons (*Laches*)	281.
Parapelopides	202, 246, 297, 314, 324, 334.
parreyi (Aulacocyclus)	276, 277.
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Paxilloides	178.
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Pelopides	197, 199, 201, 314.
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perturbans (Taeniocerus)	270.
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philippinensis (Paxilloides)	178.
Phraortes	297.
pilifer (Aceraius)	235, 291, 323, 333.
pilifer (Aceraius)	292.
pilipes (Pleurarius)	279, 320.
planicollis (Leptaulax)	309.
planus (*Leptaulacides*, Leptaulax, *Passalus*)	260, 262, 310, 326.
planus (Leptaulax)	309.
platypus (*Aulacocyclus*, Taeniocerus)	270, 319.
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pulchellus (*Leptaulacides*)	307.
punctifrons (Comacupes, *Passalus*)	269.
pygmaeus (*Aulacocyclus*, Taeniocerus)	209, 271, 319.
quadridentatus (*Passalus*)	303.
quadrifer (Ophrygonius)	286.
quaestionis (Episphenoides)	333.
rectidens (Aceraius)	233, 288, 322, 332.
redtenbacteri (Semicyclus)	178.

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reticulaticollis (Aceraius)	291.
Rhipsaspis	286.
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roepstorfi (Leptaulax)	260, 309, 326.
roepstorfi (Leptaulax)	308.
rosenbergii (Aulacocyclus)	274, 319.
rotundatoclypeatus (Aulacocyclus)	274.
rotundifrons (Macrolinus, *Tiberius*)	244, 295, 324.
rugulosus (*Leptaulacides*)	308.
saigonicus (Leptaulax)	303.
schellongi (Gonatas)	300.
schenklingi (Analaches)	200.
schmidtii (Paxilloides)	178.
schraderi (Pelopides)	201.
Semicyclus	178.
separandus (Leptaulax)	307–8.
sequens (Leptaulax)	308.
sikkimensis (*Basilianus*, Macrolinus *Tiberius*)	243, 294, 323.
simplex (Gnaphalocnemis)	248, 298, 324.
singapurae (Ophrygonius)	226, 285, 317, 320.
singhalensis (Macrolinus, *Tiberius*)	295.
sinkepicus (*Basilianus*)	286.
socius (*Laches*)	281.
stoliczkae (*Basilianus*)	282.
stoliczkae (Comacupes)	206, 268, 318.
submedius (Leptaulax)	303.
subsequens (Leptaulax)	308.
sulcatipons (Aulacocyclus)	273.
sulciperfectus (Macrolinus)	296, 324, 333.
sumatrae (Leptaulax)	308.
symmetricus (Parapelopides)	246, 297, 324, 334.
Taeniocerus	192, 193, 208 etc., 270 etc., 319.
Taeniocerus	272.
Tarquiniinae	329, 335.
Tarquinius	178, 327, 328, 329, 330, 335.
Tatius	197, 203, 314.
tavoyanus (Aceraius)	237, 292.
tavoyanus (Macrolinus)	243, 294.
tenasserimensis (Leptaulax)	308.
tereoides (Aulacocyclus)	273.
teres (Aulacocyclus, *Passalus*)	273.
thoreyi (*Leptaulax*, Trichostigmus)	261, 310, 326.
Tiberioides	189, 196, 215 etc., 280 etc., 311–3, 314, 317, 320.
Tiberius	194, 195, 197, 280, 293.
tibialis (Gonatas)	300.
timoriensis (Leptaulax, *Passalus*)	303, 326, 336.
timoriensis (Leptaulax, *Passalus*)	303.

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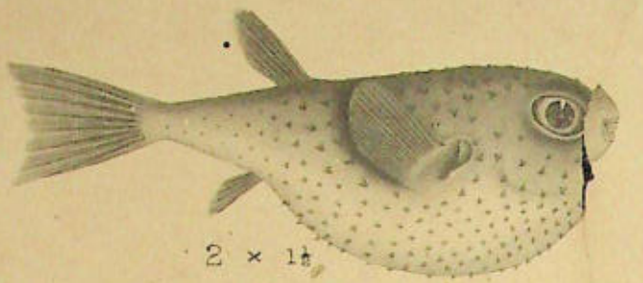
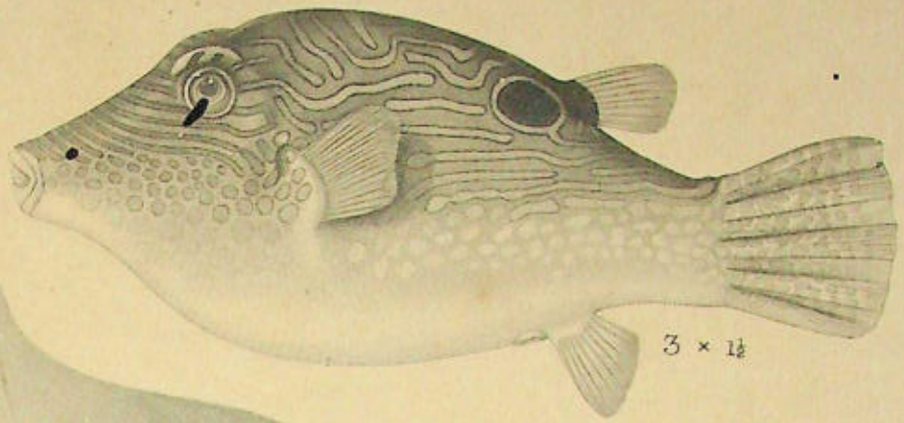
tonkinensis (Leptaulax)	303.
Trapezochilus	202, 247 etc., 297 etc., 314, 324, **335.**
Trichostigmus	203, 261 etc., 310, **318**, 326.
tricornis (Aceraius)	235, 290, 322.
tricuspis (Tristorthus)	**331.**
tridens (*Eriocnemis*, Gnaphalocnemis, *Ocythoë*, *Passalus*)	250, 299, 325, **335.**
tridens (*Eriocnemis*)	298.
tridentatus (Gonatas)	300.
trigonophorus (Kaupioloides, *Kaupiolus*) ..	202, 334.
Tristorthus	192, 193, **268**, **331.**
ursulus (*Leptaulax*, Trichostigmus)	310, 326.
urus (Macrolinus)	294, 323.
variolosus (Aulacocyclus)	277.
Vellejus	202.
vicinus (*Passalus*, *Leptaulacides*, Leptaulax) ..	259, 307, **336.**
wallacei (Aceraius, *Heterochilus*)	228, 286, **317**, 321.
waterhousei (Macrolinus, Tiberius)	245, 295, 324.
weberi (Macrolinus)	245, 296, 324.
weberi (Macrolinus)	296.
westermanni (Comacupes)	268.
yorkensis (Gonatas)	300.

EXPLANATION OF PLATE I.

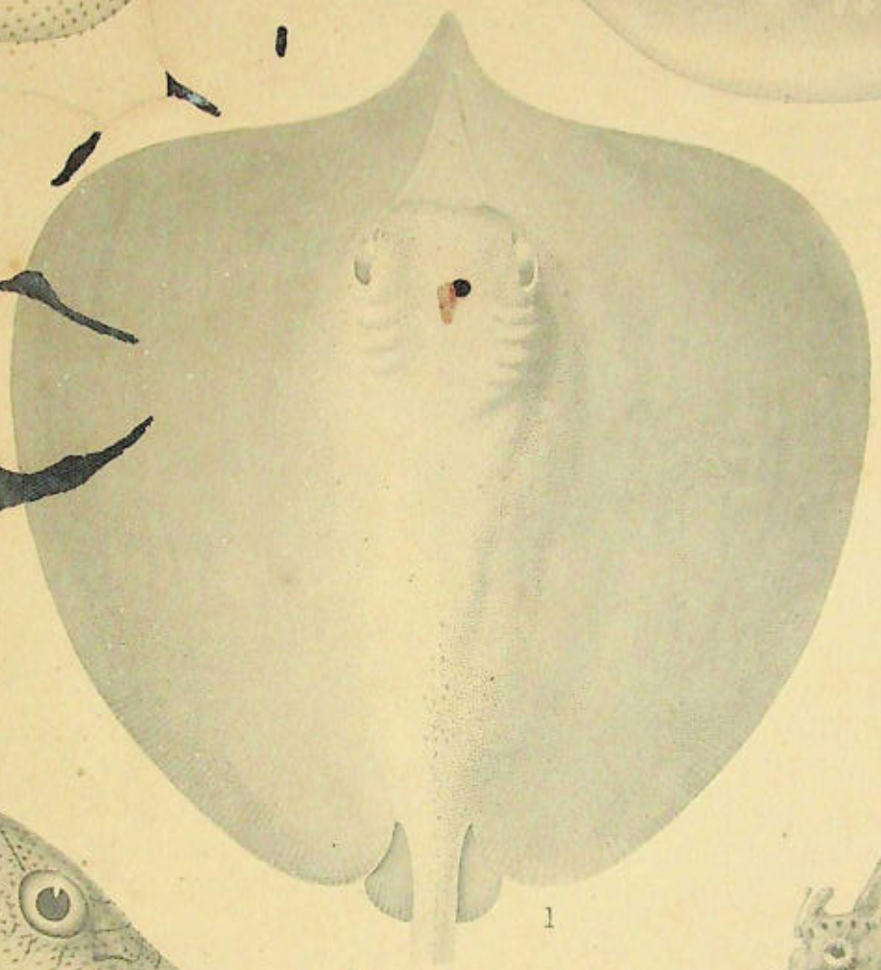
FIG. 1.—*Trygon fluviatilis* (much reduced).
,, 2.—*Tetrodon spinosissimus*, × 1½.
,, 3.—*Tropidichthys margaritatus*, × 1½.
,, 4.— ,, *investigatoris*, sp. nov., × 1½.
,, 5.—*Antennarius nummifer*, × 1½.



