AN ACCOUNT OF THE ORIENTAL PASSALIDAE (COLEOPTERA), BASED PRIMARILY ON THE COLLECTION IN THE INDIAN MUSEUM

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(Plates XI—XIII.)

CONTENTS.

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

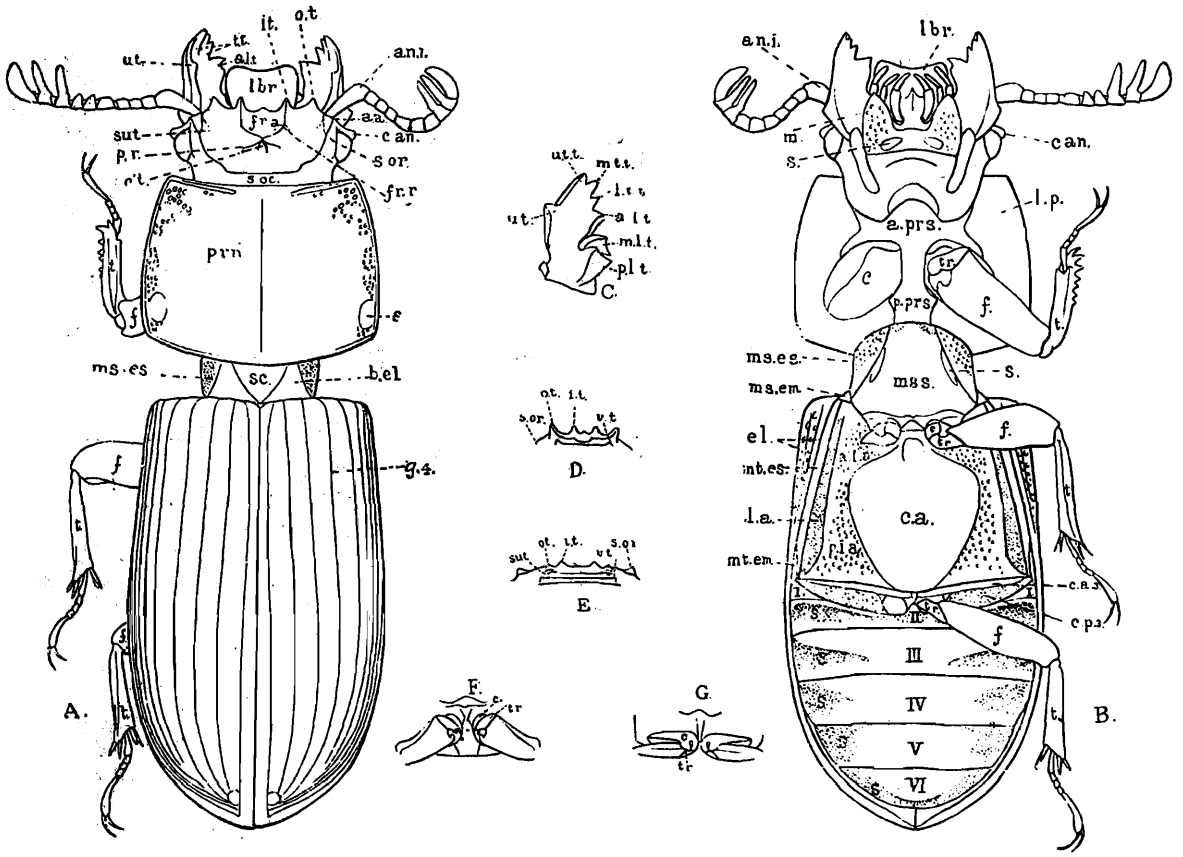
The actual length of a Passalid depends in some degree on the extent to which the head is drawn into the prothorax, and the prothorax over the mesothorax, but it appears to be the most convenient indication of size that can be given. All my measurements of total length have been taken from the front 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.3.* anterior part of hind coxa; *can.* canthus; *c.p.3.* posterior part of hind coxa; *c.t.* central tubercle; *e.* elytron; *f* femur; *fr.a.* frontal area; *fr.r.* frontal ridge; *g.4.* 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.t.t.* lowest terminal tooth; *m.* mentum; *m.l.t.* middle lower tooth; *ms.em* 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] For 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 trunctate 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 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 is 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* (Gnaphalocneminae), *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-

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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

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[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.

5.	Sides of elytra hairless, unpunctured except in the grooves	.. *Basilianus*, Kaup; pp. 220 & 282.
	Sides of elytra clothed with hair, lateral ridges more or less extensively punctured especially near the shoulder	.. *Aceraius*, Kaup; pp. 228 & 286.

All species of the subfamily Macrolininae as defined here were placed by Kuwert in one or other of the genera *Macrolinus* and *Tiberius*. Zang (1905*a*, p. 163) has pointed out that Kuwert's definitions of these genera are based on a distinction which does not really exist. Zang's definition, however, is based on a character which appears to me to be of specific rather than of generic importance. If the subfamily is to be divided into genera at all it must be along the lines indicated by Kuwert, but the definitions will have to be differently expressed, and Kuwert's genus *Macrolinus* will have to be further subdivided into three sections, to each of which generic value must be given. It seems to me preferable, therefore, to reunite the genera *Macrolinus* and *Tiberius*. The single genus thus formed may then be divided into groups of species as follows:—(1) *Macrolinus urus* and *diuvenbodei* from Celebes; (2) *M. sikkimensis*, *nicobaricus*, and *andamanensis*; (3) the Ceylon forms; and (4) the Malaysian and Philippine forms with *M. sulciperfectus* from Celebes. The so-called African species, *Tiberius caffer*, of which I have examined the type, has proved to belong to the genus *Pharochilus*; it is probably *P. dilatatus* from Australia.

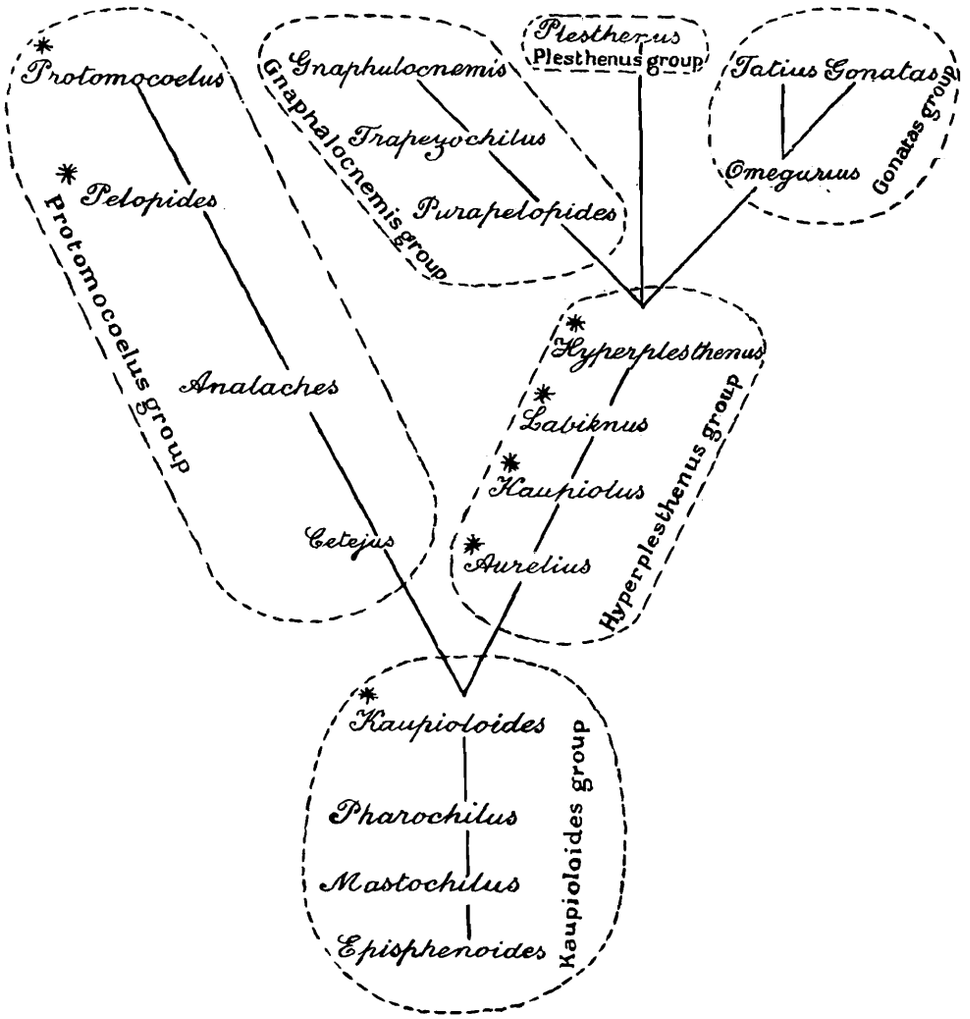
The subfamily Gnaphalocneminae contains the remaining genera belonging to the "second 9*a*" groups of Kuwert's classification, *i.e.* all except the genera *Chilomazus* (=*Laches*), *Epilaches*, *Heterochilus*, *Basilianus*, and *Aceraius*. It is most abundantly represented in the Far Eastern part of the Indo-Australian area, and the following revision of its classification is based on the collections in the Berlin and Hamburg Museums, in which *Pelopides* and *Tatius* are the only genera that are not represented.[1]

In the Gnaphalocneminae, as in the Aceraiinae, some species are symmetrical and others highly asymmetrical; it is probable that the two subfamilies are very closely allied, and that the former occupies the same position in the fauna of the Australian Region as the latter does in that of the Oriental Region.

The classification of the Gnaphalocneminae has hitherto been based principally on the sculpturing of the mentum and of the anterior margin of the head. This sculpturing appears to be of primary importance, but it is very difficult to define some genera precisely with its help alone, and I have found it necessary to use also the structure of the mandibles. In the less highly specialized genera of both Gnaphalocneminae and Aceraiinae the dentition of both mandibles is complete and normal, all the terminal and lower teeth being present and approximately equidistant one from another; whereas in the more highly specialized genera the lowest terminal tooth and anterior lower tooth tend to fuse or to disappear, on one or both of the

[1] I have also, through the kindness of Prof. Lampert, been enabled to examine the type specimen of the genus *Hyperplesthenus*, Kuwert, which is preserved in the Stuttgart Museum. Without reference to this specimen I could not have determined the characteristics of the genus.

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.	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 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.

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. $\frac{2609}{19}$	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	?
,,	$\frac{9244}{1}$ $\frac{9410{\cdot}5}{1}$ $\frac{9417{\cdot}20}{1}$ / $\frac{9423{\cdot}8}{1}$ $\frac{9430}{1}$ $\frac{9432{\cdot}8}{1}$ $\frac{9437{\cdot}8}{1}$ / $\frac{9443{\cdot}5}{1}$ $\frac{9480}{1}$ $\frac{6381{\cdot}2}{14}$	Johore	Stoliczka bequest, J. Wood-Mason, etc.
,,	$\frac{9440{\cdot}2}{1}$	?	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.	$\frac{9448}{1}$ $\frac{9483}{1}$ (*type*)	Johore, Malay Peninsula	J. Wood-Mason, etc.
,,	$\frac{8785}{18}$	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. $\frac{8786}{18}$ (*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. *Prothrorax 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. $\frac{6377}{14}$ $\frac{6384}{14}$	Sinkep Island	Moti Ram.
,, $\frac{2611}{19}$	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 FIGUER 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. $\frac{9410}{1}$, 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. *7–7b.*

Regd. No. $\frac{9447}{1}$		?	J. Wood-Mason.
,,	$\frac{9477}{1}$ $\frac{6362\text{-}8}{14}$ $\frac{6383}{14}$	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. $\frac{9475}{1}$ "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 **Y** 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. $\frac{9246\text{-}8}{1}$ $\frac{9403}{1}$ $\frac{9405}{1}$	Sikkim	Stoliczka bequest, Asiatic Society, etc.
,, $\frac{9408}{1}$ $\frac{6375}{14}$		
,, $\frac{8129}{19}$	Gopaldhara, Rungbong Valley, Darjeeling District	H. Stevens (coll. W. K. Webb).
,, $\frac{9409}{1}$	Chongtang, Darjeeling District	J. Wood-Mason.
,, $\frac{9476}{1}$	Upper Tista, 4000 ft.	?
,, $\frac{8801\text{-}2}{14}$	Sureil, Darjeeling District	A. Alcock.
,, $\frac{2667}{5}$	N. E. Frontier	?
,, $\frac{6369}{14}$ $\frac{6371}{14}$	Dafla Expedition	H. H. Godwin-Austen.
,, $\frac{6370}{14}$	Dafla, Camp 9	
,, $\frac{6373\text{-}4}{14}$ $\frac{8416}{18}$	Dikrang Valley	
,, $\frac{6372}{14}$	Harmutti, base of Dafla Hills	
,, $\frac{3121\text{-}8}{19}$ $\frac{3131\text{-}9}{19}$	Kobo, Abor Country, 400 ft.	Nov. 1911—Feb. 1912. S. W. Kemp.
,, $\frac{3261}{19}$	Rotung, Abor Country, 1400 ft.	
,, $\frac{3129\text{-}30}{19}$	Upper Rotung, Abor Country, 2000 ft.	
,, $\frac{3104\text{-}20}{19}$	Upper Renging, Abor Country	
,, $\frac{6364\text{-}8}{14}$ $\frac{8412\text{-}5}{18}$	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. $\frac{9246}{1}$ and $\frac{9403}{1}$) 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. $\frac{6120}{20}$ 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		
,, $\frac{6359\text{-}60}{14}$	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. $\frac{9482}{1}$, 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. $\left\{\begin{matrix}\frac{9317}{1}\ \frac{6385}{14} \\ \frac{8818}{18}\end{matrix}\right.$ (*paratypes*)[1] } 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.	$\frac{9103}{1}$ $\frac{9302\text{-}3}{1}$ $\frac{9464}{1}$ $\frac{6443}{14}$ $\frac{9475}{18}$	"Sikkim"	Stoliczka bequest, J. Wood Mason, etc.
,,	$\frac{1702}{19}$	Peshoke, Darjeeling District, *a.* 3000 ft.	F. Hannyngton.
,,	$\frac{6433\text{-}4}{14}$ $\frac{6147}{14}$	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. $\frac{8817}{18}$ 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.
,, $\frac{5307\text{-}8}{16}$	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* dull, 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. $\frac{9183}{18}$ 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.	$\frac{9309}{1}$ $\frac{9463}{1}$ $\frac{9472}{1}$ (*all paratypes*)	S. India.	F. Stoliczka, etc.
,,	$\frac{8802\text{-}3}{4}$	Trichinopoly	Father Honoré.
,,	$\frac{2860\text{-}1}{19}$	N. Kanara	H. L. Andrewes [2].
,,	$\frac{5767\text{-}5770}{13}$ $\frac{2862\text{-}5}{19}$	Nilgiris	Director, Forest School, Dehra Dun; H. L. Andrewes.
,,	$\frac{1573\text{-}5}{5}$	Ootacamund	Col. Beddome.
,,	$\frac{1929}{19}$	Anamalais, S. India, *ca.* 5000 ft., 21-i-12	T. Bainbrigge Fletcher.
,,	$\frac{1930}{19}$ $\frac{1932\text{-}5}{19}$ $\frac{1940}{19}$ $\frac{1945}{19}$ $\frac{1947}{9}$	Anamalais, 4000 ft., 23-i-12	In rotten logs. T. Bainbrigge Fletcher.
,,	$\frac{7493}{19}$	Anamalais, *ca.* 5000 ft., 21-i-12	
,,	$\frac{1938}{19}$	Anamalais, *ca.* 5500 ft., 21-i-12	
,,	$\frac{1931}{19}$ $\frac{1936\text{-}7}{19}$ $\frac{1939}{19}$ $\frac{1941}{19}$ $\frac{1944}{19}$ $\frac{1944}{19}$ $\frac{1949\text{-}50}{19}$	Puddutottam, Anamalais, 4200 ft., 22-i-12	
,,	$\frac{1942}{19}$ $\frac{1948}{19}$	Kalyana, Pandal, 3000 ft., 25-i-12	T. Bainbrigge Fletcher.
,,	$\frac{1943}{19}$	Monica Estate, Anamalais, 4000 ft., 24-i-12	T. Bainbrigge Fletcher.
,,	$\frac{7497}{19}$ [3]	Bababudin Hills, Mysore, 4000–5000 ft., 2-12-x-12	T. Bainbrigge Fletcher.
,,	$\frac{9658}{18}$	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. $\frac{5315\text{-}6}{16}$ $\frac{9679\text{-}9680}{18}$ S. India { Col. Beddome, British Museum.

Regd. No.	$\frac{7501\text{-}8}{19}$[1]	Bababudin Hills	T. Bainbrigge Fletcher.
,,	$\frac{6194}{19}$	Coorg	
,,	$\frac{9470}{1}$	Malabar	?
,,	$\frac{9682}{18}$	High Range, Travancore	Trivandrum Museum.
,,	$\frac{3460\text{-}70}{19}$	Coonoor, *ca.* 6000 ft. (Sims Park, Jungle, and Stillbrook Garden)	R. B. Seymour Sewell.
,,	$\frac{1576}{5}$	Ootacamund	Col. Beddome.
,,	$\frac{6500}{19}$[1] $\frac{6669}{19}$ $\frac{7500}{49}$[1]	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.
,,	$\frac{9681}{18}$	?	?

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°, never 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.
,,	$\frac{9105\text{-}9111}{1}$ $\frac{9113}{1}$ $\frac{9115\text{-}7}{1}$ $\frac{9307\text{-}8}{1}$, $\frac{9471}{1}$, $\frac{9466}{1}$, $\frac{7072}{3}$	"Sikkim"	Stoliczka bequest, Asiatic Society's collection, etc.
,,	$\frac{7490\text{-}6}{13}$	Tista, Darjeeling District	E. P. Stebbing.
,,	$\frac{8797\text{-}8800}{14}$	Sureil, Darjeeling District	A. Alcock.
,,	$\frac{1545}{16}$ $\frac{9683}{18}$	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).
,,	$\frac{6437}{14}$	Dikrang Valley, Dafla Hills	H. H. Godwin-Austen.
,,	$\frac{7078}{3}$ $\frac{7080}{3}$ $\frac{6444}{14}$	?	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.	$\frac{9688\text{-}90}{18}$	Khasi Hills, Assam	H. H. Godwin-Austen.
,,	$\frac{9684\text{-}7}{18}$	Teriaghat, Khasi Hills	H. H. Godwin-Austen.
,,	$\frac{9691}{18}$	?	?

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.

2a. O. CANTORI, subsp. DUNSIRIENSIS, n. var.

Pl. xi, fig. 23.

Regd. No.	$\frac{9692}{18}$ (*type*) $\frac{9693\text{-}5}{18}$	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*.

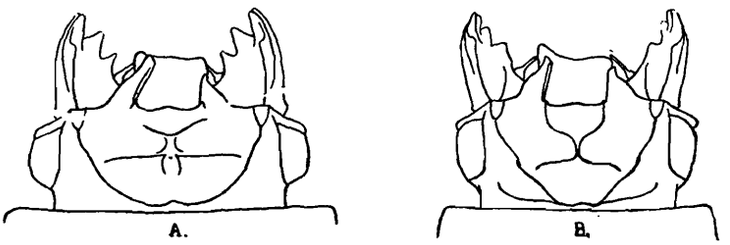
[1] Apparently always polished throughout in Darjeeling specimens.

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, 3750/19.	Malacca	Stoliczka bequest.
,,	4496/10	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. $\frac{2836\text{-}8}{19}$ 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*.

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[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. $\frac{9522}{1}$ $\frac{3031}{19}$		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. *27–27a*.

Regd. No.	$\frac{9268\text{-}70}{1}$ $\frac{3042}{19}$	Johore	J. Wood-Mason, etc.
,,	$\frac{6435\text{-}6}{14}$ $\frac{3046\text{-}50}{19}$	Sinkep Island	Moti Ram.
,,	$\frac{3269\text{-}71}{19}$	Kuching, Sarawak, Borneo	Sarawak Museum.
,,	$\frac{3268}{19}$	Limbong, Borneo	Sarawak Museum.
,,	$\frac{3051\text{-}2}{19}$	?	?

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.	$\frac{9127\text{-}8}{1}$ $\frac{9454}{1}$	.. 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.
,,	$\frac{9156}{1}$ $\frac{9461}{1}$	Bhutan	?
,,	$\frac{3283}{19}$	Harmutti, Base of Dafla Hills	H. H. Godwin-Austen.
,,	$\frac{3032}{19}$ $\frac{3282}{19}$	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.	S. W. Kemp.
,,	$\frac{3223\text{-}60}{19}$	Janakmukh, Abor Country, 600 ft.	
,,	$\frac{3263\text{-}5}{19}$ (Spirit specimens)	Rotung, Abor Country, 1400 ft.	
,,	$\frac{3208\text{-}9}{19}$ $\frac{3274}{19}$	Upper Rotung, Abor Country, 2000 ft.	
,,	$\frac{3215\text{-}22}{19}$	Kalek, Abor Country, 3800 ft.	
,,	$\frac{9602}{5}$	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.
,,	$\frac{3040}{19}$[1] ..	Between Thinganuyinauug and Sukli, Dawna Hills, 900–2100 ft.	F. H. Gravely.
,,	$\frac{3039}{19}$[1], $\frac{3041}{19}$[1] ..	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 Couri. 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,[2] 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. $\frac{3291}{19}$) 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.

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[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.

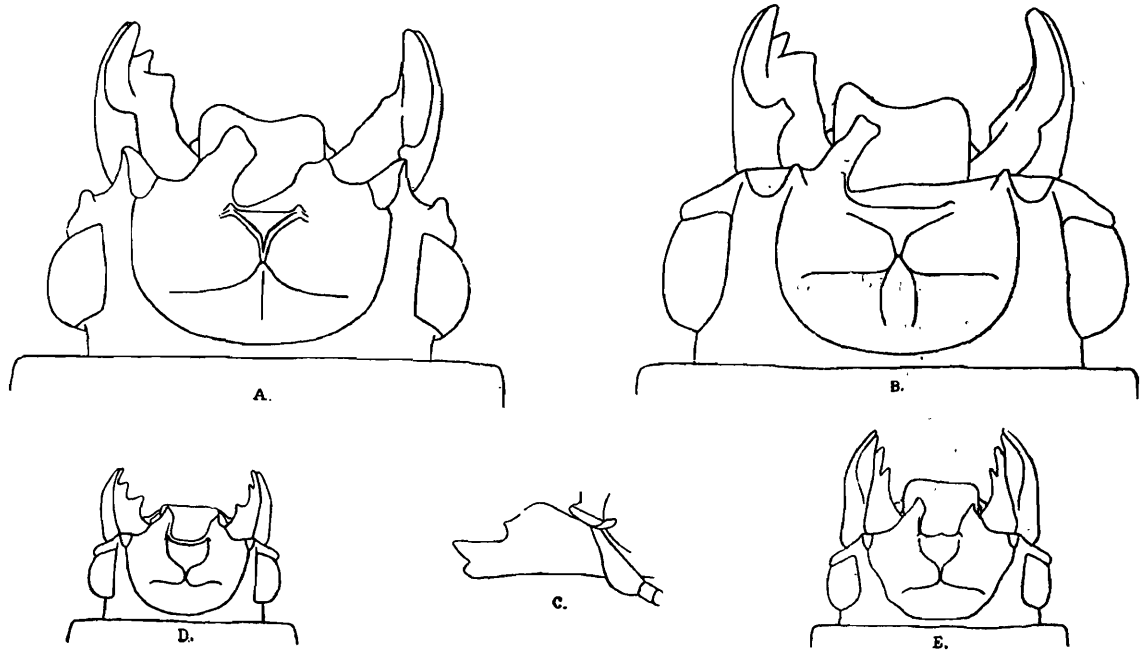
[3] See below, p. 322, last paragraph of footnote 2.

Ceraius 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. *Ceraius occulidens*, head × 4.
B. *Ceraius tricornis*, head × 4.
C. *Ceraius alutaceosternus*, left mandible from the side × 4.
D. *Ceraius minor*, head × 4.
E. *Ceraius aequidens*, head × 4.

Ceraius 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. $\frac{2835}{19}$	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.
,, $\frac{7070}{3}$, $\frac{7082}{3}$, $\frac{2859}{19}$		?	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. $\frac{82}{5}$, $\frac{86}{5}$, $\frac{664}{6}$	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. 39–39*a*.

Regd. No.	$\frac{5877}{10}$ $\frac{5886}{10}$ $\frac{2839\text{-}47}{19}$	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.
,,	$\frac{3743}{19}$	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 Mt. 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.	$\frac{9092\text{-}9}{1}$ $\frac{9101}{1}$ $\frac{9277}{1}$ $\frac{9279\text{-}81}{1}$ $\frac{516\text{-}7}{6}$ $\frac{6430\text{-}2}{14}$ $\frac{6451\text{-}2}{14}$ $\frac{9846}{18}$ (*type*); $\frac{9847\text{-}50}{18}$	Nicobar Islands	F. Stoliczka, F. A. de Roepstorff.
,,	$\frac{6981\text{-}2}{7}$	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.	$\frac{9082\text{-}91}{1}$ (*paratypes*) $\frac{9282\text{-}99}{1}$ (*paratypes*) $\frac{9465}{1}$ (*paratype*) $\frac{9467\text{-}8}{1}$ (*paratypes*) $\frac{4069\text{-}70}{5}$ $\frac{4072\text{-}4}{5}$ $\frac{3713\text{-}20}{10}$ $\frac{6602\text{-}8}{13}$ $\frac{6428\text{-}9}{14}$ $\frac{9860}{18}$	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. $\frac{9465}{1}$ and $\frac{9467\text{-}8}{1}$ 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.

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[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.	$\frac{9469}{1}$ (*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 Dafla Hills	H. H. Godwin-Austen.
,,	$\frac{6387\text{-}9}{14}$ $\frac{6454}{14}$	Dikrang Valley	
,,	$\frac{6390}{14}$ $\frac{6442}{14}$ $\frac{6453}{14}$ $\frac{9891}{18}$	Dafla Expedition	
,,	$\frac{9865\text{-}88}{18}$	Camp 9, Dafla Expedition	
,,	$\frac{3146\text{-}60}{19}$	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 *Aceraius* 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.	$\frac{2659}{19}$	Between Misty Hollow and Sukli, Dawna Hills, 2100–2500 ft.	F. H Gravely.
,,	$\frac{2645\text{-}58}{19}$	Between Thingannyinaung and Sukli, Dawna Hills, 900–2100 ft.	F. H. Gravely.
,,	$\frac{2660}{19}$	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. $\frac{3}{1}\frac{1}{9}\frac{4}{0}\frac{6}{}$) 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.	$\frac{9930\text{-}4}{18}$	Kandy, Ceylon	E. E. Green. N. Annandale.
,,	$\frac{9925\text{-}9}{18}$	Peradeniya, Ceylon	E. E. Green. F. H. Gravely.
,,	$\frac{9935}{18}$	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 weberi, Kaup.

Described from a single specimen from the Philippines in the collection of the Königliches Zoologisches Museum in 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 lateral angles of the plate which they may completely fill. *Metasternum* more or less densely punctured throughout the lateral and anterior intermediate areas, and often along the outer part of the posterior margin of the posterior intermediate areas and the ridges separating these from the lateral areas; anterior and inner part of posterior intermediate areas rarely punctured; the rest 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 mentum 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.

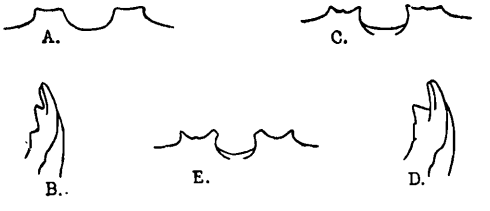
Trapezochilus nobilis (Kuwert).

Pl. xiii, fig. 48; text-fig. 5, C-D.

Regd. No. $\frac{8761}{5}$ $\frac{663}{6}$ Tavoy Museum Collector.

I have also seen a series of specimens from Taiping, 4000–5000 ft., in the collection of the Königliches Zoologisches Museum in Berlin; and two specimens from Perak in the British Museum.

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, the two upper ones broadest in the vertical plane, the lowest one horizontal; anterior lower tooth distinct and sharply pointed on the left side, obsolete or minute and fused with base of



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.

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. Supra-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

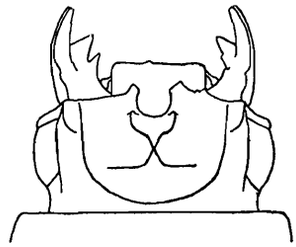
[1] This species has proved not to be distinct from the next; and the names applied to them here must both be discarded in favour of *dorsalis*, Kaup (see below, pp. 297-8)

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 bands which are sometimes fused in the middle line; *mesothoracic episterna* coarsely punctured above and in front, more finely in the posterior angles which are hairy; a small smooth area between the two punctured ones. *Mesosternum* often more or less dull and rugose, usually with a patch of hair-bearing punctures in the lateral angles; scars indistinct or absent. *Metasternum* with lateral areas very broad behind, but not in contact with 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.

Trapezochilus respectabilis (Kuwert) [1].

Text-fig. 5 E, p. 247.

Described from a series of specimens from Deli, Sumatra, in the collection of the Deutsches Entomologisches Museum.



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 tubercle and the right anterior angle of the head. *Prothorax*, *mesothorax* and *metathorax* as in *Trapezochilus nobilis*. Posterior parts of *hind coxae* rough. *Abdominal sterna* polished. Grooves nearest inner margin of *elytra* scarcely punctured, next pair somewhat more distinctly punctured, puncturing of lateral grooves very strong —quite as strong as in *G. burmeisteri*.

Gnaphalocnemis burmeisteri (Kaup).

Pl. xiii, fig. 49.

Described from specimens from Deli, Pedong, Peinan, Soerian Plantation (nr. Solok), Battak Mountain, Kepahiang, Redjang-Lebong, and Java (the type and two other specimens) in the Berlin collections; specimens from Deli and Somgei Lalah in the Hamburg collection; and a specimen from Sarawak in the Sarawak Museum collection.

Description.—Length 41–51 mm. Differs from the following species only in having grooves 5–7 of the *elytra* narrower, simply punctured without any defined flattened surface, transverse punctures, or longitudinal roughened lines.

Gnaphalocnemis monticulosus (Smith).

Pl. xiii, fig. 49*a*.

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. $\frac{9315}{1}$ 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, and a pair of distinct large oval scars on the mesosternum. *Metasternum* with lateral areas very broad throughout, almost as broad in front as behind, but not in contact with central area; central area unpunctured; lateral areas finely punctured and hairy; anterior intermediate areas hairy and a little more coarsely punctured in anterior angles, smooth behind; posterior intermediate areas very coarsely but often sparsely punctured, not hairy. *Hind coxae* usually smooth. Second *abdominal sternum* usually punctured in front of 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 either side by a roughened line, with which the punctures are often confluent, the punctures coarse and as a rule distinctly transverse.

Gnaphalocnemis tridens (Wied.).

Pl. xiii, figs. 50–50*a*.

Regd No. $\frac{9314}{1}$ Java 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 Sumatra, 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. $\frac{3809}{19}$ Java W. S. Atkinson.

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 blunt on

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 more outwards than forwards from central tubercle, then bent abruptly towards inner tubercles; ridge between these slightly produced forwards in middle line, which is marked in frontal area by an indistinct ridge; left outer tubercle broad, parallel-sided, truncate distally, the extremity being slightly concave as seen from above, straight and perpendicular from the side; right outer tubercle of equal length but more slender, sides as seen from above abruptly converging near end to meet each other in a right angle, upper surface longer than lower, the process being obliquely truncate as seen from the side; anterior angle of head containing about 100°; canthus almost equilaterally quadrangular. *Pronotum* with strong median groove, marginal groove incomplete in middle in front, obsolete in middle behind. *Prothorax* below polished; hairy and indistinctly punctured close to margin in front, more distinctly punctured behind. *Scutellum* smooth and polished; *mesothoracic episterna* polished throughout, punctured above and along anterior margin; *mesosternum* smooth and polished, with small deep scars. *Metasternum* finely punctured in lateral areas, which are very little wider behind than in front and are not in contact with central area; more strongly punctured in anterior intermediate areas; coarsely punctured in posterior intermediate areas. *Hind coxae* and *abdominal sterna* polished, almost unpunctured. *Elytra* finely punctured in dorsal grooves, more coarsely 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. $\frac{988\text{-}991}{19}$ 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 of the Deutsches Entomologisches Museum.

Description—Length 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 continuous with one another and joined to central tubercle by a single sharply keeled ridge—not curving round to meet in an acute angle close to apex of central tubercle as is usually the case in *L. dentatus*. Scars of *mesosternum* dull, their surface evenly continuous with a dull band extending along whole remaining length of outer margin. Lateral areas of *metasternum* much broader behind than in front, about equal in their widest part to minimum width of intermediate areas. *Abdomen* bordered beneath by a complete broad band of fine but dense puncturing which includes the whole of the terminal segment with the exception, in some specimens, of a small smooth spot near the posterior margin. Depressed surface of two or three outermost grooves of *elytra* dull, the sculpturing somewhat indistinct and worn-looking, especially at the ends; the ninth and tenth ribs narrow throughout.

Leptaulax dentatus (Fabr.).

1. L. DENTATUS, Fabr. s. str.

Pl. xiii, figs. 52–52*d*.

Regd. No.	$\frac{4650}{6}$ $\frac{4652}{6}$ $\frac{4654\text{-}5}{6}$	Near Vizagapatam	Museum Collector.
,,	$\frac{7509\text{-}14}{19}$	La-ai Valley	D. G. A. Pritchard and J. R. Waterfield.
,,	$\frac{3073\text{-}6}{19}$	Kobo, 400 ft., Abor Country	S. W. Kemp.
,,	$\frac{3071\text{-}2}{19}$	Janakmukh, 600 ft., Abor Country	
,,	$\frac{3077\text{-}3103}{19}$ $\frac{3266}{19}$[2]	Rotung, 1300–1400 ft., Abor Country	
,,	$\frac{3064\text{-}6}{19}$	Upper Rotung, 2000 ft., Abor Country	
,,	$\frac{3055\text{-}63}{19}$	Renging to Rotung 2600 ft. Abor Country	
,,	$\frac{3067\text{-}70}{19}$	Kalek, 3800 ft., Abor Country	
,,	$\frac{2642}{5}$ $\frac{2649}{5}$ $\frac{2657}{5}$	N.-E. Frontier	?
,,	$\frac{977\text{-}82}{19}$	Sibsagar, Assam	S. E. Peal and Museum Collector.
,,	$\frac{975}{19}$	Dafla Expedition	H. H. Godwin-Austen.
,,	$\frac{6410\text{-}3}{14}$ $\frac{6426}{14}$ $\frac{964}{19}$	Burroi, base of Dafla Hills	
,,	$\frac{6422}{14}$ $\frac{962\text{-}3}{19}$	Harmutti, base of Dafla Hills	
,,	$\frac{6417\text{-}20}{14}$ $\frac{967\text{-}74}{19}$	Dikrang Valley, Northern Frontier of Assam	
,,	$\frac{9505}{1}$ $\frac{6421}{14}$	Dunsiri Valley, Assam	?
,,	$\frac{6415\text{-}6}{14}$ $\frac{965\text{-}6}{19}$	Durrang, Assam	H. H. Godwin-Austen.

[1] This remark, since it relates to a character which is somewhat variable in both forms, 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. ?
,,	9150-63/1 9165-7/1 9170-1/1 9204/1 9211/1 9219-20/1 9224/1 9229/1 9232-3/1 9375-7/1 9387-9/1 9491/1 9493/1 6407-9/14	Sikkim	Stoliczka bequest, etc.
	9383/1	Darjeeling (Sikkim in register)	F. Stoliczka.
,,	9169/1 9380/1 9485/1 985-7/19	Assam	Stoliczka bequest, Asiatic Soc.'s collection, E. T. Atkinson, ?.
,,	976/19	E. Cachar	J. Wood-Mason.
,,	9137/1 9139-40/1 9142-9/1 9378/1	Pegu	Stoliczka bequest, S. Kurz.
	861-871[1]/19 3272[1]/19	Kawkareik, Tenasserim, c. 300 ft.	F. H. Gravely.
,,	954-9/19	Misty Hollow, W. side of Dawna Hills, Tenasserim, c. 2200 ft.	F. H. Gravely.
,,	945-953/19	Between Misty Hollow and Sukli, top of Dawna Hills, 2100-2500 ft.	F. H. Gravely.
,,	1041-3/19	Between Thingannyinaung and Sukli, E. side of Dawna Hills, 900-2100 ft.	F. H. Gravely.
,,	2913/1 872-96/19 898/19	Tenasserim	J. Wood-Mason.
,,	5875-6/10 5879-85/10 5887/10 5889-92/10 897/19 899-944/19	Upper Tenasserim	J. Wood-Mason.
,,	7720/4 7726/4 7737/4 7740/4 7748/4 7754/4 7888/4 7891/4 7897/4 7900/4 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 from a single colony. No. $\frac{3272}{19}$ is from the same colony.

[2] Adults and larvae in spirit.

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 Chaduar, Assam, 9-iv-06. In the last-named collection there is also a specimen said to be from Mussoorie, but as the label also bears the name *Lucanus lunifer* it has probably been transferred from another insect. This somewhat improbable locality must, therefore, be ignored.