2 × 1½



3 × 1½



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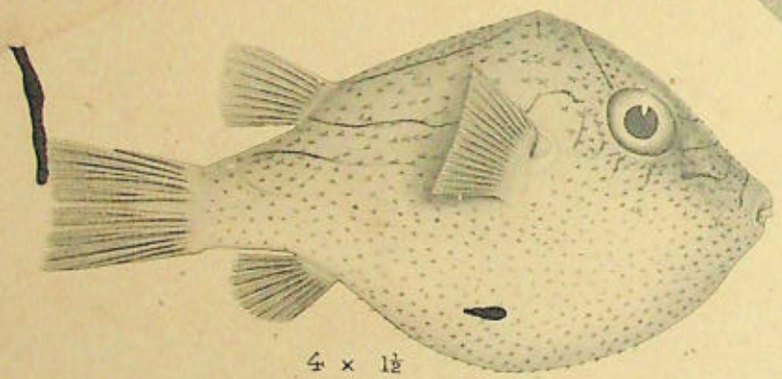
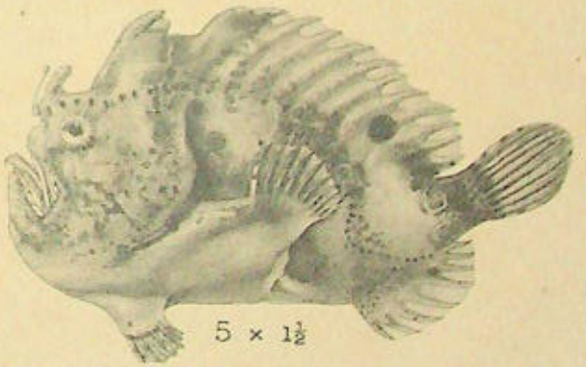


4 × 1½



5 × 1½

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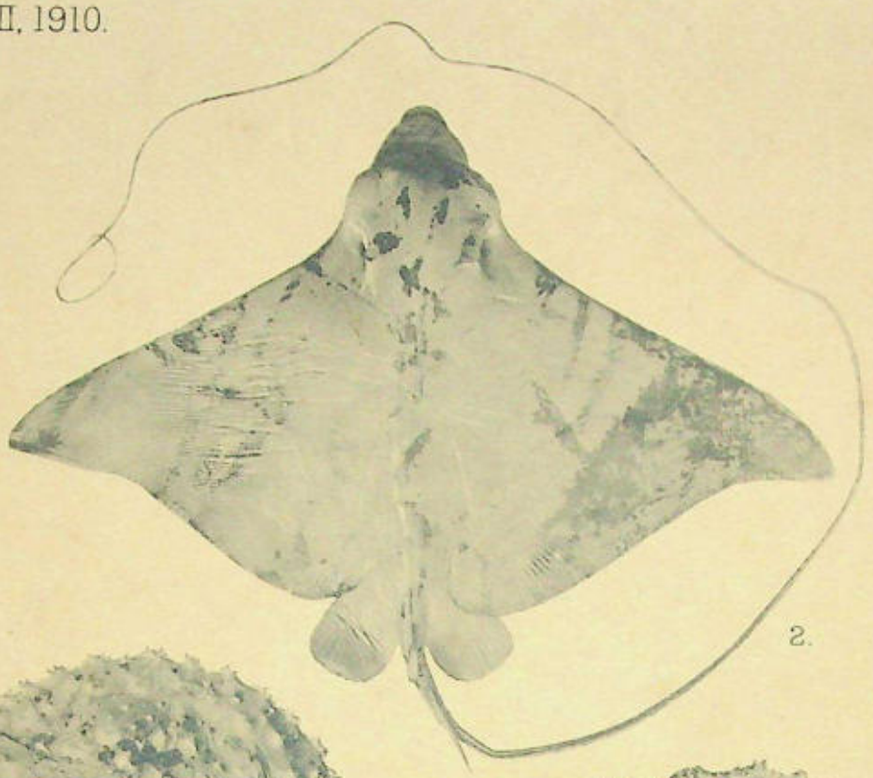
EXPLANATION OF PLATE II.

FIGS. 1, 1*a*, 1*b*.—*Urogymnus asperrimus* (young ♂): 1, 1*a*, reduced; 1*b*, nat. size.

FIG. 2.—*Aetobatis narinari* (young ♂), reduced.

,, 3.—*Halieutaca stellata*, reduced.

,, 4.— ,, *indica*, sp. nov., nat. size.



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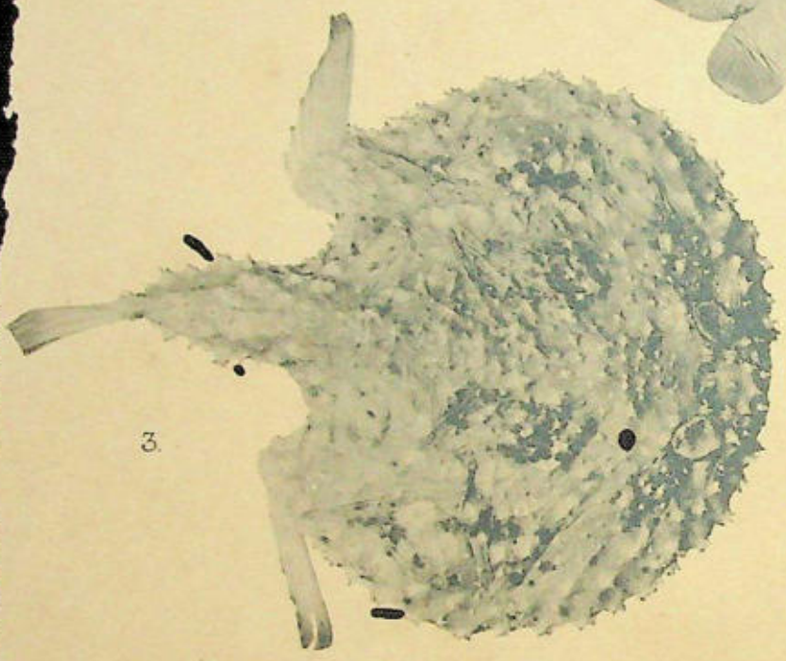

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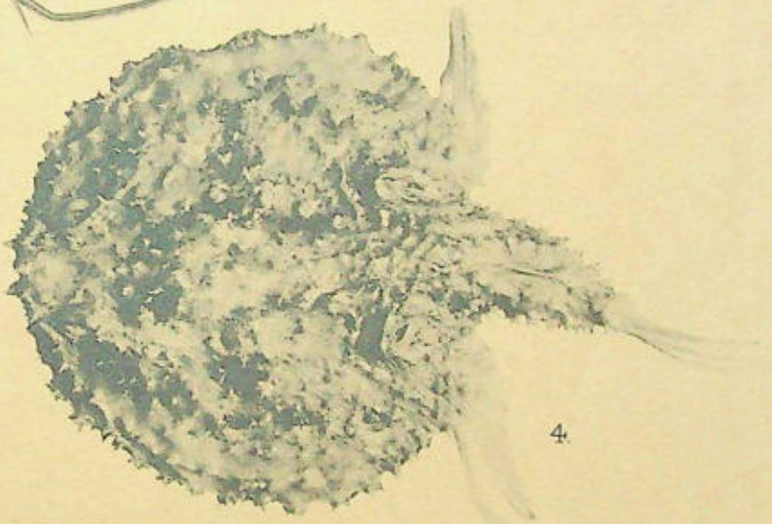

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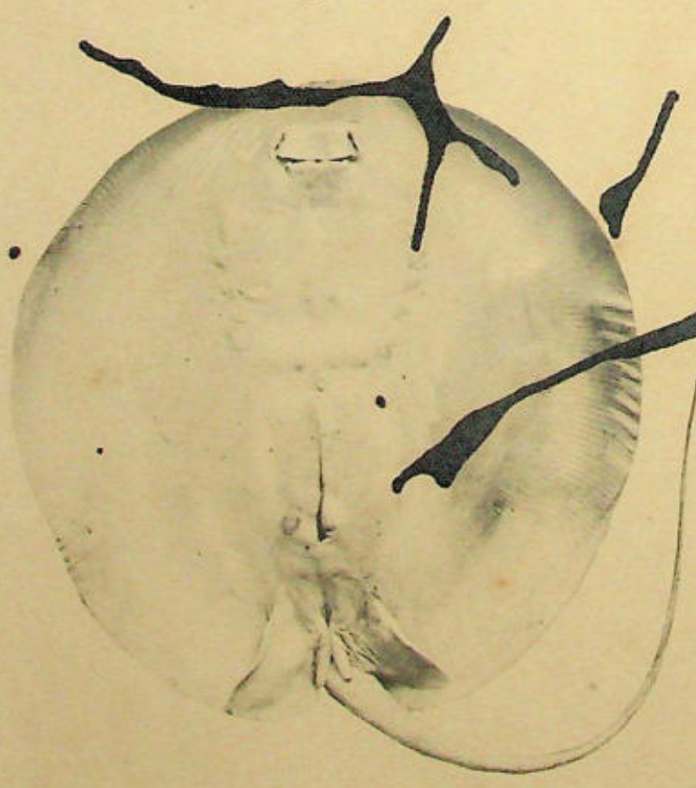
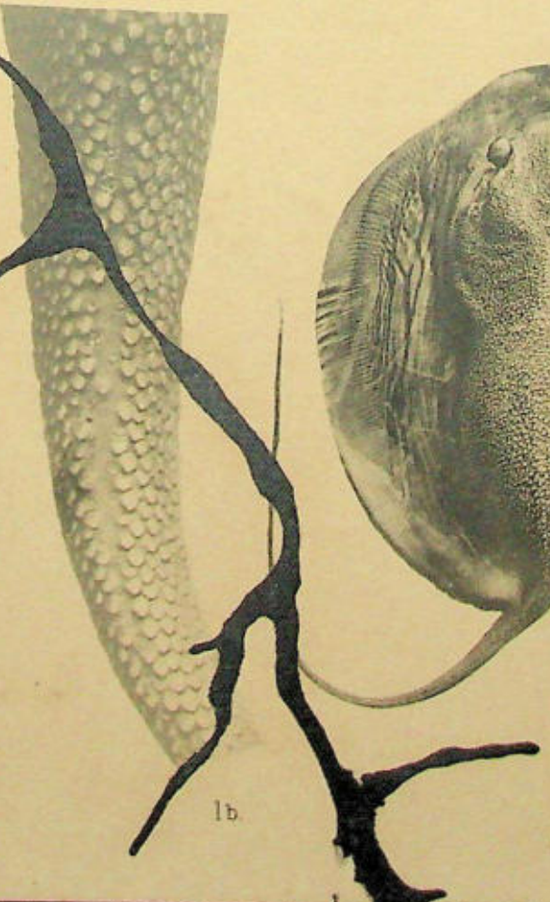


1a



1b

1

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EXPLANATION OF PLATE III.

FIG. 1.—*Plagusia obscura*, Jenkins. (Described *Rec. Ind. Mus.*, v, p. 134.)

,, 1*a*.— ,, ,, scale from coloured side of body.

,, 1*b*.— ,, ,, ,, ,, blind ,, ,,

,, 2.—*Solea sindensis*, Jenkins. (Described *ibid.*, p. 133.)