Description—Length 19·5–37 mm. *Labrum* punctured and hairy, anterior margin more or less concave, angles more or less rounded or acute; sides strongly convex or almost straight, their general direction parallel, or slightly convergent behind. *Mandibles* strongly angular on outer side; upper tooth well developed; lowest terminal tooth somewhat smaller than and posterior to the other two; anterior lower tooth double, its anterior part long and sharply pointed in unworn specimens, the posterior part extending backwards as a narrow and more or less bilobed ridge, less completely separated from the former on the right side than on the left, and much more extensive in large than in small specimens—in the latter it may be obsolete. *Mentum* with some large punctures outside, and in front of, a pair of **V**-shaped, crescentic, or almost circular scars. *Head* distinctly marked with round punctures which may be replaced in the anterior half by an obscure longitudinal rugosity; frontal area very variable in form (compare figs. 52*b-c*), usually traversed by a more or less distinct median ridge; distance between two inner tubercles on an average about equal to that between these tubercles and the outer ones, the latter being situated about half way between the former and the anterior angles of the head; the exact proportions between these distances depends on the shape of the frontal area; even when this is at its broadest, the distance between the inner tubercles is scarcely twice as great as that between the inner and outer tubercles; median tubercle distinct, obscure, or obsolete; end of canthus narrow, rounded or abruptly truncate, prominent in large specimens but as a rule not in small ones; parietal ridges short, not extending to the supra-orbital ridges. *Pronotum* smooth and highly polished above; thickly punctured at the sides, especially in the anterior angles 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 above and 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 punctures sometimes present behind the scars. Central area of *metasternum* polished, very sharply defined,

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 of *hind coxae* more or less roughened or punctured. *Abdominal sterna* finely punctured along anterior margin (often incompletely in the last two segments), and more strongly in a more or less triangular patch of very variable size (sometimes absent from last segment) on each side; otherwise smooth and polished. *Elytra* polished throughout; the lateral grooves about as broad as the ridges between them, their punctures extended to form short transverse grooves; the ninth rib broader than the eighth 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, 2913/5, 4080/5, 8144/7, 3722-3/10, 3727/10	Andaman Isles	Stoliczka bequest, J. Wood-Mason, etc.
,,	2867/19	Java	H. E. Andrewes.
,,	2868/19	Borneo	
,,	7073/3	Philippine Isles	East India Company's Museum.

This variety is not a very distinct one, forms intermediate between it and the typical form being sometimes found. It is represented in the Sarawak Museum collection by a specimen from Matang and another from Kuching—the former is of about the same size as the Andamans and Philippine specimens in the Indian Museum collection (24·5–29 mm.), but the latter is much smaller than any other specimen I have seen (21 mm.). Mr. Andrewes has sent me for examination 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.	9451/1, 9507/1	Johore	J. Wood-Mason, ?
,,	6401-2/14	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 following subspecies, from which it further differs in the following points only: parietal ridges of *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	}	H. H. Godwin-Austen.
,, $\frac{3747\text{-}3748}{19}$	Dafla Expedition	}	
,, $\frac{3199\text{-}3207}{19}$	Renging, 2150 ft.	}	S. W. Kemp.
,, $\frac{3195\text{-}8}{19}$	Upper Renging, 2150 ft.	}	

Description.—Length 15–17 mm. Differs from *L. dentatus* in the following respects only. *Head and mandibles* as in *L. humerosus* except that the parietal ridges are somewhat longer and the frontal areas always semicircular. *Mesosternum* very variable; rough or polished; in the latter case always,[1] in the former usually, with some large punctures. Central area of *metasternum* more or less strongly punctured; intermediate areas often somewhat broader in their narrowest part, with the outer margin frequently somewhat imperfectly defined. Posterior parts of *hind coxae* usually quite rough. Abdominal sterna usually more extensively punctured than in *L. dentatus*, sometimes the whole of the last two and the greater part of the rest punctured. All lateral ribs of *elytra* of about equal width.

Habits.—Mr. Kemp informs me that he got this species from under very thin bark, tightly attached to the logs it covered. He only found it on the crest of the ridge at Renging.

L. macassariensis, Schauf., subsp. anibarbis, Kuwert.

Plate xiii, fig. 54.

Regd. No. $\frac{6206}{19}$	Penrissen	Sarawak Museum.

Represented in the Sarawak Museum collection by two specimens from Penrissen, one of them from an altitude of 3200 ft.

Description.—Length 22·5–23 mm. A convex and rather coarse-looking species, closely resembling in general appearance the much smaller form *L. cyclotaenius* subsp. *himalayae*, from which it differs in the following respects only. Angle of outer side of *mandible* obsolete. Parietal ridges of *head* more as in *L. cyclotaenius*; outer tubercles rudimentary, situated about twice 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. Beebe.

Description.—Length 18 mm. *Mandibles* as in the following species. *Head* coarsely but not very distinctly striate in front, unpunctured except right at the back; frontal area broad, the inner tubercles being about equidistant from one

[1] In the specimens I have seen, but not in those described by Kuwert.

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 lateral margin, 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 straight, extending the whole length of the plate. Central area of *metasternum* with finely punctured depression in front[2], and a few large punc ures arranged in a pair of lateral groups[2] rather more than half way back; lateral areas linear, slightly roughened; intermediate areas smooth except for some punctures near inner margin of posterior division. *Hind coxae* and *abdominal sterna* smooth and highly polished. *Elytra* much as in *L. bicolor*, the grooves a little broader, however, and the punctures correspondingly coarser, but scarcely transverse.

Leptaulax bicolor (Fabricius).

1. L. BICOLOR (Fabricius), s. str.

Pl. xiii, fig. 56.

Regd. No.	1119/19	Naga Hills	?
,,	3194/19	Janakmukh, 600 ft., Abor Country	S. W. Kemp.
,,	1120-2/19	Dafla Expedition	H. H. Godwin-Austen.
,,	1123-6/19	Dikrang Valley, Northern frontier of Assam	H. H. Godwin-Austen.
,,	9506/1	Dunsiri Valley, 500 ft., Assam	?
,,	1127/19	Dunsiri Valley, Assam	H. H. Godwin-Austen.
,,	9187/1 9189-93/1 9195-9/1	Sikkim	Stoliczka bequest, etc.
,,	9200-3/1 9206-10/1 9212-8/1		
,,	9221-3/1 9225-8/1 9230-1/1		
	9234-9/1 9503-4/1 1129-31/19		
,,	9172-3/1 9364-66/1 9494-5/1	Darjeeling	Stoliczka bequest, J. Wood-Mason. ?
,,	2869-72/19	Nilgiri Hills	H. E. Andrewes.
,,	1133/19	Between Sukli and Misty Hollow, Dawna Hills, Tenasserim, 2100–2500 ft.	F. H. Gravely.
,,	1132/19	?	?
,,	2614-6/19	Kuching, Sarawak	Sarawak Museum.
,,	2873-5/19	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 two dominant species *L. dentatus* and *L. bicolor*.

[2] These are probably 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. Kinabalu in Borneo and from Java; and in Mr. Stevens' collection by a specimen from Silonbari at the base of the N. Lakhimpur hills in Assam.

Description.—Length 16–25 mm. *Labrum* and *mentum* much as in the previous species of the genus. *Mandibles* externally angular, upper tooth well developed, though less prominent than in *L. dentatus*; in front of it a characteristic oblique ridge which forms an equally prominent tooth in large specimens but is often imperfect or absent in very small ones; anterior lower tooth simple on right side, simple or faintly lobed on left. *Head* more or less clearly punctured in depressions; frontal area usually traversed by a more or less distinct median ridge, more or less longitudinally rugose, variable in form but normally much broader than in *L. dentatus*, the inner tubercles being at least twice as far from each other as from the smaller outer tubercles; frontal area connected to central tubercle by narrow median ridge; parietal ridges long, extending as far as margin of supra-orbital ridges, low but sharply crested along their anterior margin; canthus less prominent than in *L. dentatus*. *Pronotum* with strong median groove; in large specimens strongly and somewhat closely punctured in and around scars, very sparsely near angles; in somewhat smaller specimens the puncturing of the latter areas is denser, and in smaller ones still the pronotum is equally densely punctured along the whole of the sides. *Prothorax beneath* as in *L. dentatus*. *Scutellum* and *mesothoracic episterna* also as in that species. *Mesosternum* with inner wall of scars normally short and straight (rarely longer and more or less curved), the surface of the plate polished, becoming often more or less roughened or rugulose (in small specimens especially) and sometimes dull in the lateral angles. *Metasternum* with central area sharply defined, in most large specimens highly polished as in *L. dentatus*, but in smaller ones usually roughened at least in front by fine close puncturing of varying distinctness, a few large scattered punctures sometimes present; anterior intermediate area finely punctured; a broad unpunctured band extending from anterior intermediate area between central and lateral areas along whole outer border of posterior intermediate 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 small 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 were obtained in Karkur Ghat and adds, "It is gregarious and seems, as its shape would lead me 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.	1136/19	Ceylon	I. M. Mackwood.
,,	2622/19	Ganiaduwa, Ceylon	Colombo Museum.
,,	2623/19	Dimbula, Ceylon	Colombo Museum.
,,	6983/7, 6985/7	Rangoon	?
,,	6427/14	Moulmein	Museum Collector.
,,	9175-7/1, 9318-23/1, 9325-32/1, 9334-9/1, 9341-51/1, 9353-5/1, 9496-7/1, 4087-8/5, 4096/5, 3721/10, 3724-6/10, 3728/10, 3730-2/10, 1137-8/19	Andamans	Stoliczka bequest, J. Wood-Mason, etc.
,,	9178/1, 9181/1, 9184-5/1, *9359-62/1, 9499/1, 9501/1, 519/6, 6425/14, 1139/19	Nicobars	Stoliczka bequest, J. Wood-Mason, etc.
,,	2877-8/19	Java	H. E. Andrewes.
,,	2876/19	Batjan	H. E. Andrewes.
,,	6397/14, 6399/14, 1141/19	Sinkep Island	Moti Ram.
,,	7074/3	Philippine Isles	East India Co.'s Museum.
,,	1140/19	?	?
,,	2617/19	Kuching, Sarawak	Sarawak Museum.
,,	2618/19	Borneo	Sarawak Museum.

This form is represented in the Sarawak Museum collection by specimens from Kuching and Matang Road, in the Colombo Museum collection by specimens from Gamaduwa and Dimbulla, in Mr. Green's collection by specimens from Pundaloya, and in Mr. Andrewes' collection by specimens 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 puncturing of the pronotum in small specimens is very like that found in larger specimens of the typical form. I have not seen any with the uniformly dense marginal puncturing found in most small specimens of the typical form.

Leptaulax roepstorfi, Kuwert.

Pl. xiii, fig. 57.

This species and the next are the most strongly flattened forms known to me.

Regd. No.	3172-87/19	Yambung, 1100 ft., Abor Country	S. W. Kemp.
,,	3198-93/19	Rotung, 1400 ft., Abor Country	
,,	1145/19	Misty Hollow, W. side of Dawna Hills, Tenasserim, c. 2200 ft.	N. Annandale.
,,	6404/14	Tenasserim	?
,,	7692/4 7694/4	Tavoy	Museum Collector.
,,	9384-7/1 4098-9/5 4104/5 4111/5 4113/5 3733/10 3735-6/10 6403/14	Andamans	J. Wood-Mason, etc.

Description.—Length 15–18 mm. *Mandibles* sometimes without ridge between upper tooth and first terminal tooth; otherwise as in *L. bicolor*. *Head* proportionally broader than in that species, with inner tubercles more widely separated from outer tubercles and from anterior angles; keels of parietal ridges less overhanging. *Pronotum* very much flattened, with deeply impressed median groove; very sparsely punctured at sides, punctures usually thickening a little in anterior angles; *prothorax beneath, scutellum* and *mesothoracic episterna* as in all preceding species of the genus; *mesosternum* as in *L. anipunctus*, the horizontal central area occasionally marked with obscure fine punctures. *Metasternum* entirely unpunctured, often more or less roughened in lateral and anterior intermediate areas, more rarely in posterior intermediate areas also; lateral areas linear, not in contact with central area. Posterior parts of *hind coxae* never altogether smooth and polished, mostly rough. *Abdominal sterna* with usual anterior marginal band and lateral patches of punctures of variable extent; terminal sternum smooth or more or less covered with more or less indistinct punctures. Lateral grooves of *elytra* not broader than ridges between them, their strong punctures not drawn out 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.	8034/5	Tenasserim [1]	Museum Collector.
,,	8771/5	Tavoy	Museum Collector.
,,	9388-9/1 9391-9402/1 9508/1 6391-5/14	Johore, Malay Peninsula	J. Wood-Mason, etc.
,,	9509/1 9511/1	"Malacca"	?

[1] According to Register "Hills between Tenasserim and Siam, about lat. 13° 45′, long. 98°."

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 are preserved in the Sarawak Museum from Kuching, Matang Road, Sadong and Paku.

Description.—Length 11–14 mm. Differs from *L. roepstorfi* in the following characters only. *Mandibles* with a minute denticle above at base of upper terminal tooth in unworn specimens. Frontal area of *head* usually longer in the middle line and more rounded behind. *Pronotum* somewhat more thickly and uniformly punctured at sides. *Mesosternum* with inner wall of scars more or less incomplete behind; central area more often, and sometimes also more distinctly, roughened or finely punctured; central area of *metasternum* normally marked thus; intermediate areas of metasternum strongly punctured throughout. *Hind coxae* polished. Abdominal sterna uniformly marked with large shallow punctures quite unlike those found in any other species of the genus that is known to me.

Genus **TRICHOSTIGMUS**, Kaup.

Trichostigmus thoreyi, Kaup.

Described from a single specimen from Middle Luzon, in the Hamburg Museum collection.

Description.—Length 24 mm. *Head and its appendages* much as in the specimen of *Leptaulax bicolor* shown on pl. xiii, fig. 58: the middle lower tooth of both mandibles is, however, somewhat more acute; the median tubercle of the anterior margin of the head is obsolete; the frontal area is wider behind, consequently appearing larger and almost rectangular; and on the mentum the scars are more sharply bent than is usual in the genus *Leptaulax*. *Pronotum* with strongly developed median and marginal grooves, former scarcely complete in front, latter markedly incomplete across middle before and behind; a few punctures 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 whole 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 four grooves somewhat confused with somewhat smaller hair-bearing punctures with which the ridges 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 mm.), and *Leptaulax dentatus* (19·5–37 mm.). Of both of them the largest specimens I have seen are about twice as long as the smallest. Next to these come three species of Aceraiinae, *Episphenus indicus* (25–41 mm.), *Episphenus comptoni* (27·5–42 mm.) and *Aceraius grandis* (northern race, which I have been better able to study than southern one, 33–49 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 manner; the most variable, as far as my own observations go, are *Aceraius helferi* (30–40 mm.), *Leptaulax humerosus* (15–20), *Leptaulax planus* (11–14 mm.), *Pleurarius brachyphyllus* (35·5–45 mm.) and *Ophrygonius cantori* (*s. lat.*, 27–34 mm.), of all of which the largest specimens are somewhat more than one and a quarter times as long as the smallest; then come *Ceracupes austeni* (20–25 mm.) and *Tiberioides kuwerti* (36–44 mm.), in both of which the largest specimens are just one and a quarter times as long as the smallest; these are followed by others little less variable than themselves; and so on through all the rest.

Leptaulacides bicolor, *Leptaulax dentatus*, *Episphenus indicus*, *Episphenus comptoni*, and *Aceraius grandis* are all common species, so it is natural to suppose that their range of variation may be more completely 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, we ought to find isolated examples of unusual dimensions belonging to at least a few of the many rarer species, and such are not found; and the comparative uniformity in length of all specimens of the long series I have seen of *Episphenus neelgherriensis*, 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 my mind, 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 any new name. This view, as will be seen later, is further supported by the fact that *Episphenus comptoni* is a gregarious species, is the only asymmetrical member of the Aceraiinae found in Ceylon, and is also the commonest member of that sub-family living in the island [1].

The specimens from which my descriptions of *Episphenus indicus* and *Aceraius grandis* sub-sp. *hirsutus* were drawn up show, as a whole, no breaks in the continuity of the range of variation in length. Moreover they seem to indicate that different colonies differ from one another in average size, and that the lengths of different members of any one colony do not usually differ very greatly one from another. The evidence is most definite in the case of *Aceraius grandis*. Out of a series of 38 specimens of this species known to have been taken from a single colony at Janakmukh, 37 show a continuous range of length from 36 to 39 mm., the remaining specimen being 33 mm. long; and again, the specimens from Kalek form a single short series of individuals all between 38 and 40 mm. in length. On the other hand, two specimens, presumably of opposite sex, taken from a single burrow at Rotung were 34 and 41 mm. long respectively. Such facts suggest that although large and small specimens may be quite well able to unite to found a new colony, their offspring tend to be to of a moderately uniform size; and that the majority of specimens in each colony are the descendants of the original founders of that colony, which do not leave their home until they are compelled to do so, when they may either found new colonies or enter the ranks of an old one from whose average size they may differ very considerably.

Such evidence as is available regarding the variable species of Leptaulacinae all points in the same direction. *Leptaulax dentatus*, s. str., is represented in our collection by over three hundred specimens, whose range of variation in length is unbroken; but when these are arranged according the localities from which they come, it is found that those from each well-represented locality fall into several separate series, each of which probably includes only specimens from colonies that are not represented in any of the other groups, unless it be by one or 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 prothorax; 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 specimens labelled "Sikkim" 2 are 19·5 and 20 mm. long respectively, 8 are 21–23 mm. long, and 33 are 24·5–31 mm. long. On the other hand, 47 specimens known to have been collected from a single colony at Kawkareik are all 29–33·5 mm. long, and form a single unbroken series.

Leptaulacides bicolor is unusually variable in the extent to which the body is flattened, as well as in total length, and in the extent to which certain plates are punctured. For this reason, and partly, perhaps, because the specimens I have seen belong in almost equal numbers to two different forms of the species, which must, at least provisionally, be treated separately, these specimens have proved not to be nearly enough to form a satisfactory basis for any full account of the manner in which different colonies vary one from another. It appears, however, that size is not a character that is at all likely to prove of any great importance for the sub-division of the species into sub-species or varieties.

Members of a single colony in this, as in other variable species, probably differ comparatively little one from another in size, which suggests that they may be comparatively uniform in structure also. Any investigations on a collection in which different individuals, instead of different colonies, have to be taken as units, must be conducted with great caution; for the presence in collections of a number of short series from different colonies, is likely give a false appearance of the constancy of a number of more or less distinct types; and I am confident that this fact more than any other has led, on account of the remarkable variability of the common species *L. bicolor* and *L. dentatus*, to the appalling multiplication of so-called species of the genus *Leptaulax*. The colony ought, in my opinion, to replace the individual as the unit for taxonomic work in all these variable species, and it is partly in the hope that collectors will turn their attention to collecting separate colonies, and partly to avoid adding to what I am convinced is largely a meaningless multiplication of names, that I put forward here, on the somewhat inconclusive evidence at present before me, the hypothesis that members of any one Passalid 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, together 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 so 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 those of a male Lucanid except in the genus *Ceracupes*, the species of which are not known to vary greatly in size; yet in two of the most variable Passalids—*Aceraius grandis* sub-sp. *hirsutus* and *Leptaulax dentatus* (? s. str. only)—their dentition is less complex in small than in large specimens. In the former the upper tooth of the left mandible is often double in very large specimens (fig. 28*a*), but not in medium sized (fig. 28), or small ones; and in the latter, the anterior lower tooth of the left mandible is tridentate in large specimens (fig. 52) and bidentate (sometimes scarcely more than unidentate) in small ones (fig. 52*d*).

The processes of the anterior margin of the head on the other hand tend to be more acute, and often proportionally longer, in small specimens than in large ones, when any such differences are found. This is best seen in the processes developed from the anterior angles of the head in *Episphenus indicus* and *Aceraius grandis* (? sub-sp. *hirsutus* only) as will be seen on comparing fig. 20 with fig. 20*b* and fig. 28 with fig. 28*a*. A somewhat similar phenomenon is found among Lucanidae in the genus *Aegus*. In large specimens of certain species of this genus (e.g. *A. kandyensis* and *A. roepstorffi*) the front of the head bears two median protuberances, one above the other; while in smaller specimens of the same species, although the uppermost of these disappears, the lower one is represented by a pair or minute tubercles, situated side by side and more distinctly separated one from another the smaller the specimen is.

The relative extent of the punctured areas of large and small specimens presents, however, a much better instance of the similarity between the variations in structure associated with variations in size, found in the two families. In both families it seems to be always the small specimens that are most extensively punctured, in species in which any such difference occurs. In the Lucanidae (e.g. certain Himalayan species of Dorcinae) the difference is most marked in the elytra, and after that in the pronotum and sometimes the abdominal sterna. In the Passalidae the elytra are always furrowed, and such slight variations as occur in the extent to which the furrows are punctured, do not appear to 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 ones.

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 synonymy 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 be wholly free from error. As, however, the large series of specimens that I have been able to examine, especially of the genera *Episphenus*, *Aceraius* and *Leptaulax*, besides showing how unexpectedly variable in size, and in some respects also in structure, certain species of these genera may be, have given me an exceptionally good opportunity of acquainting myself with the range of variation which individual species normally exhibit, I have ventured to apply the knowledge thus acquired to the synonymy of species which I have not seen. It should be noted that the collection in the Königliches Zoologisches Museum in Berlin shows that Kuwert was often himself unable to recognize his species a second time, and has sometimes applied the same name to quite distinct species, as well as describing specimens of a single species under a number of different names. An examination of Kuwert's cotypes, such as I have made in a number of instances, is not, therefore, so safe a guide in dealing with his synonymy as it ought to be.

I have tried to include in this part of the paper every published reference to every described species of every genus at present known from the Oriental Region together with China and Japan. This has involved the inclusion of many species with which I am not directly acquainted. Consequently the completeness of the synonymy indicated probably varies considerably in different genera. The names of genera and species which I have not myself examined are marked with an asterisk, as also are references to works which I have not been able to consult. References to works which do not contain descriptions or original notes on the particular species mentioned are enclosed in brackets—references to many of the new species in Kuwert's catalogue of 1891 are included among these as many of the new names there published were *nomina nuda*, and remained such till the publication of his dichotomous tables in 1896–1898. The word "part" in square brackets in such cases indicates that two or more distinct species have been included in the author's synonymy; but when used in connection with a published description it implies that 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 is 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" here, a term used to include islands situated close to the mainland, such as Singapore.

Subfamily *AULACOCYCLINAE.*

Members of this subfamily occur in China and Japan and throughout almost the the whole of the Indo-Australian region; but only one specimen 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) probably belongs to the genus *Tristorthus*, so is omitted here.

Comacupes foveicollis, Kuwert.

Comacupes foveicollis, Kuwert, 1891, p. 171.
Comacupes foveicollis, Kuwert, 1897, p. 284.
Comacupes † *minor*, Heller, 1896, pp. 3-4, pl. i, figs. 11-11*a*.

The hairless abdomen and practically unpunctured mesosternum suggest that this species may be more closely allied to the Australian genera *Tristorthus* and *Aulacocyclus* than to any member of the otherwise purely Oriental genus *Comacupes*. The mentum is, however, more or less keeled in front, so I retain it in the last-named genus.

In the ten specimens from Sarawak in the British Museum the central tubercle is even less distinctly bifid than in the type of *C. minor*, Heller, from Celebes; so the latter probably represents a distinct local race.

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.
(*Aulacocyclus 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, 1891, p. 171).
Comacupes † *westermanni*, Kuwert, 1897, p. 284.
Comacupes cavicornis, Zang, 1905*c*, p. 226.
Comacupes † *cavicornis* + var. † *borneensis* + var. † *laevicornis*, Gravely, above, pp. 204–205, pl. xi, figs. 1–2*b*.

All the specimens identified by Stoliczka as *Aulacocyclus parryi* have proved to be in reality *Comacupes cavicornis* var. *laevicornis*. Zang has pointed out that Kuwert's *Comacupes westermanni*, not his *Tristorthus cavicornis*, is identical with Kaup's *Comacupes cavicornis*.

Localities:—

Malay Peninsula: Penang; Johore (? all var. *laevicornis*).
Sumatran Islands; Sumatra; Sinkep Island (? all typical form).
Java (? another form).[2]
Borneo Sarawak:—Kuching (? all var. *borneensis*).

Comacupes stoliczkae, Gravely.

Comacupes cylindraceus (part), Kaup, 1871, p. 18, pl. iii, upper unit of fig. 4.
Comacupes † *cylindraceus*, Stoliczka, 1873, p. 151.
?(*Comacupes cylindraceus*, Kuwert, 1891, p. 171).
? *Comacupes cylindraceus* [part] Kuwert, 1897, p. 285.
Comacupes † *stoliczkae*, Gravely, above, p. 206, pl. xi, figs. 3-3*a*.

This species was described by Kaup as a form of *C. cylindraceus*. As pointed out above (pp. 205–6) Kaup's two forms of *C. cylindraceus* are quite distinct; and it is probably to the other that the name was first applied.

Localities:—

Malay Peninsula: Johore; ? Singapore.
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.

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[1] Kaup appears to have described this species under an unpublished name attached by 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 the latter is identical with Kuwert's *C. angusticornis*; an examination of the type of *C. masoni*, and of specimens determined by Kuwert, has confirmed the former suggestion but not the latter.

Locality:—

Malay Peninsula: Johore; Perak[1]; Tengah Mountain.[1]
N. Sumatra: Silulangit.[2]

Kuwert's 1891 record "Lahore" is doubtless a mistake, as he appears to have been unacquainted with the species at that time except through Stoliczka's account of it.

Comacupes cylindraceus (Perty).

Passalus cylindraceus, Perty, 1831, p. 36, fig. 3.
Passalus cylindraceus, Percheron, 1841, pp. 40–1, pl. lxxix, fig. 4.
Passalus punctifrons, Hope, 1845, p. 29.
Passalus cylindraceus, Burmeister, 1847, pp. 516–7.
(*Aulacocyclus cylindraceus* [part], Kaup, 1868*a*, p. 4).
(*Aulacocyclus cylindraceus* [part], Gemminger and Harold, 1868, p. 968).
Comacupes cylindraceus [part], Kaup, 1871, p. 18, pl. iii, lower unit of fig 4.
(*Comacupes cylindraceus* [part], Wytsmann, 1884, p. 329).
Comacupes † *angusticornis* + † *cylindraceus* [part] + *masoni*, Kuwert, 1897, p. 285.
(*Comacupes cylindraceus*, Zang, 1903*b*, p. 419).
(*Comacupes* † *Masoni*, Zang, 1905*c*, p. 231).
Comacupes † *cormocerus*, Zang; 1905*d*, pp. 233-5.
Comacupes † *punctifrons*, Arrow, 1907, p. 444.
Comacupes † *cylindraceus*, Gravely, above, p. 207, pl. xi, figs. 5-6*a*, text-fig 2.

Other references to the name *cylindraceus* will be found under *C. stoliczkae* (previous page).

Localities:—

Malay Peninsula: S. Perak (Telom, 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 4200–4500 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 4 of this paper.

[2] There is a single specimen from this locality in the British Museum; it is less distinct from *C. cylindraceus* 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 local 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, Kaup.

Aulacocyclus platypus, Kaup, 1868*a*, p. 5.
(*Aulacocyclus platypus*, Gemminger and Harold, 1868, p. 969.)
Taeniocerus platypus, Kaup, 1871, p. 21.
Aulacocyclus platypus, Lewis, 1883, p. 341.
(*Taeniocerus platypus*, Wytsman, 1884, p. 329.)
(*Taeniocerus Platypus*, Kuwert, 1891, p. 170.)
Taeniocerus platypus, Kuwert, 1897, p. 275.

Localities[1]:—

Malay Peninsula: Perak; Naungchik (Bukit Besar, 2500 ft.).[2]
Sumatra: Deli.
Borneo: Sarawak.

Taeniocerus bicanthatus (Percheron).

Passalus bicanthatus, Guérin-Méneville[3] in Percheron, 1841, pp. 41-2, pl. lxxix, fig. 5.
?*Passalus bicanthatus*, Burmeister, 1847, p. 516.
(*Passalus bicanthatus*, Smith, 1852, p. 17.)
Aulacocyclus bicanthatus, Kaup, 1868*a*, p. 6.
(*Aulacocyclus bicanthatus*, Gemminger and Harold, 1868, p. 968).
Taeniocerus bicanthatus, Kaup, 1871, p. 21, pl. iii, fig. 6.
Taeniocerus †bicanthatus, Stoliczka, 1873, p. 152.
(*Taeniocerus bicanthatus*, Wytsman, 1884, p. 329.)
(*Taeniocerus Bicanthatus*, Kuwert, 1891, p. 170.)
Taeniocerus †bicanthatus + ab. *perturbans* + *imitator*, Kuwert, 1897, p. 276.
Taeniocerus bicanthatus, Zang, 1905*a*, p. 105.
Taeniocerus †bicanthatus, Gravely, above, pp. 208-209, pl. xi, figs. 7-7*b*.

Burmeister's description of this species is not altogether in agreement with my observations. Neither in this, nor in either of the other known species of *Taeniocerus*,

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[1] Borneo is the locality given by Kaup, who mentions 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.", 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 éte 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 Monographie " 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 genus, had not his description of the head appeared to me to be rather that of the head of the former genus. Until the specimen is re-examined its identity must remain uncertain. Passalids often break in two between the pro- and mesothorax, and it is quite possible that the specimen is really a composite one, the anterior part of a *Taeniocerus* having been gummed on to the posterior part of a *Comacupes*. Concerning Zang's suggestion that variations in the form of the central tubercle indicate a splitting 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 pygmaeus, Kaup.

Aulacocyclus pygmaeus, Kaup, 1868*a*, p. 5.
(*Aulacocyclus pygmaeus*, Gemminger and Harold, 1868, p. 969.)
Taeniocerus pygmaeus, Kaup, 1871, pp. 20-21.
(*Taeniocerus* †*pygmaeus*, Stoliczka, 1873, p. 152.)
(*Taeniocerus pygmaeus*, Wytsman, 1884, p. 329.)
(*Taeniocerus Pygmaeus*, Kuwert, 1891, p. 170.)
Taeniocerus †*parvus* + *pygmaeus*, Kuwert, 1897, p. 276.
(*Taeniocerus pygmaeus*, Zang, 1903*b*, p. 419.)
Taeniocerus †*pygmaeus*, Gravely, above, pp. 209-210, 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: Sarawak—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, 1884, p. 329.)
(*Taeniocerus Bicuspis*, Kuwert, 1891, p. 170.)
Taeniocerus bicuspis, Kuwert, 1897, pp. 276–7.
Taeniocerus †*bicuspis*, Gravely, above, pp. 210–211, pl. xi, figs. 9–9*a*.

Localities:—

E. Himalayas: 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 AULACOCYCLUS, Kaup (1868) 1871.

= *Aulacocyclus* [part], Kaup, 1868; incl. *Taeniocerus* [part] Kaup, 1871.

I have not attempted to do more than accept the opinions of previous authors in the following list of the species of this genus. Blackburn (1896, p. 234) has already pointed out the difficulty of dealing with it. He suggests that several of the names accepted below are really synonymous. I am inclined to agree with him; but I cannot help thinking, in addition, that the characters to which he has been driven to attach the greatest taxonomic importance, 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, 1867, p. 50.
Aulacocyclus teres, Kaup, 1868*a*, p. 9.
(*Aulacocyclus teres*, Gemminger and Harold, 1868, p. 969.)
Aulacocyclus teres, Kaup, 1871, pp. 15–16, pl. iii, figs. 1–1*a*.
(*Aulacocyclus teres*, Wytsman, 1884, p. 328.)
(*Aulacocyclus Teres*, Kuwert, 1891, p. 170.)
Aulacocyclus teres, Kuwert, 1897, p. 277.

Locality:—
Australia: ? Sidney.

Redtenbacher's Sidney specimen very possibly has the same sort of history as his *Mastochilus politus*, concerning which see 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. Denis, 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. 279 and 282.

Locality :—
? South Sea Islands or Australia.

Aulacocyclus rosenbergii, Kaup.

Aulacocyclus Rosenbergii + Percheroni, Kaup, 1868*a*, pp. 7 and 8.
(*Aulacocyclus Rosenbergi + Percheroni*, Gemminger and Harold, 1868, p. 969.)
Aulacocyclus Rosenbergii, Kaup, 1871, p. 16.
(*Aulacocyclus Rosenbergii*, Wytsman, 1884, p. 328.)
(*Aulacocyclus Rosenbergii*, Kuwert, 1891, p. 170.)
Aulacocyclus Rosenbergii + Percheroni, Blackburn, 1896, p. 234.
Aulacocyclus rosenbergi Kuwert, 1897, pp. 279 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*a*, p. 8.)
(*Aulacocyclus edentulus*, Gemminger and Harold, 1868, p. 969.)
Aulacocyclus edentulus, Kaup, 1871, pp. 14–15.
(*Aulacocyclus edentulus*, Wytsman, 1884, p. 328.)
(*Aulacocyclus Edentulus*, Kuwert, 1891, p. 170.)
Aulacocyclus edentulus, Blackburn, 1896, pp. 233–4.
Aulacocyclus edentulus, Kuwert, 1897, pp. 280 and 282.

Localities:—
Australia: Port Jackson.
New Caledonia: Balade.

[* Aulacocyclus errans, Blackburn.]

Aulacocyclus errans, Blackburn, 1896, pl. 233.

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 to his Javanese record of 1891, so it may be doubted whether this species is really Oriental.[1]

[*Aulacocyclus 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*c*, p. 228.

Locality :—
New Caledonia.

Genus ERACUPES, Kaup, 1871.

= *Aulacocyclus* [part], Kaup, 1868.

The genus *Ceracupes* is only known from the 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, 1914*a*, p. 31.

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*, Wystman, 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. 970.)
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. 338–9.
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, 1906, 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 orolieus* + *Aceraius inaequalis*, Gemminger and Harold, 1868, pp. 970 and 972.)
Leptaulax orolieus, 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*.

[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.

Ceraius 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.
Ocythoe emarginatus, Castelnau, 1850, p. 179.
Passalus grandis, Smith, 1852, p. 5.
Ceraius grandis, Kaup, 1868*a*, p. 27.
Ceraius grandis, Kaup, 1868*b*, p. 3.
(*Ceraius grandis*, Gemminger and Harold, 1868, p. 972).
Ceraius †*grandis*, Stoliczka, 1873, p 158.
(*Ceraius grandis*, Wytsman, 1884, p. 336).
Ceraius Addendus + *Rectidens* + *Hirsutus* + *Ceylonicus*, Kuwert, 1891, p. 163.
Ceraius addendus + †*grandis* + †*minutifrons* + *prosternisulcatus* + *ceylonicus* + †*hirsutus* + †*rectidens* + †*magnus* + *chinensis* + *molossus*, Kuwert, 1898, pp. 342–4.
Ceraius †*grandis*, Zang, 1904*b*, pp. 184–5.
Ceraius †*hirsutus*, Zang, 1905*a*, p 104.
Ceraeus †*palawanus*, Zang, 1905*d*, pp. 236–238.
Ceraius †*grandis*, Gravely, 1914*a*, p. 31.
Ceraius †*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.

(*Aceraius 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 laterisculptus, 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.
Ocythoe tridens, Castelnau, 1850, II, p. 170.
(*Passalus tridens*, Smith, 1852, 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.

= *Aceraius* [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. I, 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. 293–4.
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].

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[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. 188-9.
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.

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[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 † *papauanus* + † *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.

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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.)[1]
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).