,, 2*a* and 2*b*.—Scales from coloured and from blind side of body of *Solea sindensis*, × 16.

,, 3.—*Cynoglossus acinaces*, Jenkins. (Described, *ibid.*, p. 130.)

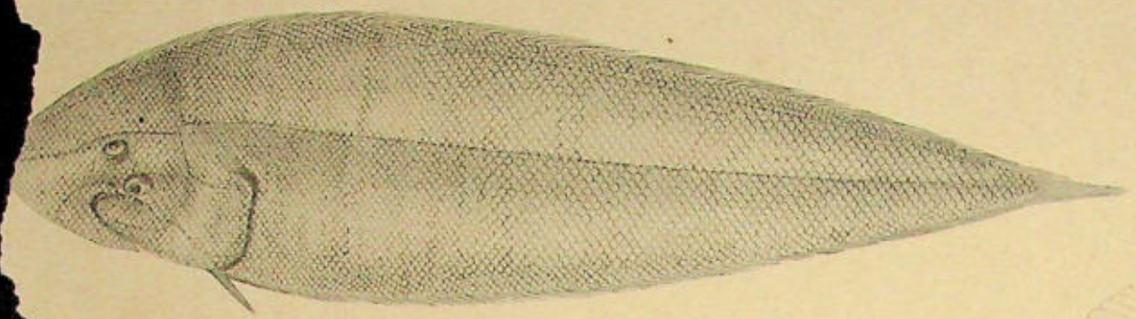
,, 3*a* and 3*b*.—Scales from coloured and from blind side of body of *Cynoglossus acinaces*, × 16.

,, 4. *Solea synapturoides*, sp. nov.

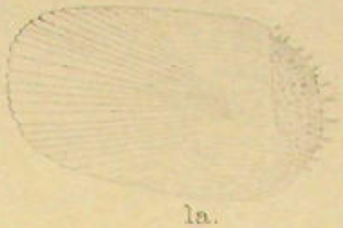
,, 4*a* and 4*b*.—Scales from coloured and from blind side of body of *Solea synapturoides*, × 8.

,, 5.—*Cynoglossus deltae*, Jenkins, × [illegible] Described *ibid.*, p. 130.)

,, 5*a* and 5*b*.—Scales from coloured and from blind side [illegible] *glossus deltae*, [illegible] 16.

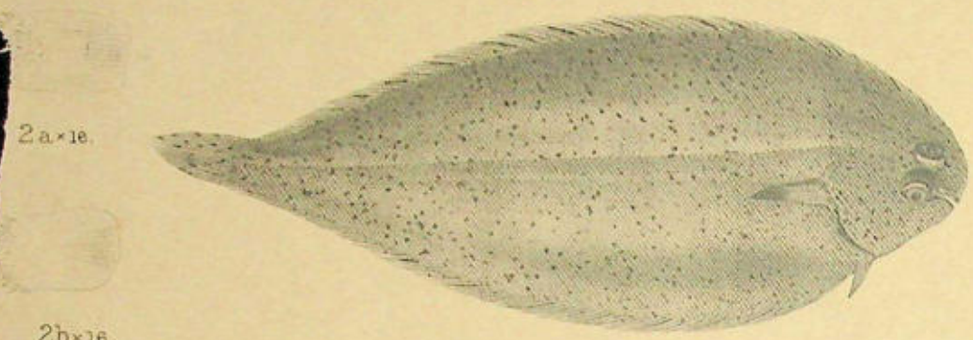


1.



1a.

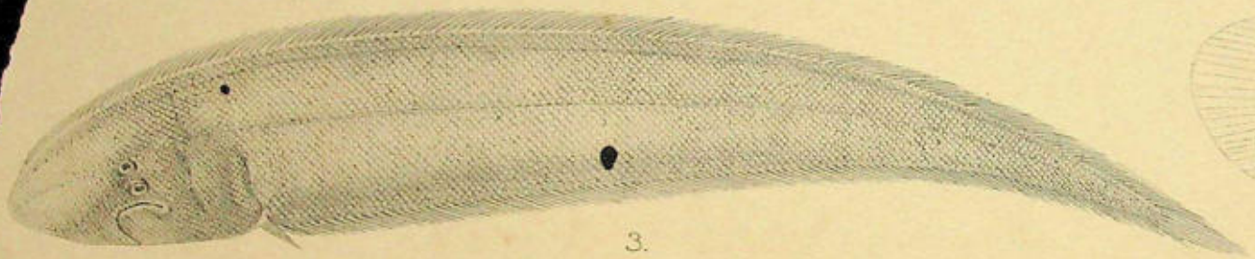
1b.



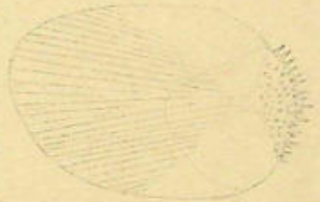
2.

2a×16.

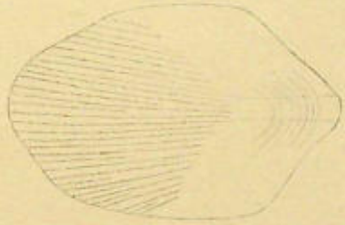
2b×16.



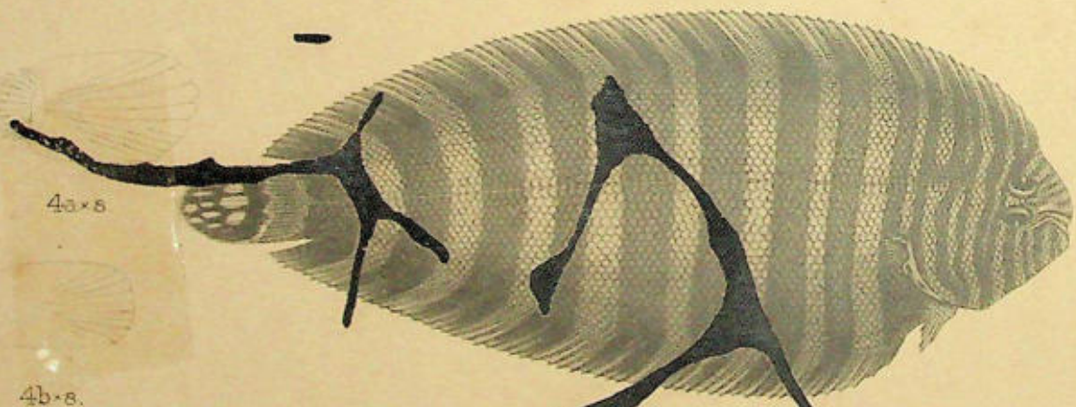
3.



3a×16.



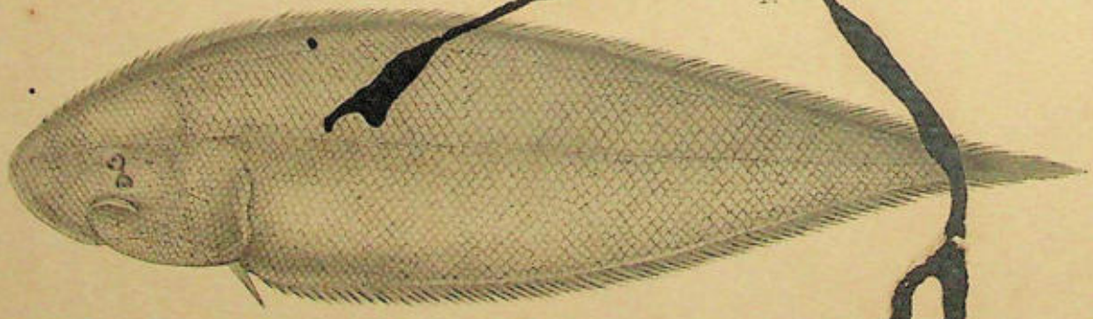
3b×16.



4.

4a×8

4b×8.



5×2

5a×16.

5b×16.

A.C.Chowdhary & S.C.Mondul, del.

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INDIAN PLEURONECTIDÆ.

EXPLANATION OF PLATE IV.

FIG. 1.—*Scalpellum squamuliferum*, Welt. Pupa of hermaphrodite, × 100. Minute valves were present, but are not shown.

,, 2.—*S. squamuliferum*. Young hermaphrodite measuring 2·5 mm. in length, × 75. Decalcified and stained with borax carmine. The testes, which are small at this stage, are not shown in the figure.

,, 3.—*S. squamuliferum*. Transverse section through the capitulum of a young hermaphrodite, × 180.

,, 4.—*S. squamuliferum*. Pupa of male, × 110. Stained borax carmine. Erratum—the letters c g. point to a vesicular space instead of to the cement glands. The latter are represented by the group of small sharp nuclei lying somewhat more ventrally.

,, 5.—*S. squamuliferum*. Pupa of male [illegible]owing valves. Unstained.

,, 6.—*S. squamuliferum*. Young mal[illegible]rtly after casting off the bivalve shell. Decalcified, unstained.

,, 7.—*Ibla cumingii*, Darwin. M[illegible]e, × 75. Stained borax carmine.

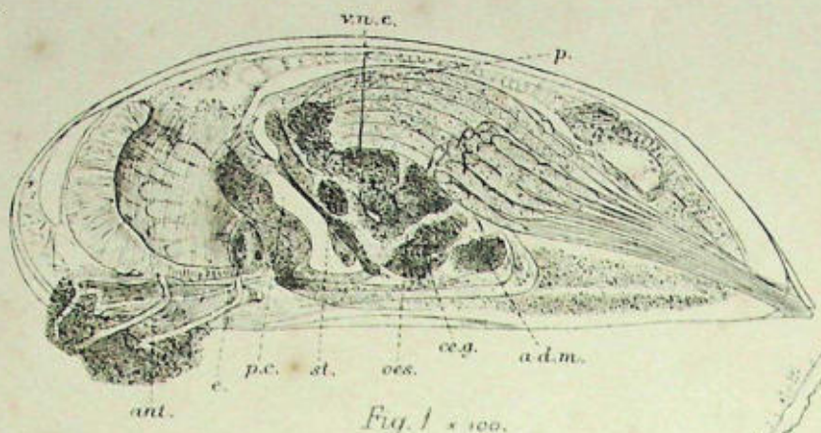


Fig. 1 x 100.