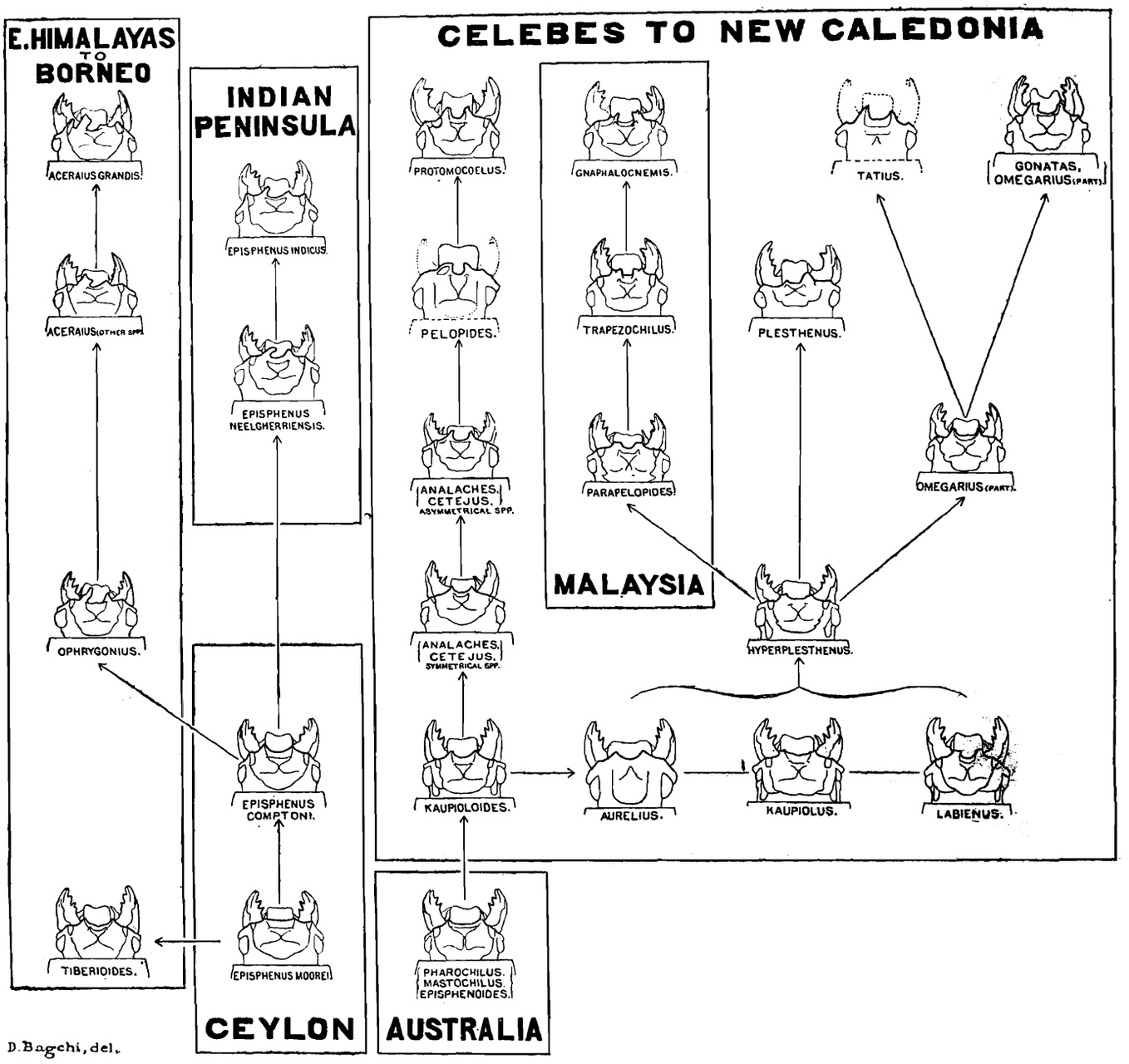
lowest terminal tooth still well developed on both mandibles and the anterior angles of the head even when prominent not asymmetrical, have been driven beyond the Gangetic Plain; but one of them has developed all the characteristics of a dominant form, except perhaps a higher degree of asymmetry than 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,

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[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 ⅓—½ as long as that separating outer tubercles	*Tiberioides*, Gravely, pp. 215 & 280.
	Inner tubercles separated by a space ⅔—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 ..	*Ceraius*, 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.
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. sulciperfectus*, 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 flattened, 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.

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[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.

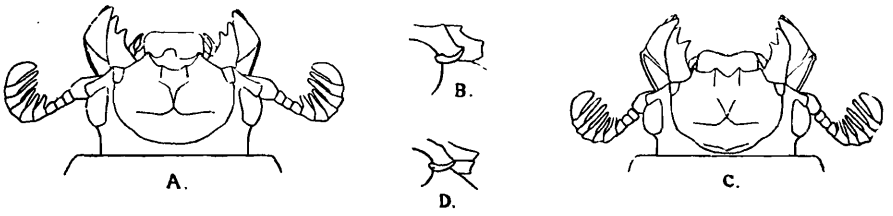
Pseudepisphenus, n. gen.

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 Leptaulaciinae 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.	$\frac{6204}{20}$-$\frac{6212}{20}$	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.	$\frac{4360}{20}$	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.	$\frac{899}{1}$	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.	4775/20	Singapore	British Museum.
,,	4776/20	Penang	,,

Genus ACERAIUS, Kaup.

Aceraius perakensis, Kuwert.

Regd. No.	4382/20	Taiping, 4000–4500 ft.	K. Zool. Mus., Berlin.
,,	6213/20	Telom, S. Perak, 4000 ft.	Oxford Museum.

Aceraius laevicollis (Illiger).

Regd. No.	4386-7/20	W. Sumatra ("Bandar Buat b. Padang Schoede S. G.")	K. Zool. Mus., Berlin.
,,	4388/20	Delhi, Sumatra	,,
,,	4444/20	Java	Deutsches Entom. Mus.
,,	4385/20	Bandjermasin	K. Zool. Mus., Berlin.
,,	4445/20	S. Palawan	Deutsches Entom. Mus.
,,	4389/20	Luzon	K. Zool. Mus., Berlin.

Aceraius grandis (Burmeister), s. str.

Regd. No.	4393/20	Sumatra	K. Zool. Mus., Berlin.
,,	4447/20	Tengger Mountain, Java	Deutsches Entom. Mus.
,,	4390/20 4392/20	Java	K. Zool. Mus., Berlin.
,,	4448/20		Deutsches Entom. Mus.
,,	4391/20	Bandjermasin	K. Zool. Mus., Berlin.

A. grandis var. rectidens, Kuwert.

Regd. No.	4384/20	Deli, Sumatra	K. Zool. Mus., Berlin.
,,	4383/20	Java	,,
,,	4446/20 (*A. Magnus*, Kuwert det.)	?	Deutsches Entom. Mus.

A. grandis subsp. hirsutus, Kuwert.

Regd. No.	4450/20	Catchin Cauri	Deutsches Entom. Mus.
,,	4396-8/20	Mt. Mauson, 2-3000 ft. Tonkin	K. Zool. Mus., Berlin.
,,	4449/20	Tonkin	Deutsches Entom. Mus.
,,	4399-4400/20	Hainan	K. Zool. Mus., Berlin.
,,	4408/20	Fuhosho, S. Formosa	,, ,,
,,	4453/20	Kosempo, Formosa	Deutsches Entom. Mus.
,,	4406-7/20 4409/20	Polisha, Formosa	K. Zool. Mus., Berlin.
,,	4451-2/20 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.	$\frac{4425}{20}$	Toricelli Mts., Kaiser Wilhelmsland	Deutsches Entom. Mus.

Genus **CETEJUS**, Kaup.

Cetejus grabowskyi, Kuwert.

Regd. No.	$\frac{4358\text{-}9}{20}$	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.	$\frac{4361}{20}$	Kapaur, Dutch New Guinea	K. Zool. Mus., Berlin.

Genus **LABIENUS**, Kaup.

Labienus, sp.

Regd. No.	$\frac{4363}{20}$	?	K. Zool. Mus., Berlin.
,,	$\frac{4364}{20}$	Bukana, Huon Gulf, German New Guinea	,, ,,

Genus **HYPERPLESTHENUS**, Kuwert.

Hyperplesthenus gracilis (Heller).

Regd. No.	$\frac{4423}{20}$	(*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	Peinan, 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.	$\frac{4469}{20}$ (*cotype*)	Sumbawa	Hamburg Museum.

Leptaulax timoriensis (Percheron).

Regd. No.	$\frac{4411}{20}$	Timor	K. Zool. Mus., Berlin.

L. dentatus (Fabricius) s. str.

Regd. No.	$\frac{4412}{20}$	Mt. Mauson, 2000–3000 ft.	K. Zool. Mus., Berlin.
,,	$\frac{4461}{20}$	Fuhosho, Formosa	Deutsches Entom. Mus.
,,	$\frac{4463}{20}$	Polisha, Formosa	,,
,,	$\frac{4460}{20}$ $\frac{4462}{20}$ $\frac{4464}{20}$	Sokutsu, Formosa	,,

L. dentatus, var. glabriventris, Gravely.

Regd. No.	$\frac{4414}{20}$	Deli, Sumatra	K. Zool. Mus., Berlin.

Leptaulax cyclotaenius subsp. himalayae, Kuwert.

Regd. No.	$\frac{4410}{20}$	Mt. Mauson, 2000–3000 ft.	K. Zool. Mus., Berlin.

Leptaulax bicolor Fabricius) s. str.

Regd. No.	$\frac{4415\text{-}6}{20}$ $\frac{4420}{20}$	Mt. Mauson, 2000–3000 ft.	K. Zool. Mus., Berlin.
,,	$\frac{4465\text{-}6}{20}$	Kosempo, Formosa	Deutsches Entom. Mus.
,,	$\frac{4467\text{-}8}{20}$	Polisha, Formosa	,,
,,	$\frac{4417\text{-}8}{20}$	Taiping, 4000–5000 ft.	K. Zool. Mus., Berlin.
,,	$\frac{4459}{20}$	St. Rambé, Sumatra	Deutsches Entom. Mus.
,,	$\frac{4476\text{-}7}{20}$	Preanger, Java, 4000–6000 ft.	Hamburg Museum.
,,	$\frac{4419}{20}$ $\frac{4421}{20}$	Tjibodas, c. 5000 ft.	K. Zool. Mus., Berlin.
,,	$\frac{4478\text{-}9}{20}$	Tjibodas, Java	Hamburg Museum.
,,	$\frac{4480\text{-}1}{20}$	Banguey Island	,,

Leptaulax bicolor var. vicinus (Percheron).

Regd. No.	$\frac{4758\text{-}65}{20}$	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. 197, 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 frontal 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 (*Leptaulax 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, *Aceraius 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.

1792. Fabricius, J C. " Entomologia Systematica emenda et aucta." Vol. I (Hafniae, 1892), pp. 240-1.

* 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.

1860. Montrouzier, le Père, "Essai sur la Faune Entomologique de la Nouvelle-Calédonie (Balade) et des Iles des Pins, Art, Lifu etc." Ann. Soc. Ent. France (3) viii, pp. 229-308.

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.

1891. Kuwert, A. "Systematische Uebersicht der Passaliden Arten und Gattungen." Deutsche Ent. Zeitschr. 1891 (1), pp. 161-192.

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.

1898. Heller, K. M. "Neue Käfer von Celebes." Abh. u. Ber. d. K. Zool. u. Anthr.-Ethn. Mus. zu Dresden, VII, 1898-9 (3), 42 pp., 1 pl.

1900. Heller K. M. Ditto. IX, 1900 (5), 46 pp.

* 1902. Fruhstorfer. "Tagebuchblättern." Insekten-Börse XIX, 1902, p. 28.

1903. Fauvel, A. "Faune Analytique des Coléoptères de la Nouvelle Calédonie." Rev. Ent. franc. XXII, 1903, pp. 203-378.

1903. Zang, R. (*a*) "Vorlaufige Diagnosen neuer Indo-Australischer Passaliden" Insekten-Börse, 20 Jahrg., No. 43, pp. 338-9.

(*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*) "Änderung 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.

1906. Zang, R. (*a*) "Uebersicht der Basilianus-Arten." Deutsche Ent. Zeitschr., 1906, pp. 177–183.

*(*b*) "Passalini" in "Nova Guinea, Résultats de l'Expedition scientifique Néerlandaise à la Nouvelle-Guinée en 1903, sous les auspices de Arthur Wichmann, Chef de l'Expedition." V (1) pp. 23–26.

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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).

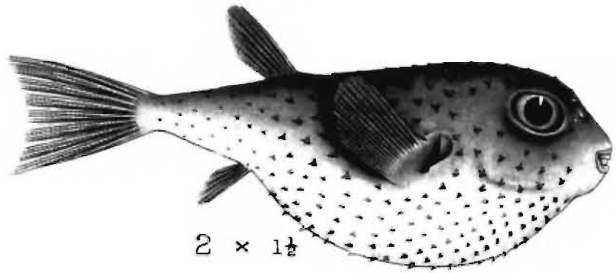
13. INDEX.

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.

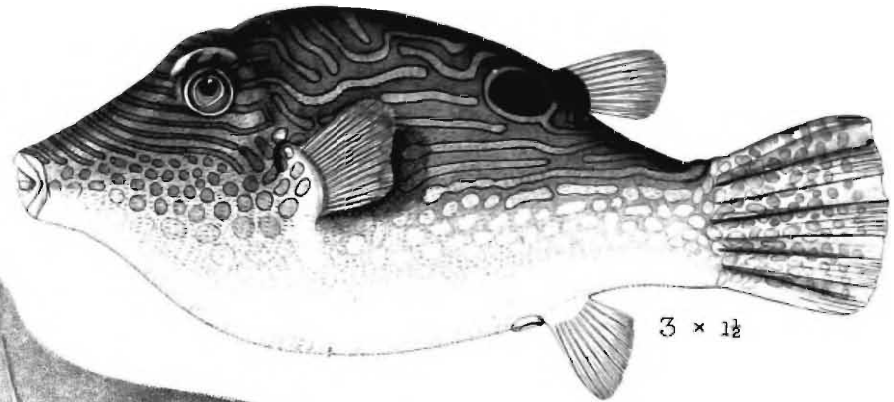
The summary of the paper on pp. 336–349 has been designed partly as a guide to the whereabouts of the principal facts recorded. References to it are not included in this index.

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



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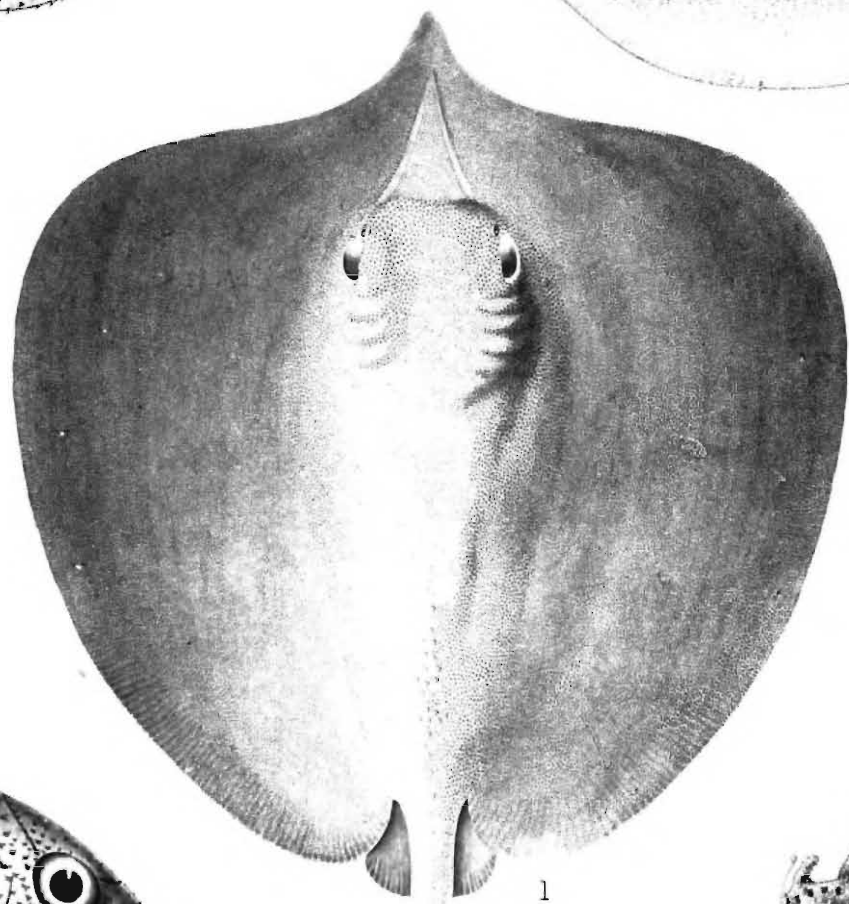

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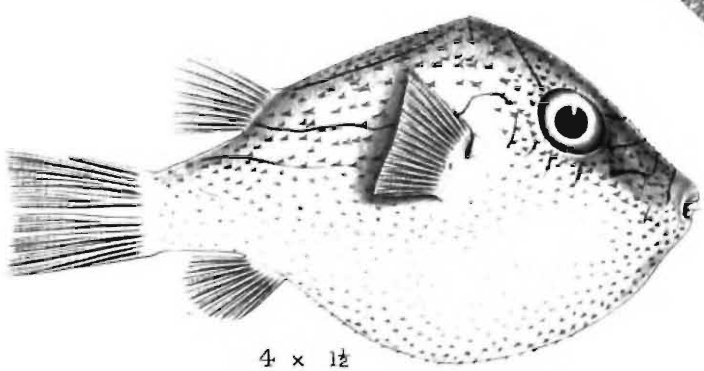
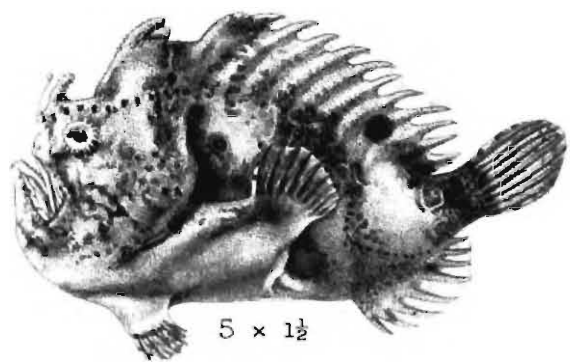


4 × 1½



5 × 1½

A C Chowdhary & S.C. Mondul. del.

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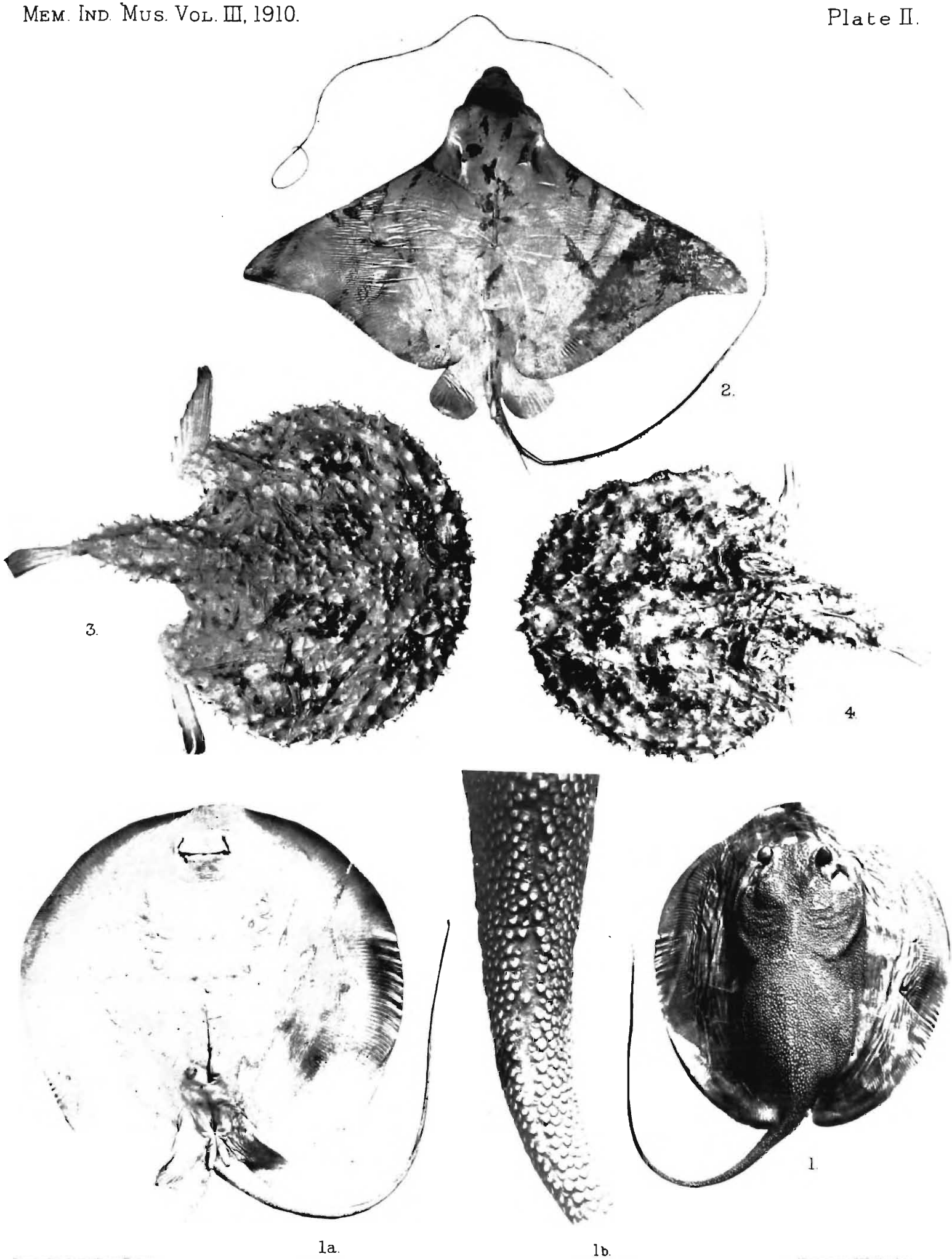
EXPLANATION OF PLATE II.