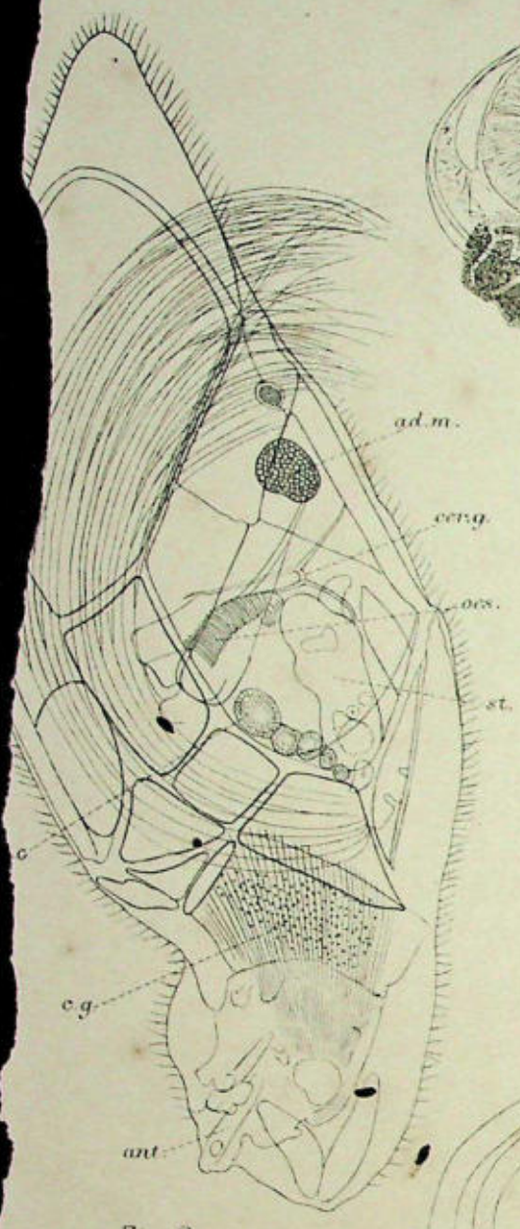


Fig. 2 x 75

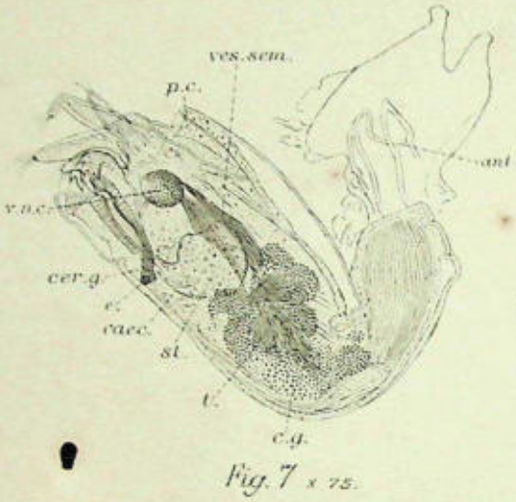


Fig. 7 x 75.

Fig. 3 x 180.

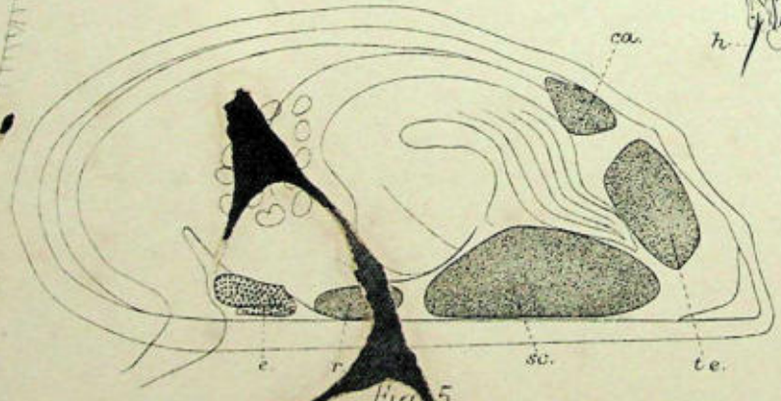
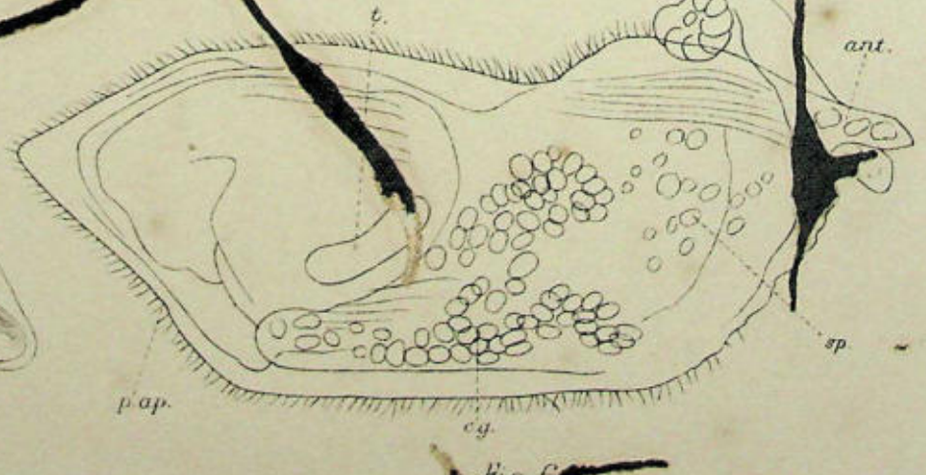


Fig. 5.

x 110.



alpellum squamuliferum, Welt. Fig. 7. Ibla cum[illegible]n, Darwin.

EXPLANATION OF PLATE V.

FIG. 1.—*Scalpellum squamuliferum*, Welt. Male, × 80. Stained borax carmine.

,, 2.—*S. squamuliferum*. Transverse section through the capitulum of the young male figured in pl. iv, fig. 6, × 250. Stained with iron haematoxylin.

,, 3.—*S. squamuliferum*. Transverse section through peduncle of the young male figured in pl. iv, fig. 6, × 250. Stain thionin eosin.

,, 4.—*S. squamuliferum*. The anterior portion of the pupa of a male, to show tissue elements. The anterior end is downward.

,, 5.—*S. squamuliferum*. Transverse section through peduncle of young hermaphrodite measuring 2·5 mm., × 250. Stained with iron haematoxylin.

,, 6.—*S. squamuliferum*. Cement cells seen in transverse section through peduncle of a hermaphrodite 16 mm. long. Stained with iron haematoxylin.

Fig. 2. × 250.

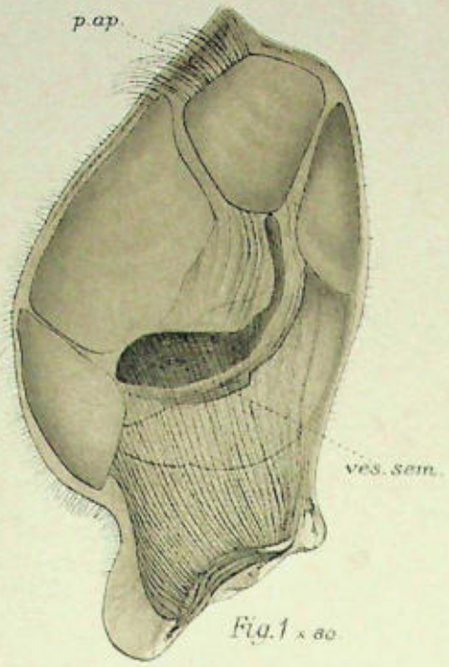


Fig. 1 × 80

Fig. 3 × 250

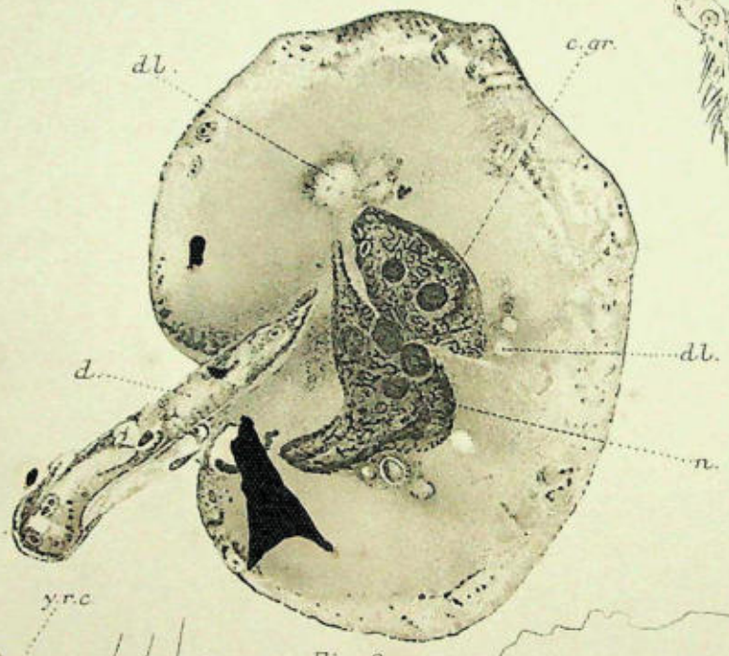


Fig. 6

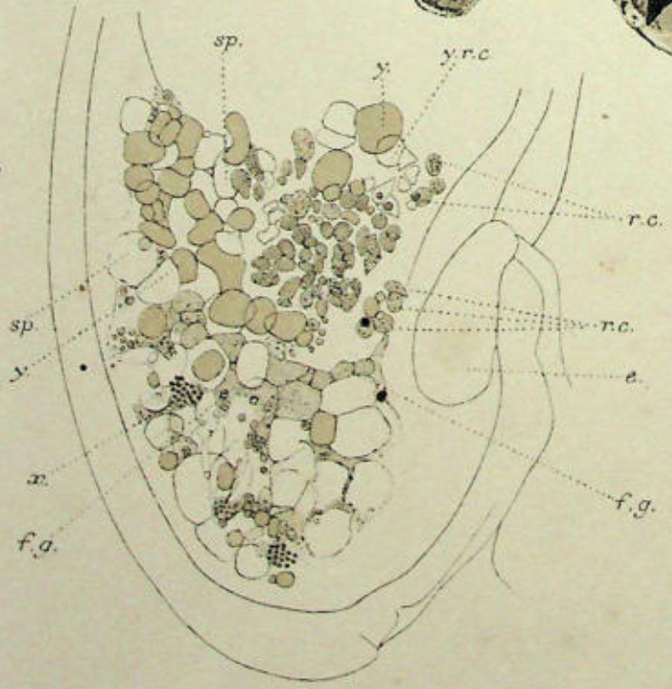


Fig. 4.

Fig. 5 × 250.

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Scalpellum squamuliferum, Welt.

EXPLANATION OF PLATE VI.

FIG. 1.—*Scalpellum squamuliferum*, Welt. Transverse section through the rostral duct of the pupa of a hermaphrodite. Stain iron haematoxylin.

,, 2.—*S. squamuliferum*. Transverse section through rostral duct and ovaries of hermaphrodite measuring 2·5 mm. Stain iron haematoxylin.

,, 3.—*S. squamuliferum*. Transverse section through rostral duct and ovaries of hermaphrodite measuring 12 mm., ×240. Stain iron haematoxylin.

,, 4.—*S. squamuliferum*. Transverse section through fundus of an ovarian tube in an hermaphrodite measuring 16 mm., drawn under $\frac{1}{12}''$ oil immersion lens.. Stain iron haematoxylin.

,, 5.—*S. squamuliferum*. Section of an ovarian tube with ovum: hermaphrodite measuring 16 mm.: ×

,, 6.—*S. squamuliferum*. Section of ripe ovum in full-grown hermaphrodite, ×182. Stain iron haematoxylin.

,, 7.—*S. bengalense*, Annand. Male, × 1[illegible] Stain borax carmine.

,, 8.—*S. gruvelii*, Annand. Cyprid of [illegible], ×85. Stain carmalum.

,, 9.—*S. squamuliferum*. Section through cuticle of a male; hairs and nerves. Under $\frac{1}{12}''$ oil immersion. Stain iron haematoxylin.

,, 10.—*S. bengalense*. Transverse section through body wall. Hairs; epidermal ganglion; one single hair separate. Under $\frac{1}{12}''$ oil immersion objective. Stain iron haematoxylin.

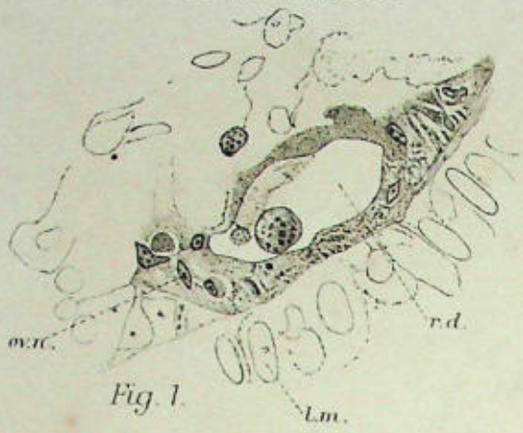

Fig. 1.

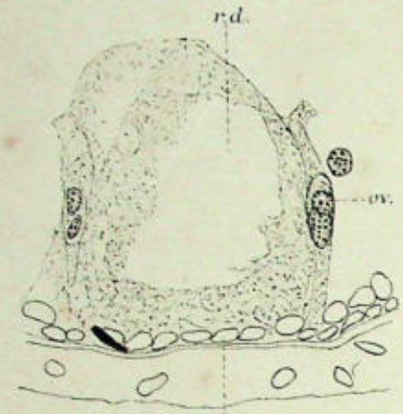

Fig. 2.

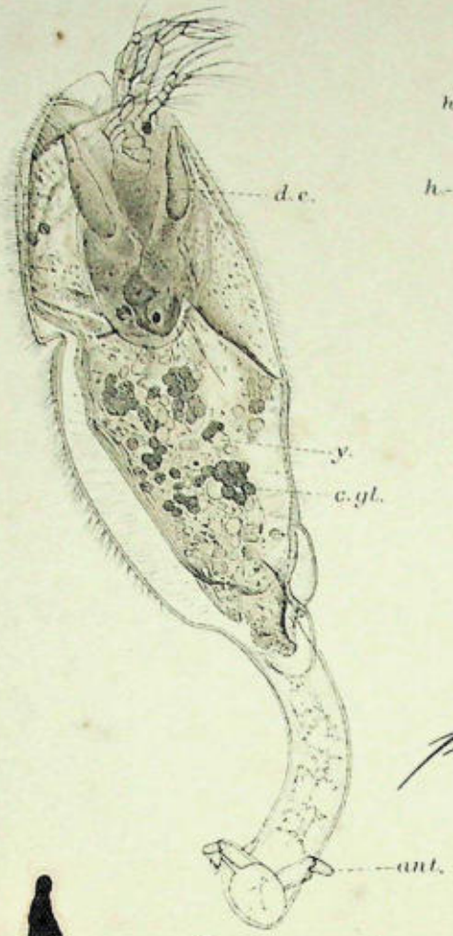

Fig. 7 × 105.

Fig. 9.

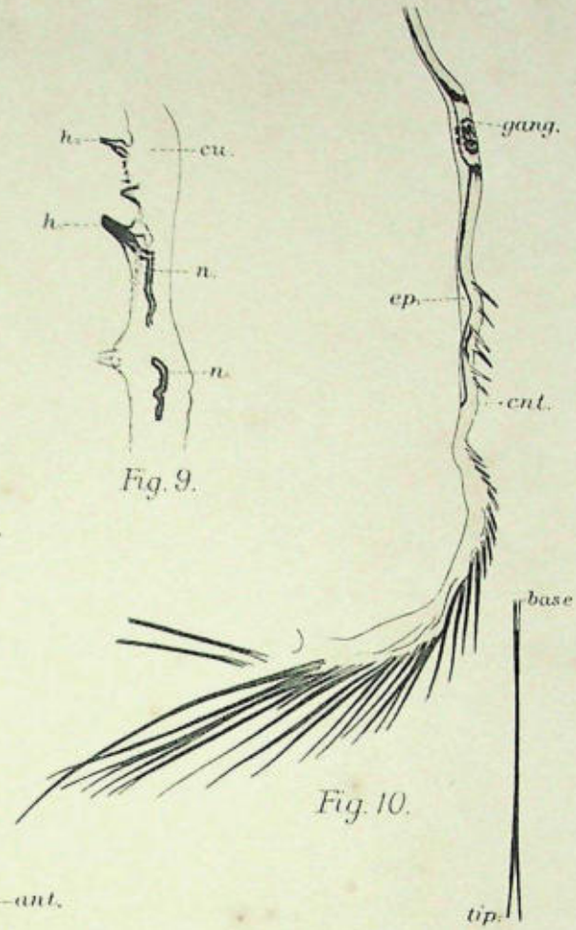

Fig. 10.

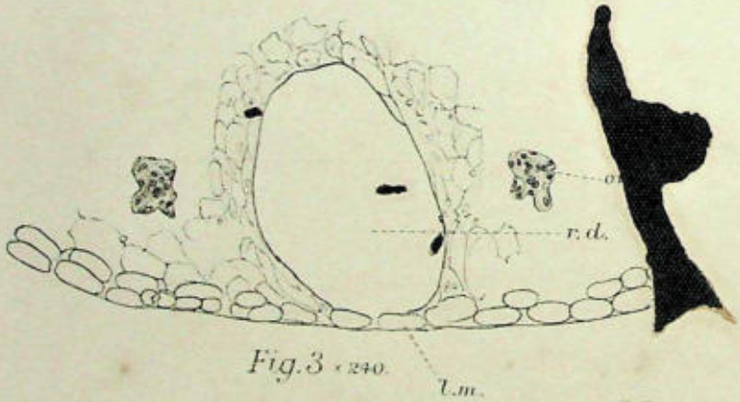

Fig. 3 × 240.

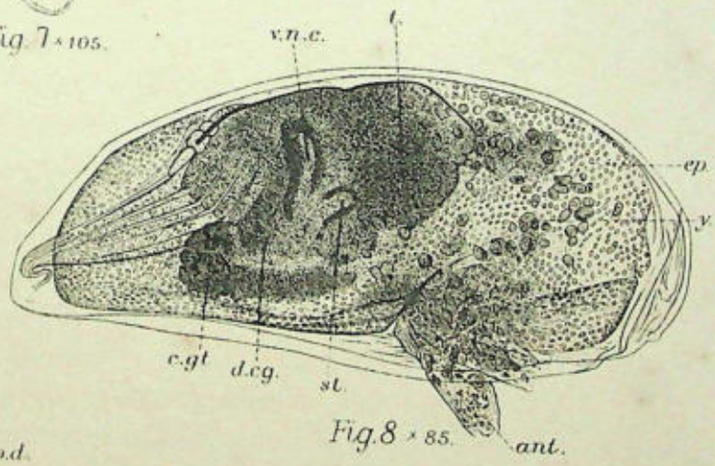

Fig. 8 × 85.

Fig. 4.

Fig. 5.

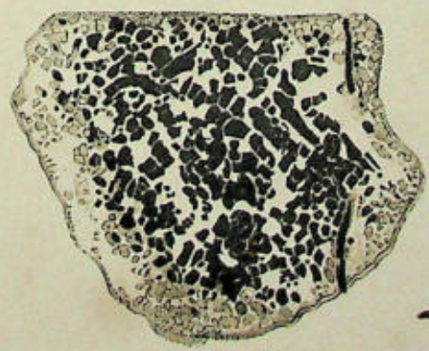

Fig. 6.

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Huth, Lith^r London

Figs. 1–6 & Fig. 9. Scalpellum squamuliferum, Welt. Figs. 7 & 10. Scalpellum bengalense, Annand.
Fig. 8. Scalpellum gruvelii, Annand.

EXPLANATION OF PLATE VII.

FIG. 1.—*Scalpellum gruvelii*, Annand. Transverse section through cyprid of male at level of base of antennae, × 250. Stain iron haematoxylin.

,, 2.—*S. gruvelii*. Transverse section through cyprid of male, about the junction of 2nd and 3rd thirds of the body length, × 250. Stain iron haematoxylin.

,, 3.—*S. gruvelii*. Transverse section through pupa, at about the middle of body length, × 250. Stain iron haematoxylin.

,, 4.—*S. gruvelii*. Transverse section through pupa, somewhat behind level of fig. 3, × 250. Stain iron haematoxylin.

,, 5.—*S. gruvelii*. The male, × 100. Stain borax carmine.