FIGS. 1, 1*a*, 1*b*.—*Urogymnus asperrimus* (young ♂): 1, 1*a*, reduced; 1*b*, nat. size.

FIG. 2.—*Aetobatis narinari* (young ♂), reduced.

,, 3.—*Halieutaea stellata*, reduced.

,, 4.— ,, *indica*, sp. nov., nat. size.



2.

3.

4.

1.

1a.

1b.

Photo. by A. C. Chowdhary.

Bemrose Ltd. Derby

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.)

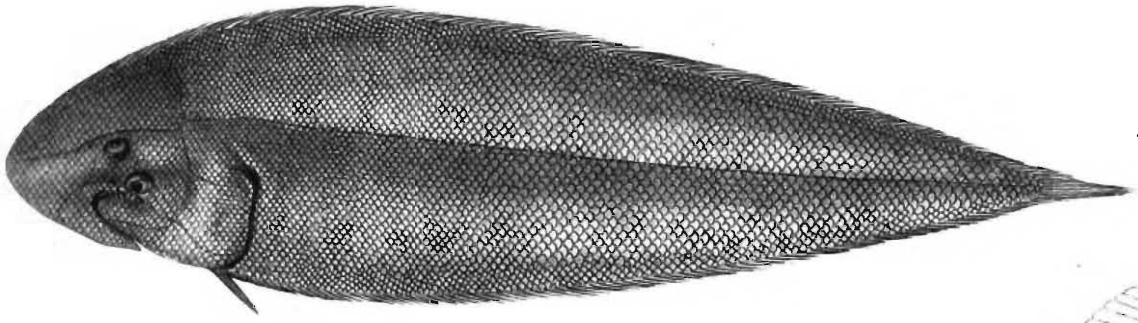
,, 3*a* and 3*b*.—Scales from coloured and from blind side of body of *Cynoglossus acinaces*, × 16.

,, 4. *Solea synapturoides*, sp. nov.

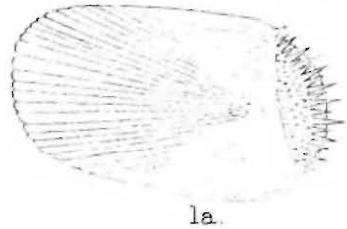
,, 4*a* and 4*b*.—Scales from coloured and from blind side of body of *Solea synapturoides*, × 8.

,, 5.—*Cynoglossus deltae*, Jenkins, × 2. (Described *ibid.*, p. 130.)

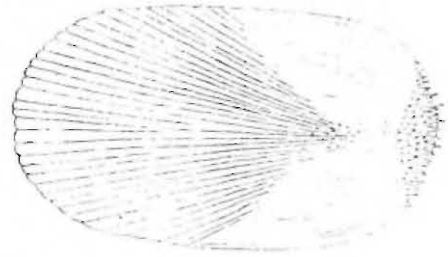
,, 5*a* and 5*b*.—Scales from coloured and from blind side of body of *Cynoglossus deltae*, × 16.



1.

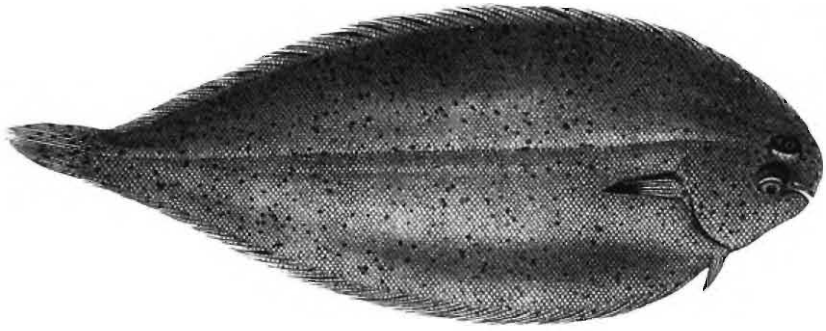


1a.



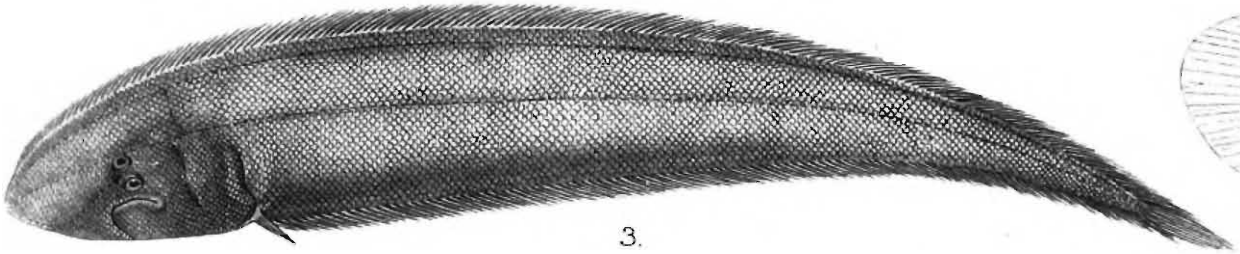
1b.

2a×16.



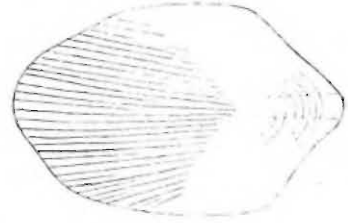
2.

2b×16.

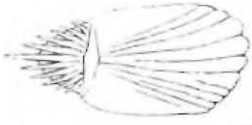


3.

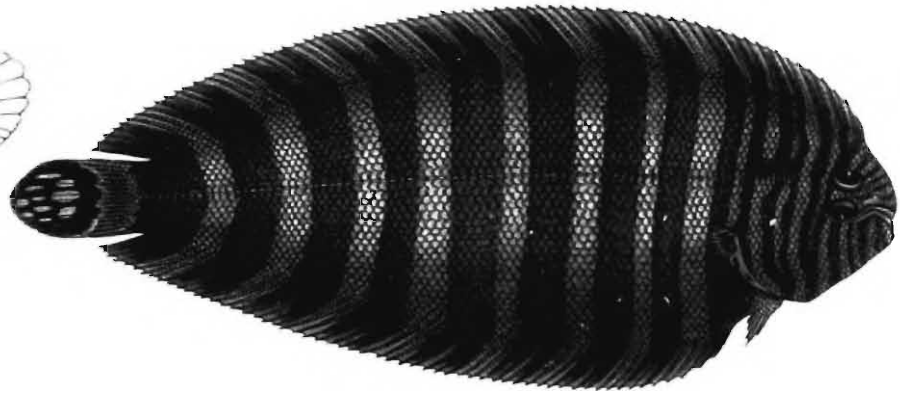
3a×16.



3b×16.

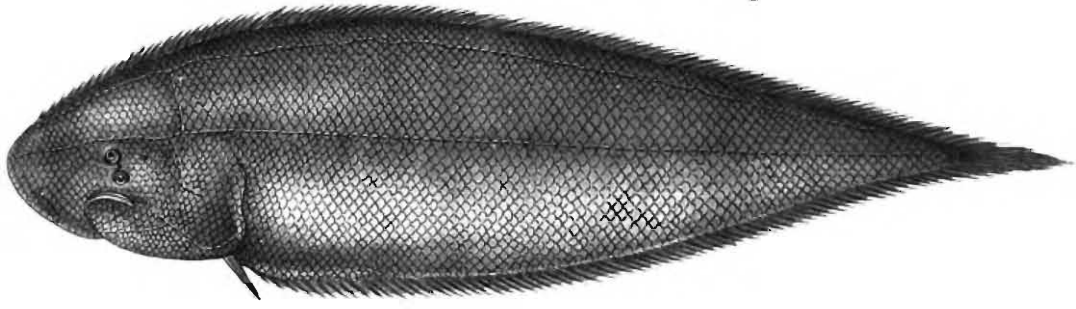


4a×8.



4.

4b×8.



5×2

5a×16.

5b×16.

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, showing valves. Unstained.

,, 6.—*S. squamuliferum*. Young male shortly after casting off the bivalve shell. Decalcified, unstained.

,, 7.—*Ibla cumingii*, Darwin. Male, × 75. Stained borax carmine.

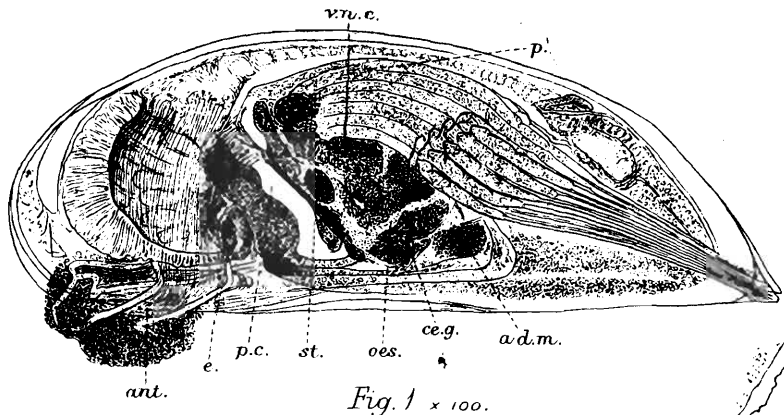


Fig. 1 × 100.

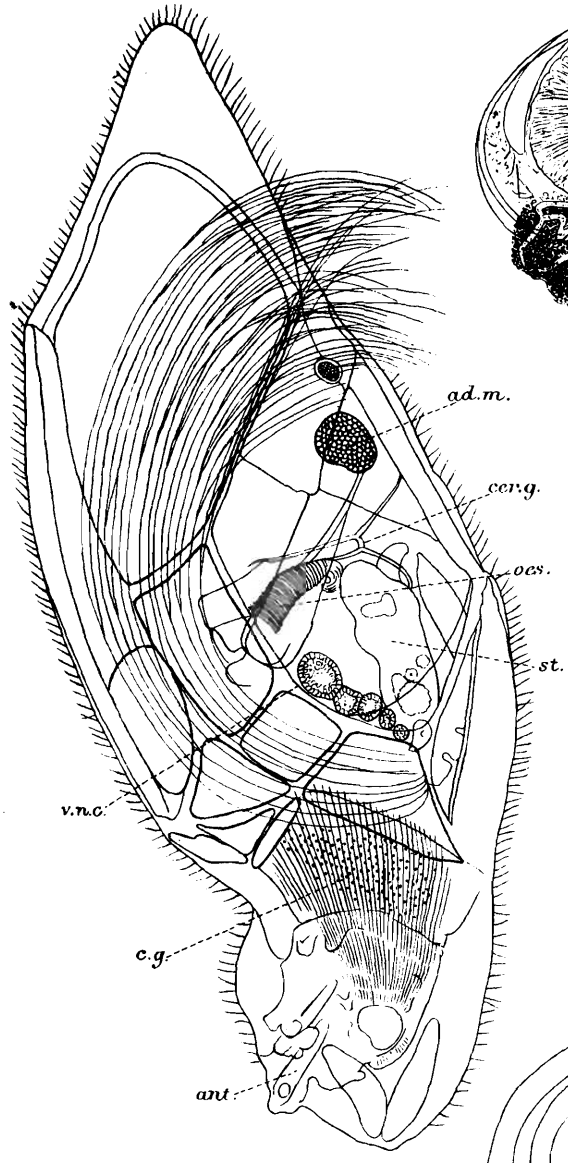


Fig. 2 × 75

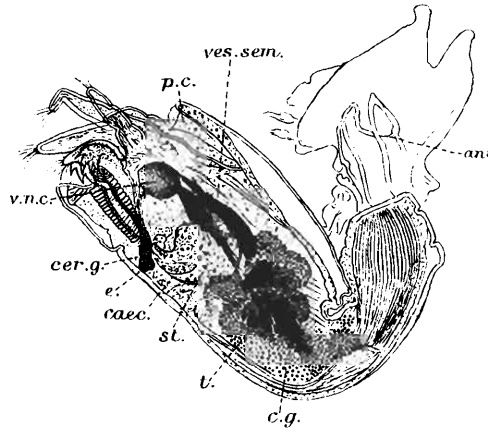


Fig. 7 × 75.

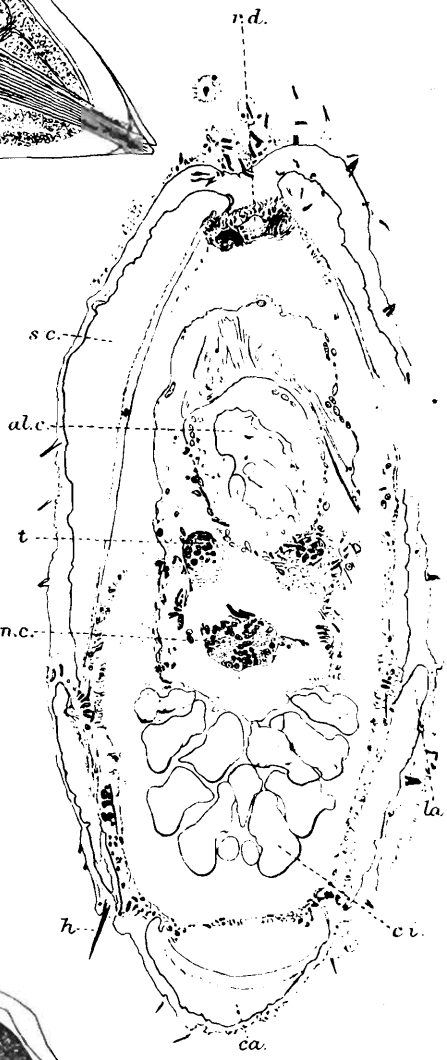


Fig. 3 × 180.

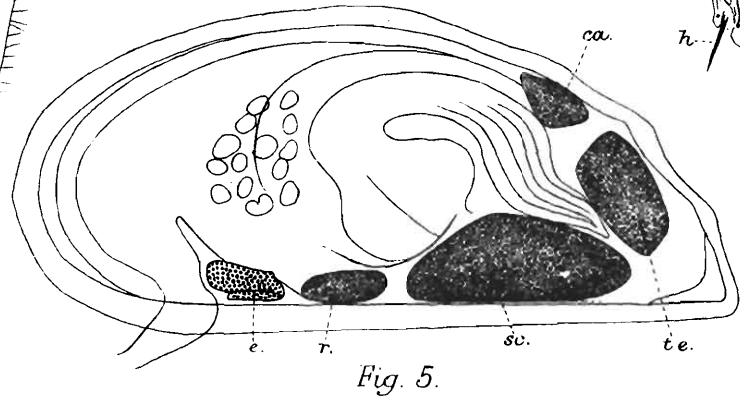


Fig. 5.

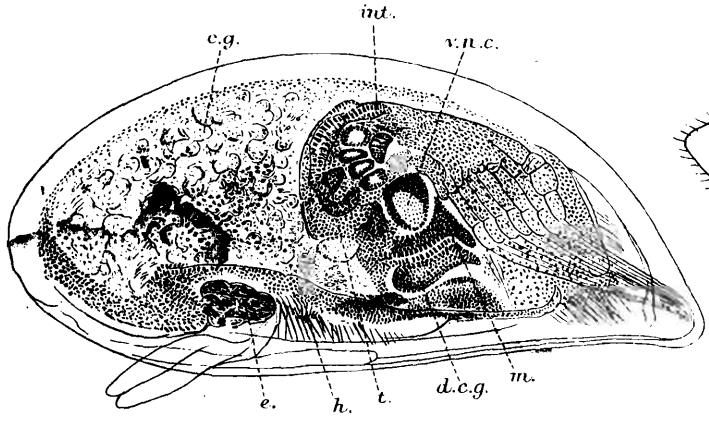


Fig. 4 × 110.

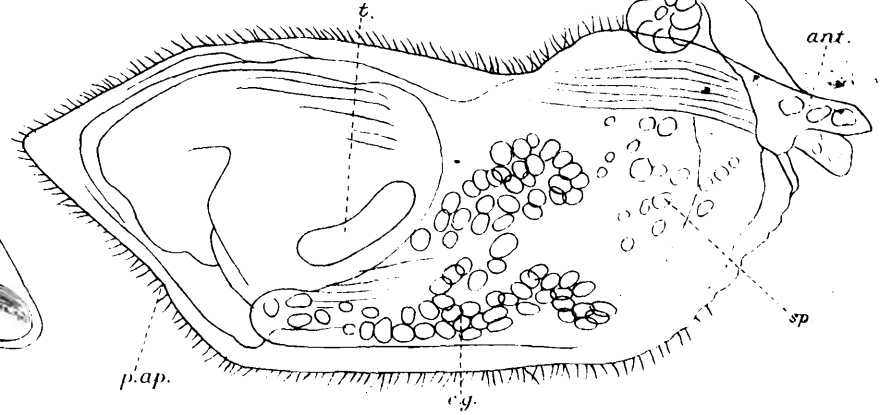


Fig. 6.

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Figs 1–6. Scalpellum squamuliferum, Welt. Fig. 7. Ibla cumingii, Darwin.

Roth. Lith. London

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 cell seen in transverse section through peduncle of a hermaphrodite 16 mm. long. Stained with iron haematoxylin.