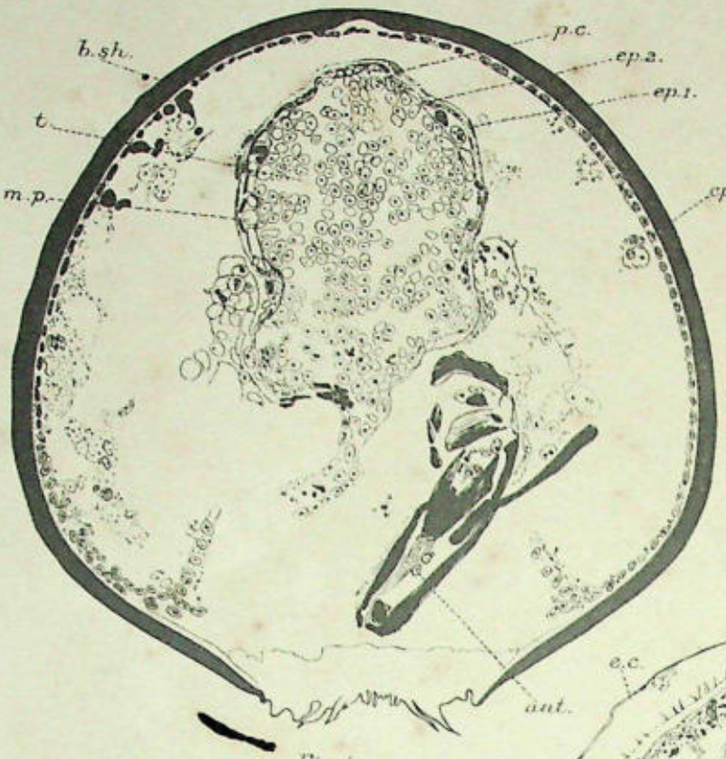

Fig. 1 × 250.

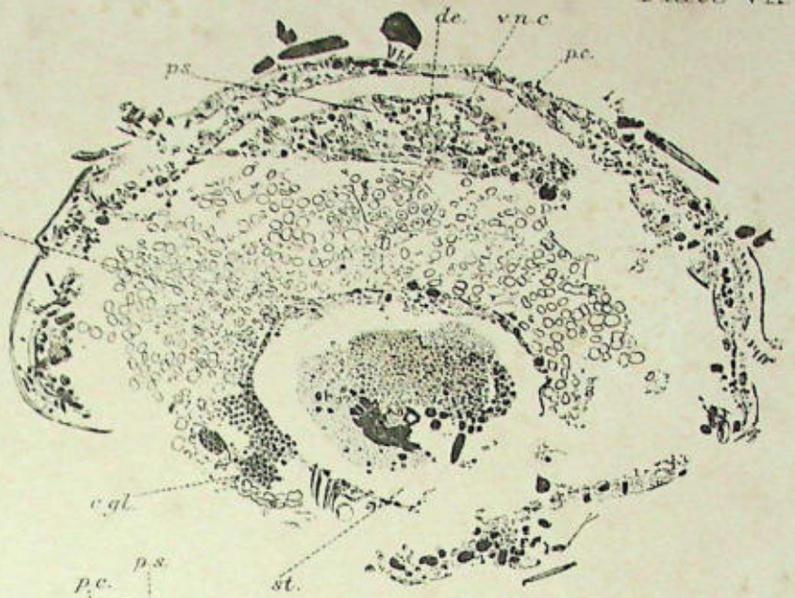

Fig. 3 × 250.

Fig. 4. × 250.

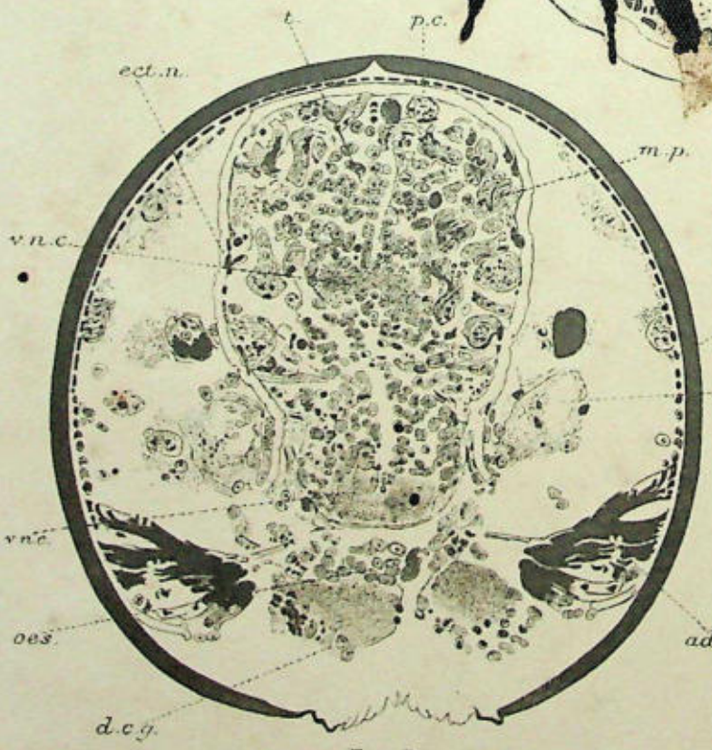

Fig. 2 × 250.

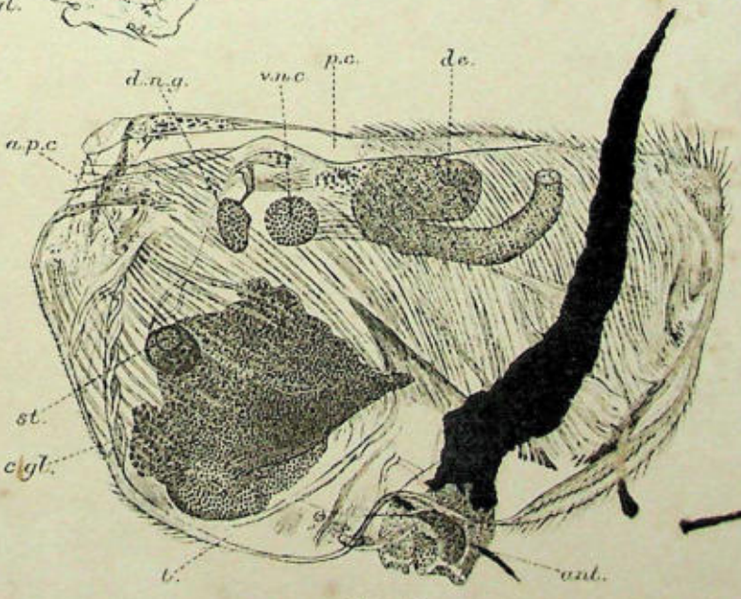

Fig. 5 × 100.

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Scalpellum gruvelii, Annand.

Hanhart Lith. London

EXPLANATION OF PLATE VIII.

Wings of Oriental and Australian Trypaneidae.

FIG. 1. *Leptoxyda* sp. nr. *longistyla*, Wied.
,, 2. *Bactrocera diversa*, Coq.
,, 3. The same (from another specimen).
,, 4. *Bactrocera zonata*, Saund.
,, 5. ,, *ferruginea*, Fab.
,, 6. ,, ,, var. *mangiferae*, Cotes.
,, 7. ,, *cucurbitae*, Coq.
,, 8. ,, *caudata*, Fab.
,, 9. ,, *garciniae*, Bezzi.
,, 10. ,, *scutellaris*, Bezzi.
,, 11. ,, *maculipennis*, Dol.
,, 12. *Anoplomus flexuosus*, Bezzi.
,, 13. *Stictaspis ceratitis*, Bezzi.
,, 14. ,, *striata*, Bezzi.
,, 15. ,, *separata*, Bezzi.
,, 16. *Gastrozona fasciventris*, Macq.
,, 17. ,, *montana*, Bezzi.
,, 18. ,, *melanista*, Bezzi.
,, 19. *Diarrhegma modestum*, Fab.
,, 20. *Ptilona nigriventris*, Bezzi.
,, 21. ,, *? brevicornis*, Wulp.
,, 22. *Rioxa vaga*, Wied.
,, 23. ,, *mutyca*, Wlk.
,, 24. ,, *vidua*, Bezzi.

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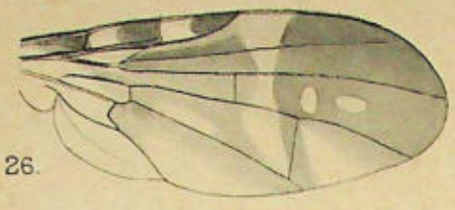
ORIENTAL AND AUSTRALIAN TRYPANEIDAE.

EXPLANATION OF PLATE IX.

Wings of Oriental and Australian Trypaneidae.

FIG. 25. *Rioxa dunlopi*, Wulp.
,, 26 ,, *soluta*, Bezzi.
,, 27. ,, *quinquemaculata*, Bezzi.
,, 28. ,, *? s[illegible]lata*, Macq.
,, 29. *Acanthonura ?fuscipennis*, Macq.
,, 30. *Phaeospila varipes*, Bezzi.
,, 31. *Taeniostola vittigera*, Bezzi.
,, 32. ,, *gracilis*, Bezzi.
,, 33. *Staurella crux*, Fab.
,, 34. ,, *dissoluta*, Bezzi.
,, 35. ,, *nigripeda*, Bezzi.
,, 36. *Callistomyia pavonina*, [illegible]ezzi.
,, 37. *Chaetellipsis parado[illegible]*ezzi.
,, 38. *Poecillis judica[illegible]*zi.
,, 39. *Myiopardalis para[illegible]*, [illegible]ig.
,, 40. *Carpomyia vesuviana*, Co[illegible]a.
,, 41. *Zonosema dubium*, Bezzi.
,, 42. *Vidalia ceratophora*, Bezzi.
,, 43. ,, *triceratops*, Bezzi.
,, 44. *Xanthorrachis annandalei*, Bezzi.
,, 45. *Acidia himalayensis*, Bezzi.
,, 46. ,, *rioxaeformis*, Bezzi.
,, 47. ,, *apicalis*, Bezzi.
,, 48. ,, *fossata*, Fab.

25.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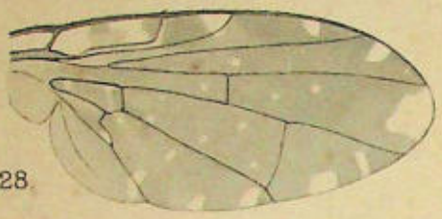
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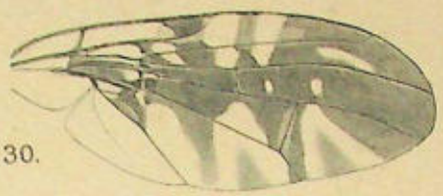
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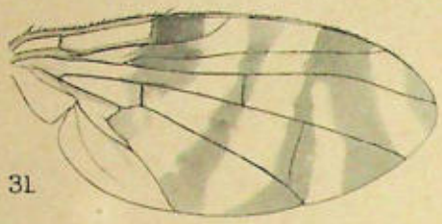
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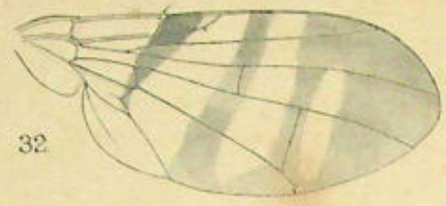
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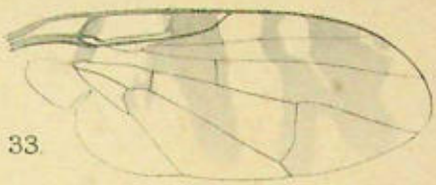
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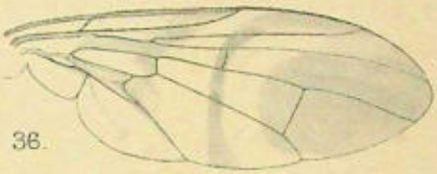
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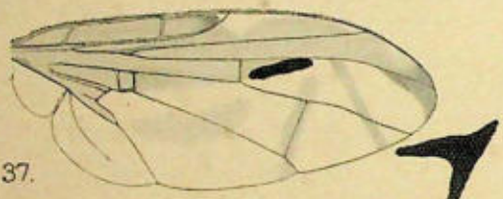
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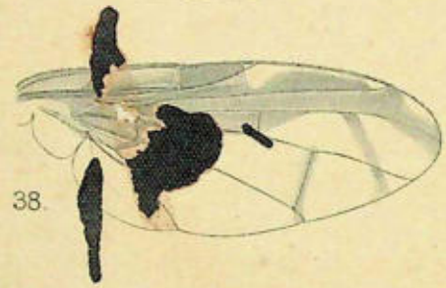
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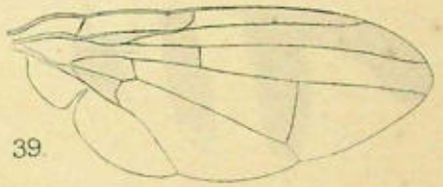
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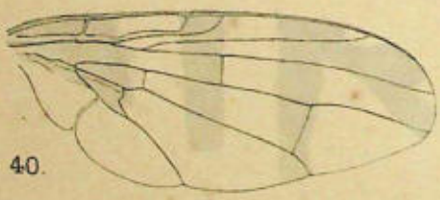
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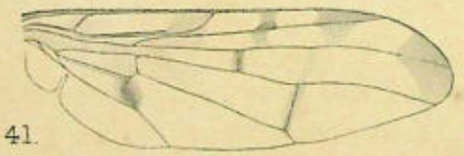
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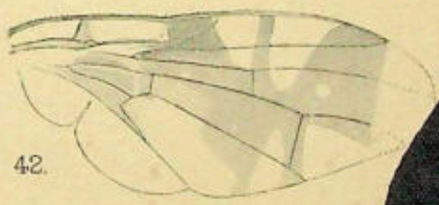
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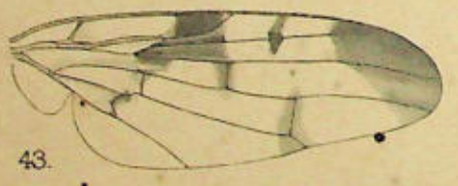
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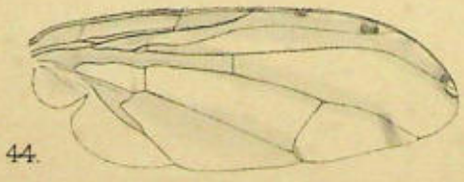
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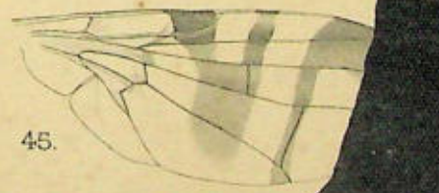
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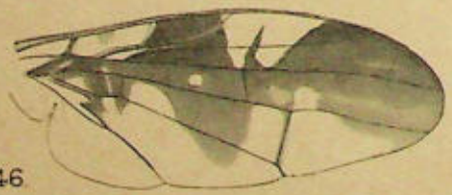
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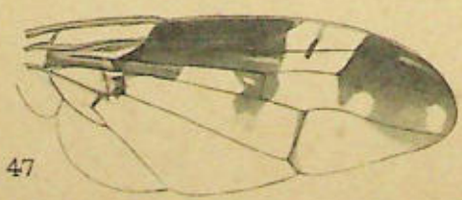
47.

48.

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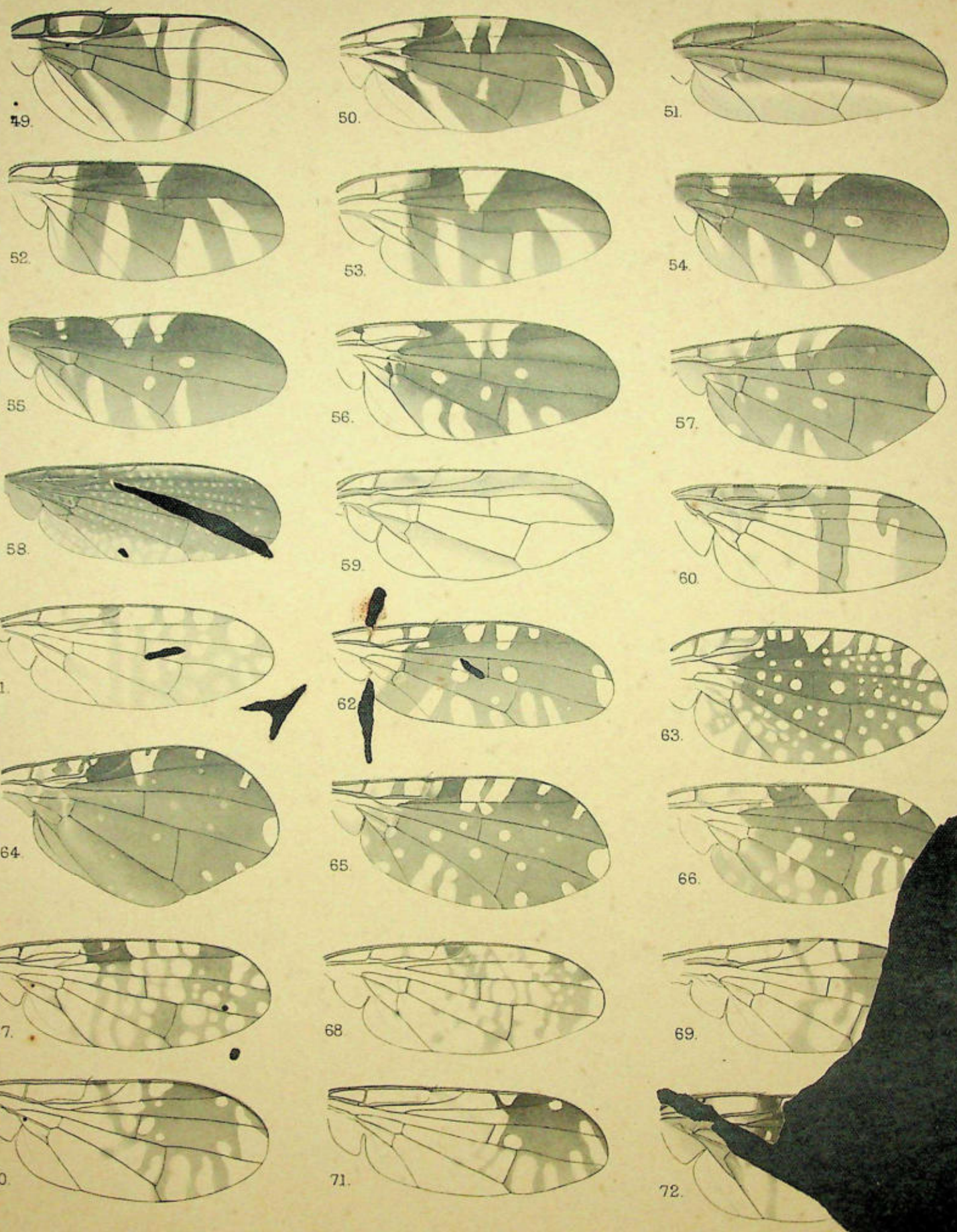
Bemrose

ORIENTAL AND AUSTRALIAN TRYPANEIDAE.

EXPLANATION OF PLATE X.

Wings of Oriental and Australian Trypaneidae.

FIG. 49. *Acidia alboscutellata*, Wulp.
,, 50. ,, *erythraspis*, Bezzi.
,, 51. ,, (*Oncros*) *praestans*, Bezzi.
,, 52. *Spheniscomyia quadrincisa*, Wied.
,, 53. ,, *sexmaculata*, Macq.
,, 54. *Aciura monochaeta*, Bezzi.
,, 55. ,, *xanthotricha*, Bezzi.
,, 56. *Tephrella decipiens*, Bezzi.
,, 57. *Tephrostola acrostacta*, Wied.
,, 58. *Parallelopteru pterocallaeformis*, Bezzi.
,, 59. *Craspedoxantha octopunctata*, Bezzi.
,, 60. *Sphenella indica*, Schiner.
,, 61. *Oxyna sororcula*, Wied.
,, 62. ,, *parca*, Bezzi.
,, 63. *Campiglossa cribellata*, Bezzi.
,, 64. *Tephritis euryptera*, Bezzi.
,, 65. ,, *zodiacalis*, Bezzi.
,, 66. ,, *zonogastra*, Bezzi.
,, 67. ,, *lyncea*, Bezzi.
,, 68. ,, *spiloptera*, Bezzi.
,, 69. *Trypanea aucta*, Bezzi.
,, 70. ,, *amoena*, Frauenf.
,, 71. ,, *asteria*, Schiner.
,, 72. *Phagocarpus immsi*, Bezzi.



A. C. Chowdhary. del.

ORIENTAL AND AUSTRALIAN TRYPANEIDAE.

EXPLANATION OF PLATE XI.

FIG. 1.—*Comacupes cavicornis* var. *borneensis* (type). Head from above, × 2.

,, 1*a*. Ditto Head from the side, × 2.

,, 2.—*Comacupes cavicornis* var. *laevicornis* (regd. no. $\frac{9433}{1}$). Head from above, × 2.

,, 2*a*. Ditto Head from the side. × 2.

,, 2*b*. Ditto Mentum, etc., × 4.

,, 3.—*Comacupes stoliczkae* (type). Head from above, × 2.

,, 3*a*. Ditto Head from the side, × 2.