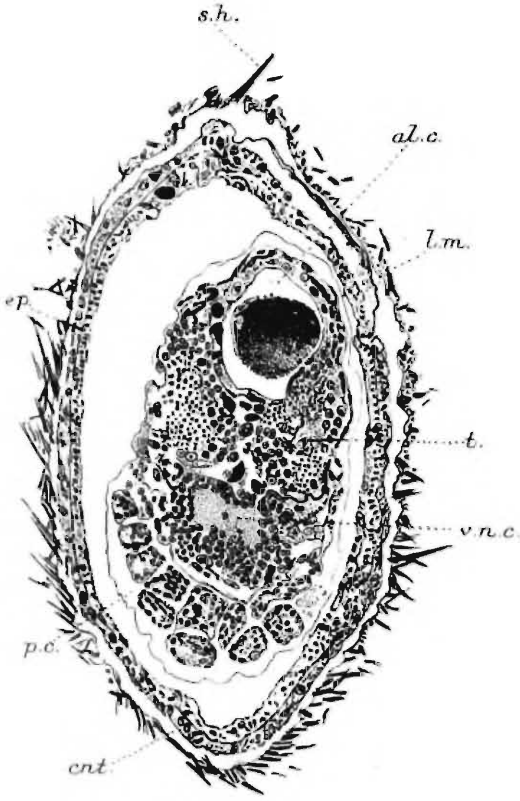

Fig. 2. × 250.

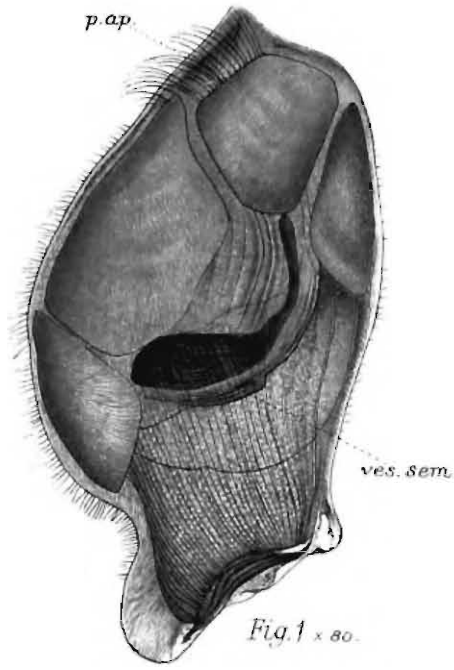

Fig. 1 × 80.

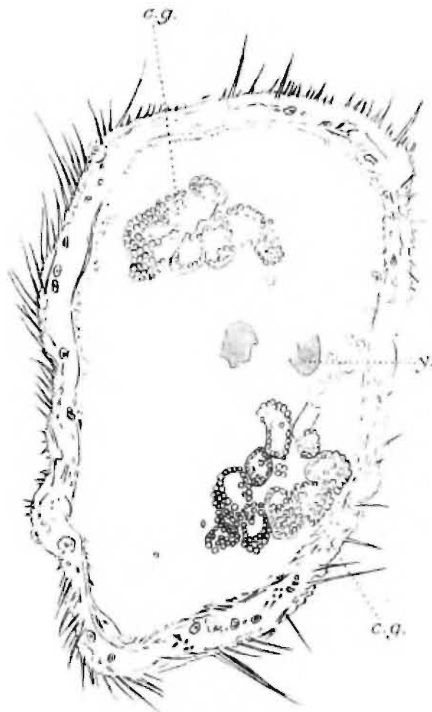

Fig. 3 × 250.

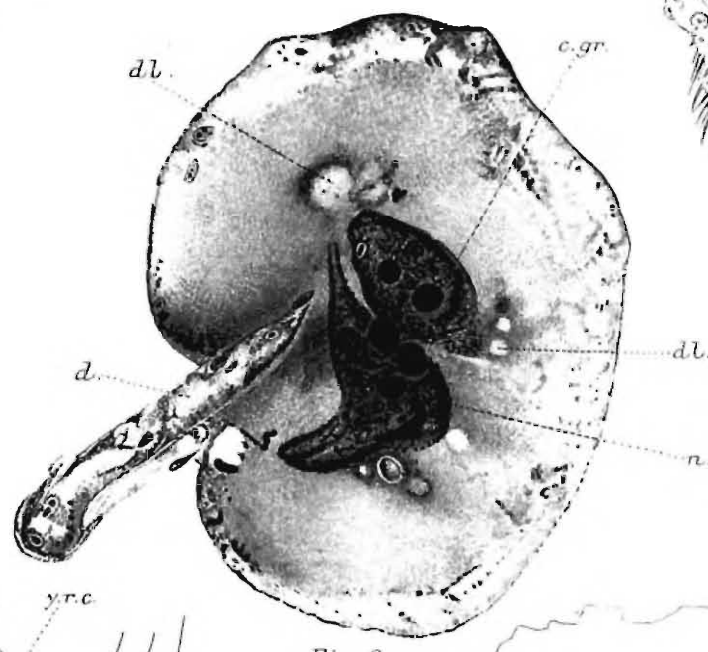

Fig. 6.

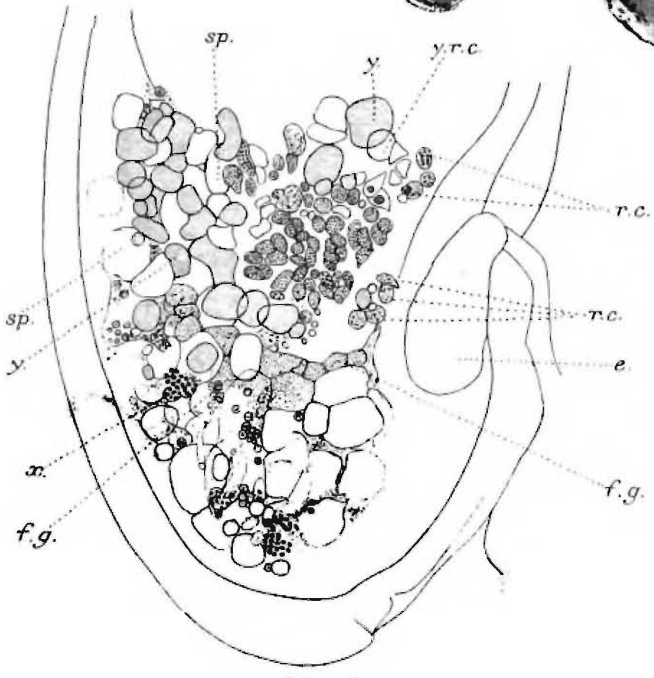

Fig. 4.

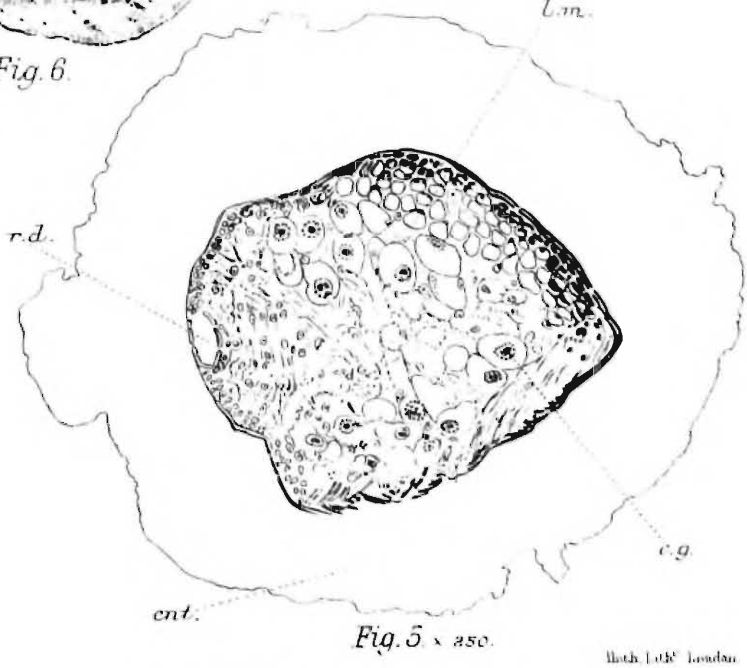

Fig. 5 × 250.

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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.: ×475.

,, 6.—*S. squamuliferum*. Section of ripe ovum in full-grown hermaphrodite, ×182. Stain iron haematoxylin.

,, 7.—*S. bengalense*, Annand. Male, ×105. Stain borax carmine.

,, 8.—*S. gruvelii*, Annand. Cyprid of male, ×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.

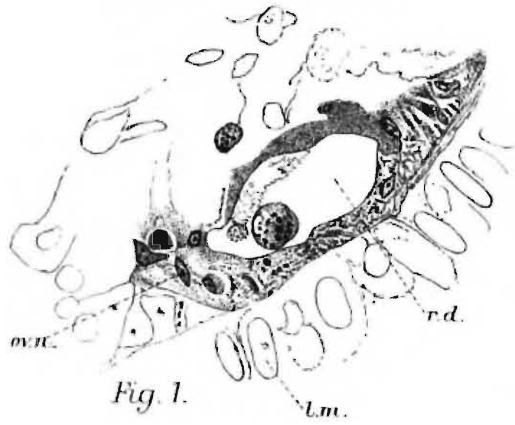


Fig. 1.

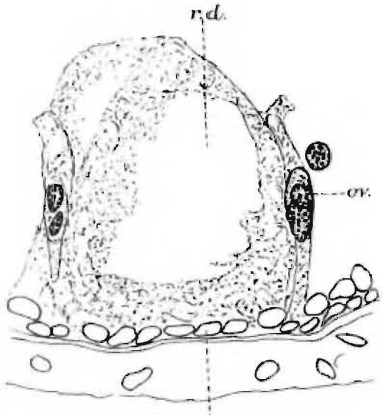


Fig. 2.

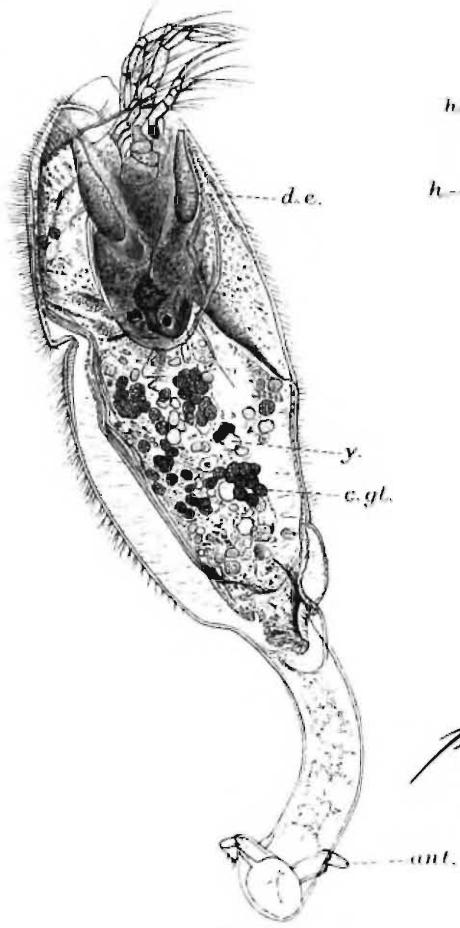


Fig. 7 × 105.

Fig. 9.

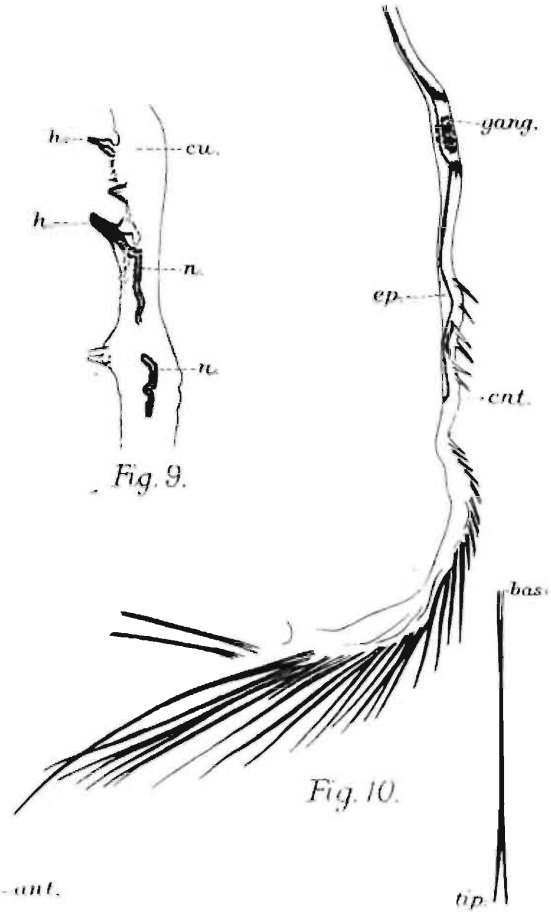


Fig. 10.

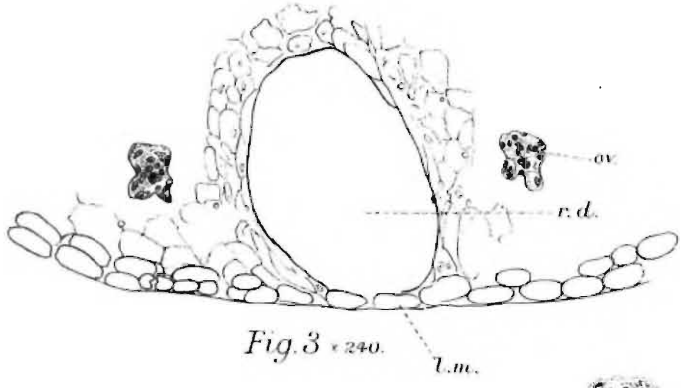


Fig. 3 × 240.

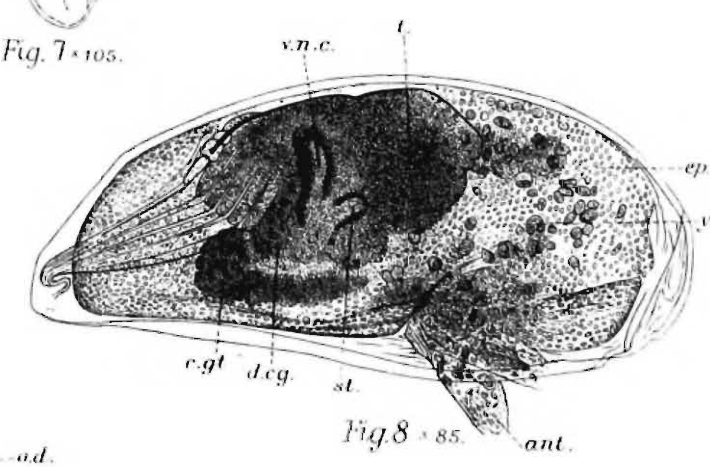


Fig. 8 × 85.

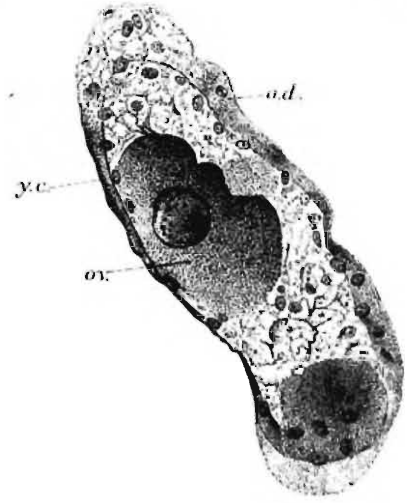


Fig. 5.

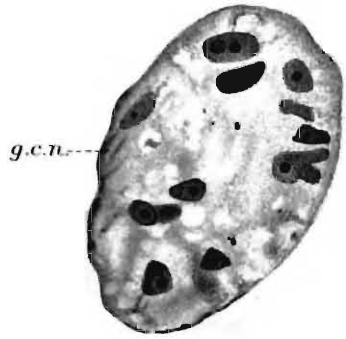


Fig. 4.

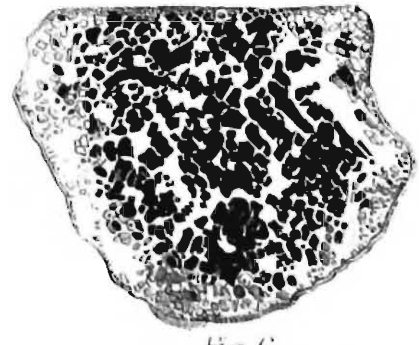


Fig. 6.

S.C. Mondul del. 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.

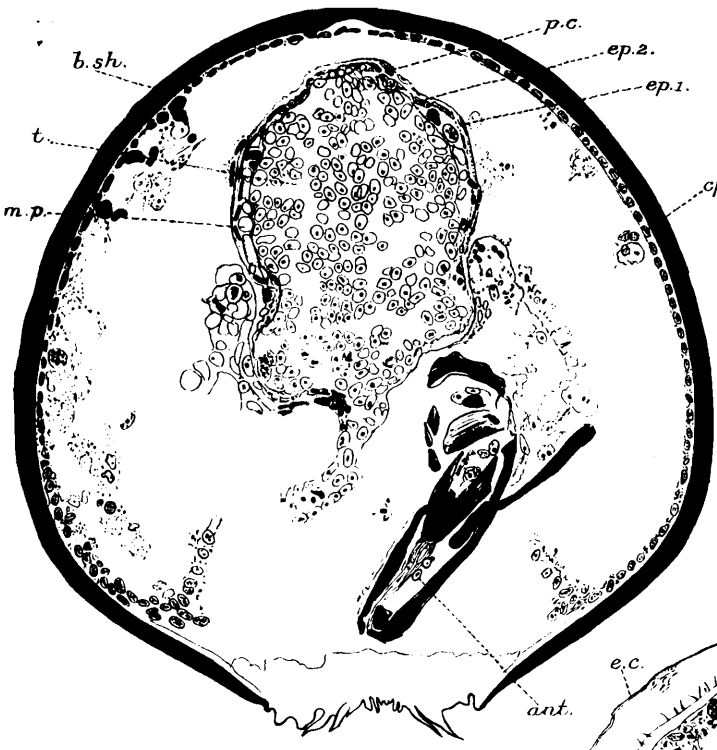


Fig. 1 × 250.