,, 4.—*Comacupes masoni* (type). Head from above, × 2.

,, 4*a*. Ditto Head from the side, × 2.

,, 5.—*Comacupes cylindraceus* (regd. no. $\frac{6877}{14}$). Head from above, × 2.

,, 5*a*. Ditto Head from the side, × 2.

,, 6.—Another form of the same species (from a specimen in the British Museum). Head from above, × 2.

,, 6*a*. Ditto Head from the side, × 2.

,, 7.—*Taeniocerus bicanthatus* (regd. no. $\frac{6382}{14}$). Head from above, × 2.

,, 7*a*. Ditto Head from the side, × 2.

,, 7*b*. Ditto Mentum, etc., × 4.

,, 8.—*Taeniocerus pygmaeus* (regd. no. $\frac{9175}{1}$). Head from above, × 2.

,, 8*a*. Ditto Head from the side, × 2.

,, 9.—*Taeniocerus bicuspis* (regd. no. $\frac{6875}{14}$). Head from above, × 2.

,, 9*a*. Ditto Head from the side, × 2.

,, 10.—*Aulacocyclus andrewesi* (from the type in Mr. Andrewes' collection). Head from above, × 2.

,, 10*a*. Ditto Head from the side, × 2.

,, 11.—*Ceracupes austeni* (type). Head from above, × 2.

,, 11*a*. Ditto. Head from the side, × 2.

,, 12.—*Ceracupes fronticornis* (regd. no. $\frac{6120}{29}$). Head from above, × 2.

,, 13.—*Pleurarius brachyphyllus* (regd. no. $\frac{6345}{14}$). Head from above, × 2.

,, 13*a*. Ditto Mentum, etc., × 4.

,, 14.—*Tiberioides kuwerti* (regd. no. $\frac{6415}{14}$). Head from above, × 2.

,, 15.—*Tiberioides austeni* (type). Head from above, × 2.

,, 15*a*. Ditto Mentum, etc., × 4.

,, 16.—*Episphenus moorei* (regd. no. $\frac{8847}{18}$). Head from above, × 2.

,, 16*a*. Ditto Mentum, etc., × 4.

,, 17.—*Episphenus pearsoni*[1] (type). Head from above, × 2.

,, 18.—*Episphenus comptoni* (regd. no. $\frac{5307}{16}$). Head from above, × 2.

,, 18*a*. Ditto Mentum, etc., × 4.

,, 19.—*Episphenus comptoni* var. *flachi* (regd. no. $\frac{9179}{18}$ and $\frac{9181}{18}$). Frontal area, etc., × 3, showing the variability of the shape of this area.

,, 19*a*. Abnormal mentum of another specimen (regd. no. $\frac{9183}{18}$) × 4.

,, 20.—*Episphenus indicus*, large specimen (regd. no. $\frac{5768}{13}$). Head from above, × 2.

,, 20*a*. Ditto Mentum, etc., × 4.

,, 20*b*. Same species, small specimen (from a specimen in the Bombay Natural History Society's collection). Head from above, × 2.

,, 21.—*Episphenus neelgherriensis* (regd. no. $\frac{1925}{19}$). Head from above, × 2.

,, 21*a*. Ditto Mentum, etc., × 4.

,, 22.—*Ophrygonius cantori* (regd. no. $\frac{9119}{1}$). Head from above, × 2.

,, 22*a*. Ditto Mentum, etc., × 4.

,, 23.—*Ophrygonius cantori* var. *dunsiriensis* (type). Mentum, etc., × 4.

[1] E. moorei, see above, p. 281.

D. Bagchi, del.

ORIENTAL PASSALIDAE.

EXPLANATION OF PLATE XII.

FIG. 24.—*Ophrygonius inaequalis* (regd. no. $\frac{9674}{18}$). Head from above, × 2.

,, 24*a*. Ditto Mentum, etc., × 4.

,, 25.—*Aceraius borneanus* (regd. no. $\frac{2827}{19}$). Head from above, × 2.

,, 25*a*. Ditto Left mandible from the side, × 4.

,, 25*b*. Ditto Mentum, etc., × 4.

,, 26.—*Aceraius wallacei* (regd. no. $\frac{2826}{19}$). Head from above, × 2.

,, 26*a*. Ditto Left mandible from the side, × 4.

,, 26*b*. Ditto Mentum, etc., × 4.

,, 27.—*Aceraius laevicollis* (regd. no. $\frac{3208}{19}$). Head from above, × 2.

,, 27*a*. Ditto Left mandible from the side, × 4.

,, 28.—*Aceraius grandis* subsp. *hirsutus*, a specimen of moderate size (regd. no. $\frac{9201}{1}$). Head from above, × 2.

,, 28*a*. A large specimen of the same species and subspecies (regd. no. $\frac{3632}{19}$). Head from above, × 2.

,, 28*b*. Left mandible of a similar specimen to the last from ab[illegible], × 4.

,, 29.—Left mandible of another specimen of the same sub-[illegible]cies (regd. no. $\frac{8758}{8}$) from above, × 4.

,, 30.—*Aceraius grandis* var. *rectidens* (from a [illegible]pecimen in the Sarawak Museum collection). Head from above, × 2.

,, 31.—*Aceraius kuwerti* (from a specimen in Mr. Andrewes' collection). Head from above, × 2.

,, 32.—*Aceraius illegalis* (regd. no. $\frac{9509}{1}$). Head from [illegible]bove, × 2.

,, 32*a*. Ditto Mentum, etc., × 4.

,, 33.—*Aceraius möschleri* (regd. no. $\frac{2830}{19}$). Head from above, × 2.

,, 34.—*Aceraius alutaceosternus* (regd. no. $\frac{2835}{19}$). Head from above, × 2.

,, 34*a*. Ditto Mentum, etc., × 4.

,, 35.—*Aceraius pilifer* (from a specimen in Mr. Andrewes' collection). Head from above, × 2.

,, 36.—*Aceraius himalayensis* (type). Head from above, × 2.

,, 36*a*. Ditto Anterior part of head from the right side, × 4.

,, 37.—*Aceraius assamensis* (regd. no. $\frac{5310}{16}$). Head from above.

,, 37*a* Ditto Anterior part of head from the right side, × 4.

,, 38.—*Aceraius tavoyanus*[1] (regd. no. $\frac{82}{5}$). Head from above, × 2.

,, 38*a*. Ditto Anterior part of head from the right side, × 4.

,, 39.—*Aceraius helferi* (regd. no. $\frac{2818}{19}$). Head from above, × 2

,, 39*a*. Ditto Anterior part of head from the right side, × 4.

[1] A. helferi, see above, p. 292.

D. Bagchi, del

Bemrose, Collo., Derby.

ORIENTAL PASSALIDAE.

EXPLANATION OF PLATE XIII.

FIG. 40.—*Macrolinus nicobaricus* (type). Head from above, ×2.

,, 40*a*. Ditto Anterior part of head from the side, ×4.

,, 41.—*Macrolinus andamanensis* (regd. no. $\frac{9165}{1}$). Head from above, ×2.

,, 41*a*. Ditto Anterior part of head from the side, ×4.

,, 42.—*Macrolinus sikkimensis* (type). Head from above, ×2.

,, 42*a*. Ditto. Mentum, etc., ×4.

,, 43.—*Macrolinus rotundifrons* (regd. no. $\frac{9225}{18}$). Head from above, ×2.

,, 44.—*Macrolinus waterhousei* (regd. no. $\frac{9621}{19}$). Head from above, ×2.

,, 45.—*Macrolinus latipennis* (regd. no. $\frac{9521}{1}$). Head from above, ×2.

,, 46.—Another specimen of the same species (regd. no. $\frac{9520}{1}$). Head from above, ×2.

,, 47.—*Gonatas germari* (regd. no. $\frac{3869}{19}$). Head from above, ×2.

,, 47*a*. Ditto Mentum, etc., ×4.

,, 48—*Trapezochilus dorsalis* (regd. no. $\frac{8761}{5}$). Head from above, ×2.

,, 49.—*Gnaphalocnemis burmeisteri* (regd. no. $\frac{9073}{19}$). Head from above, ×2.

,, 49*a*. *Gnaphalocnemis monticulosus* (regd. no. $\frac{9015}{1}$). Head from above, ×2.

,, 50.—*Gnaphalocnemis tridens* (from a specimen in Mr. A[illegible]reyes' collection). Head from above, ×2.

,, 50*a*. Ditto Mentum, [illegible] ×4.

,, 51.—*Leptaulax humerosus* (regd. no. [illegible] from above, ×2.

,, 52.—*Leptaulax dentatus*, large specimen (regd. no. [illegible]). Head from above, × 2.

,, 52*a*. Ditto Mentum etc., × 4.

,, 52*b*. Frontal areas of some specimens of the same species (regd. nos. $\frac{862}{19}$, $\frac{864}{19}$, $\frac{865}{19}$), all taken from one colony, × 2.

,, 52*c*. Frontal areas of specimens of the same species (regd. nos. $\frac{904}{19}$, $\frac{924}{19}$, $\frac{937}{19}$) from other colonies, × 2.

,, 52*d*. Small specimen of the same species (regd. no. $\frac{903}{19}$). Head from above, ×2.

,, 53.—*Leptaulax cyclotaenius*, s. str. (regd. no. $\frac{9151}{1}$). Head from above, × 2.

,, 54.—*Leptaulax macassariensis* subsp. *anibarbis* (regd. no. $\frac{6296}{19}$). Head from above, × 2.

,, 55.—*Leptaulax anipunctus* (regd. no. $\frac{1135}{19}$). Head from above, ×2.

,, 56.—*Leptaulax bicolor*, s. str., large specimen (regd. no. $\frac{9705}{1}$). Head from above, × 2.

,, 56*a*. The same species (var. *vicinus*), small specimen (regd. no. $\frac{2617}{19}$). Head from above, × 2.

,, 57.—*Leptaulax roepstorfi* (regd. no. $\frac{4115}{5}$). Head from above, × 2.

,, 58.—*Leptaulax planus* (regd. no. $\frac{6395}{14}$). Head from above, × 2.

40.

41.

42.

40a.

41a.

42a.

43.

44.

45.

46.

47.

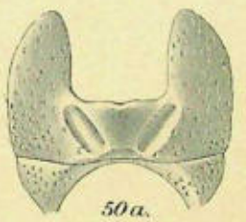
47a.

48.

50.

49.

49a.


50a.

51.

52.

52a.

52b.

52c.

52d.

53.

54.

55.

56.

56a.

57.

58.

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Bemrose, Collo, Derby.

ORIENTAL PASSALIDAE.

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