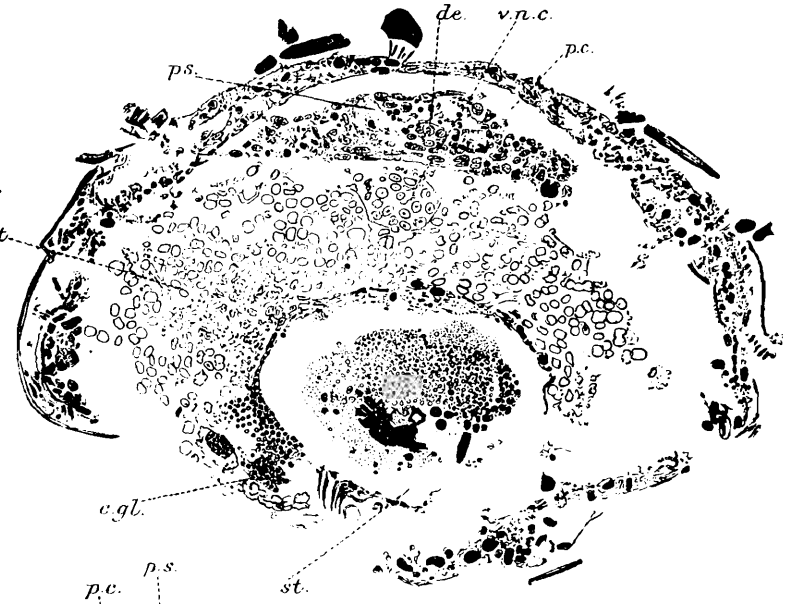


Fig. 3 × 250.

Fig. 4. × 250.

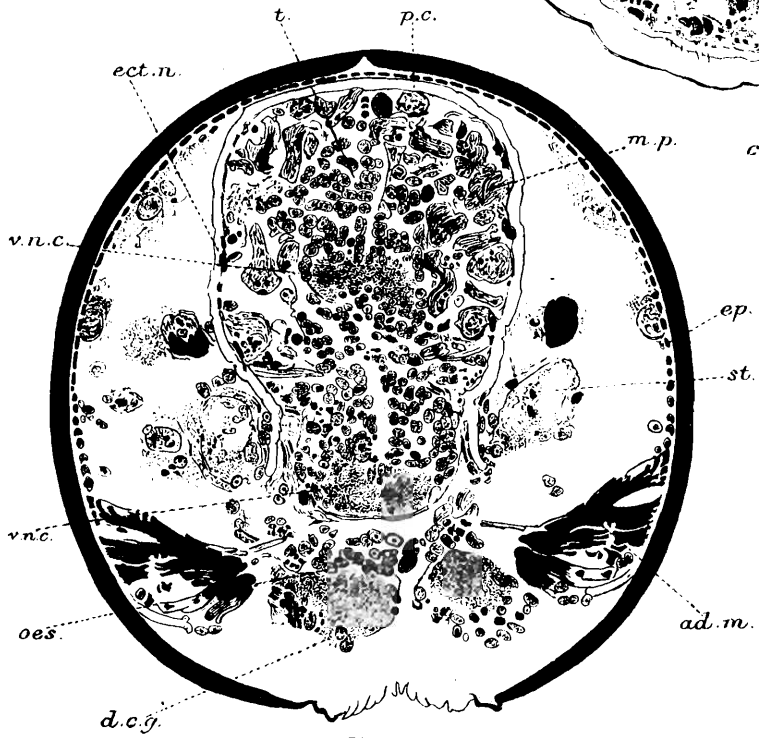


Fig. 2 × 250.

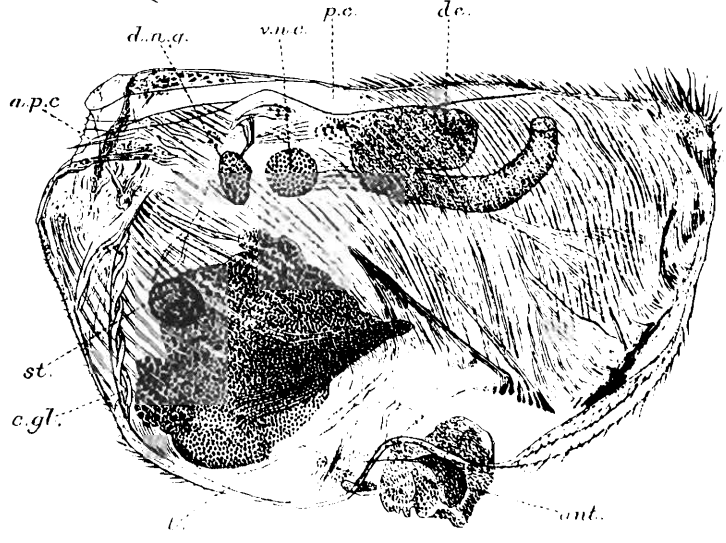


Fig. 5 × 100.

S.C. Mondul, del.

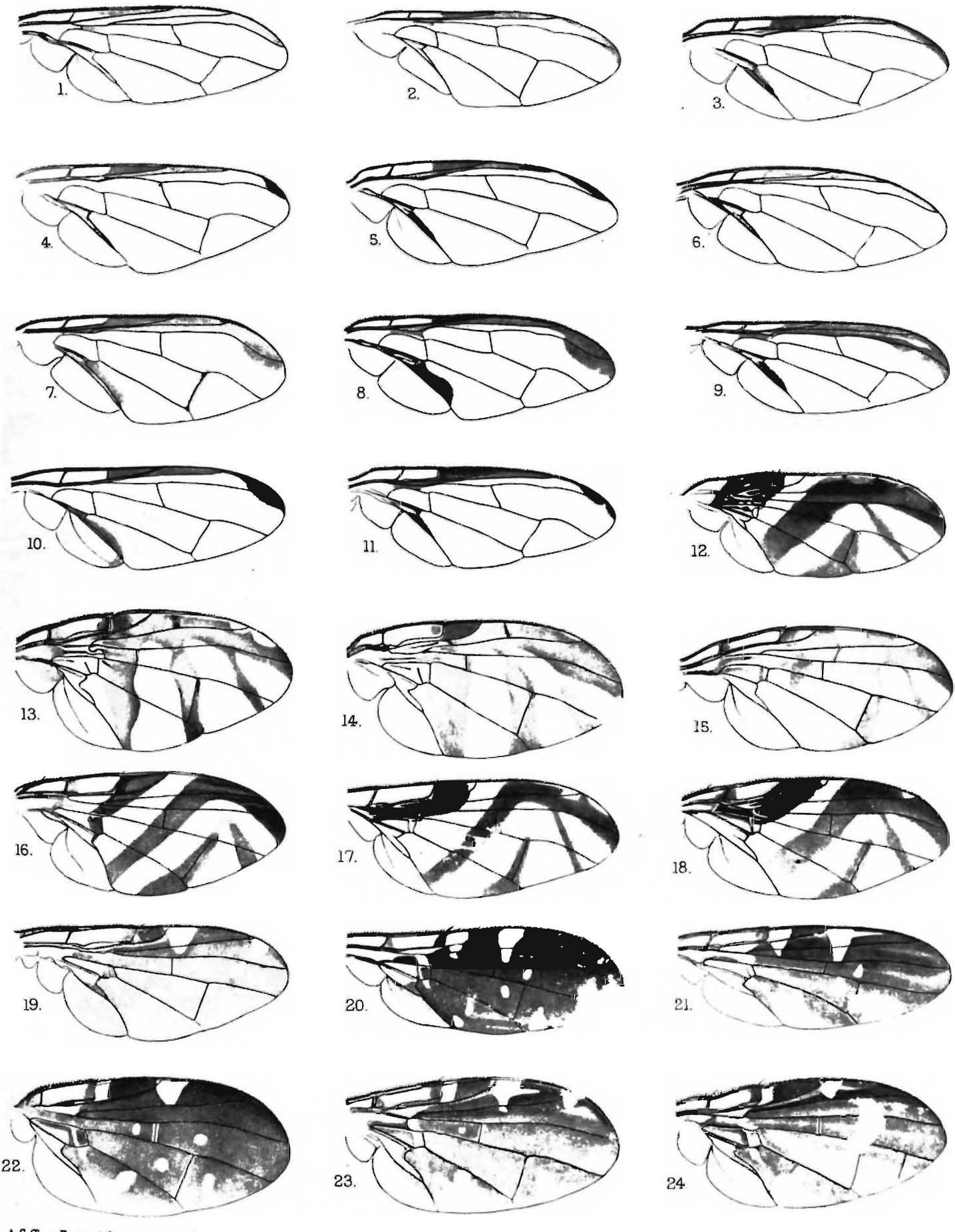
Scalpellum gruvelii, Annand.

Huth. 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 ceratitina*, Bezzi.
,, 14. ,, *striata*, Frogg.
,, 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.



A.C. Chowdhary, del.

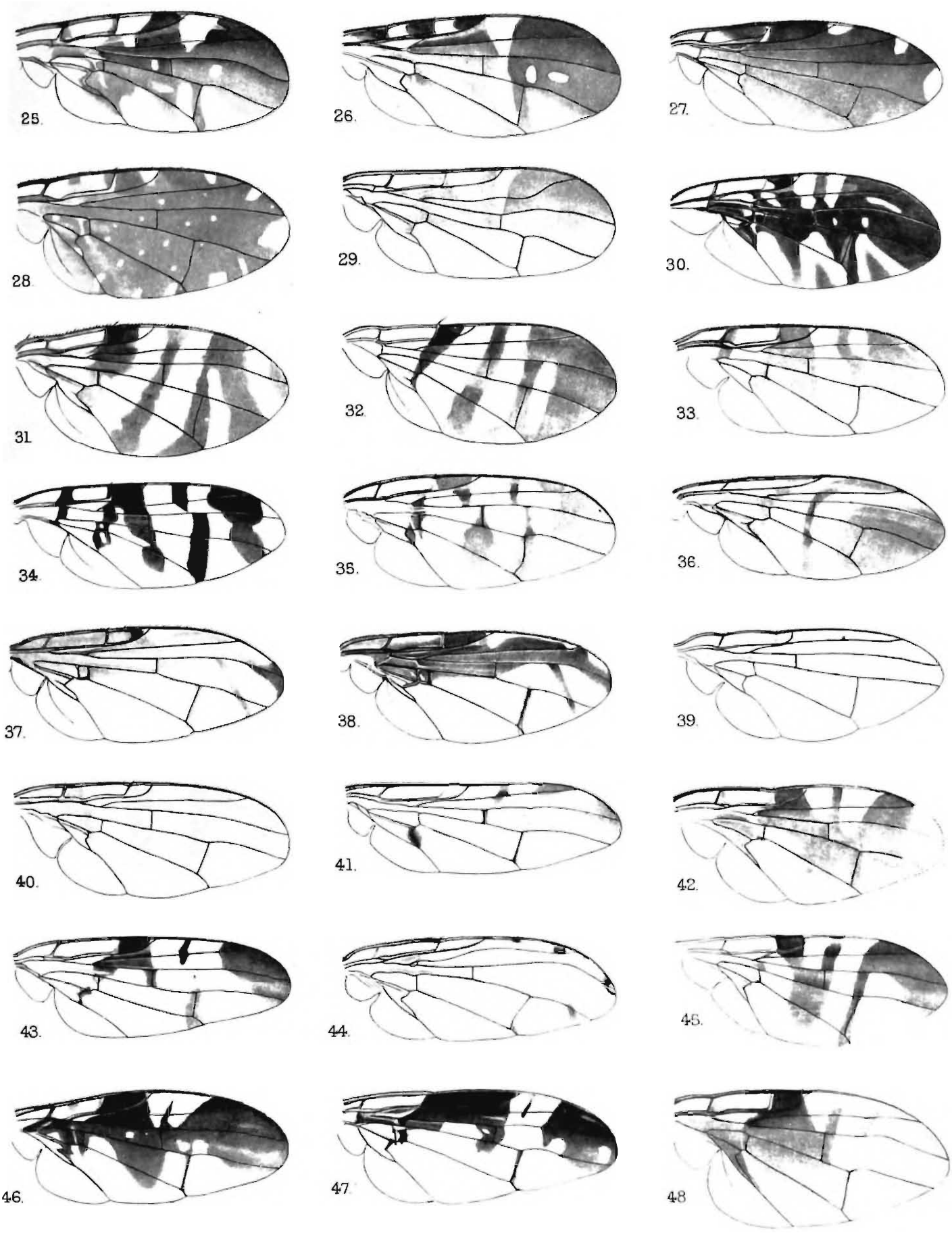
Bemrose, ..., Derby

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. ,, *? stellata*, Macq.
29. *Acanthoneura ? 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*, Bezzi.
,, 37. *Chaetellipsis paradoxa*, Bezzi.
,, 38. *Poecillis judicanda*, Bezzi.
,, 39. *Myiopardalis pardalina*, Big.
,, 40. *Carpomyia vesuviana*, Costa.
,, 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.



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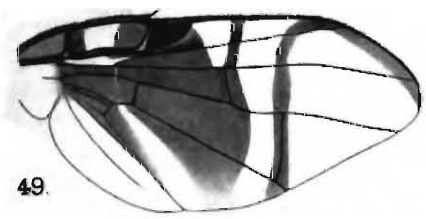
ORIENTAL AND AUSTRALIAN TRYPANEIDAE.

EXPLANATION OF PLATE X.

Wings of Oriental and Australian Trypaneidae.

FIG. 49. *Acidia alboscutellata*, Wulp.
,, 50. ,, *erythraspis*, Bezzi.
,, 51. ,, (*Ocneros*) *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. *Paralleloptera 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.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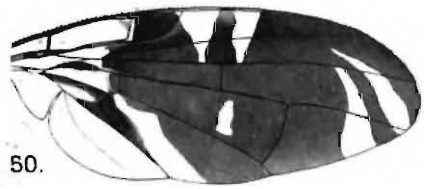
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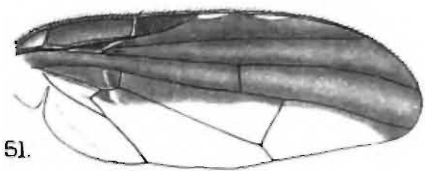
51.


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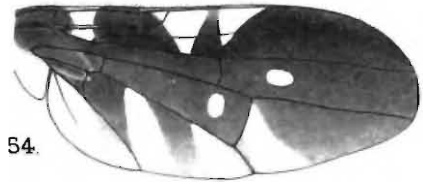
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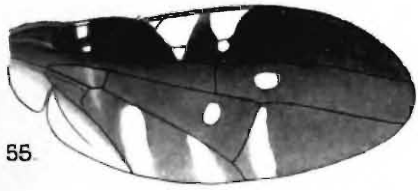
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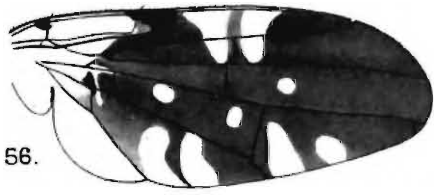
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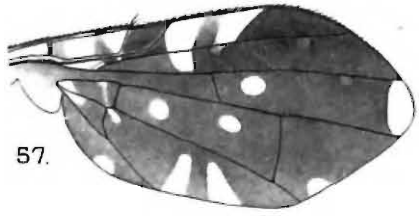
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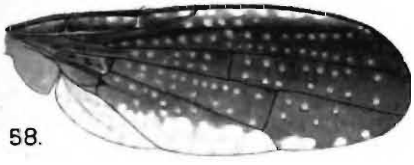
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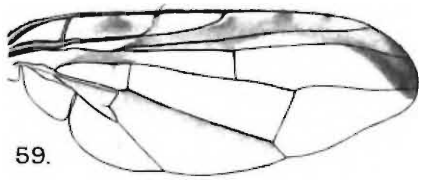
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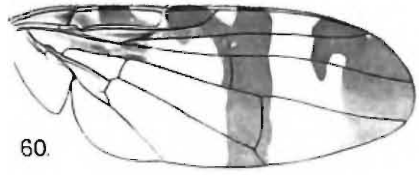
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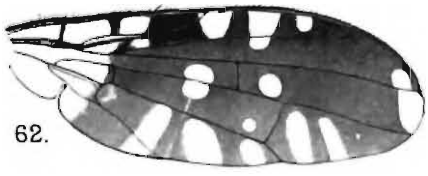
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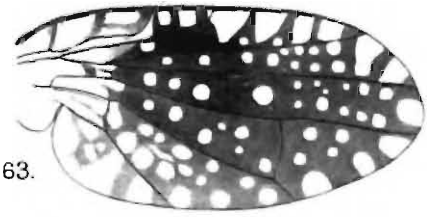
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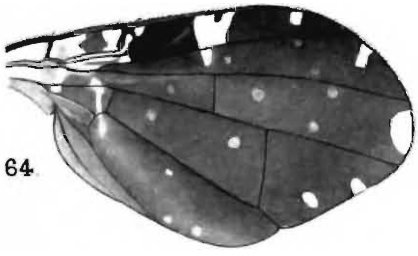
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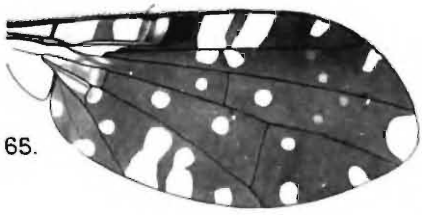
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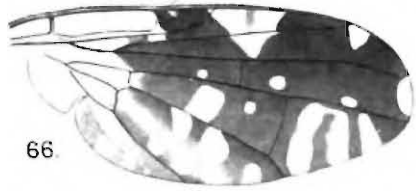
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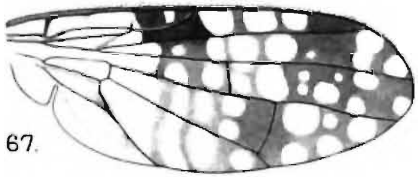
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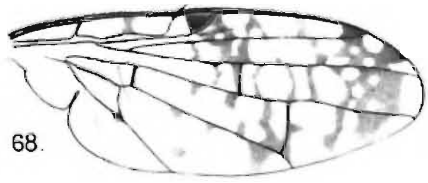
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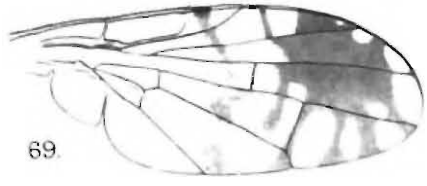
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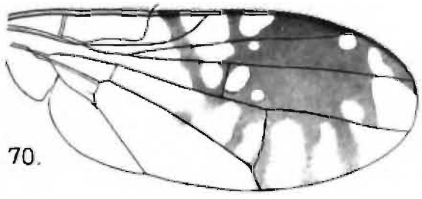
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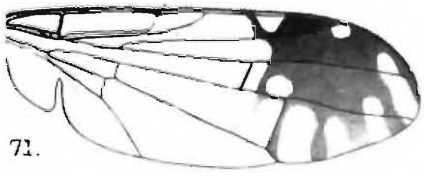
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72.

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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. $\frac{6377}{14}$). 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. $\frac{6362}{14}$). Head from above, × 2.

,, 7*a*. Ditto Head from the side, × 2.

,, 7*b*. Ditto Mentum, etc., × 4.

,, 8.—*Taeniocerus pygmaeus* (regd. no. $\frac{9475}{1}$). Head from above, × 2.

,, 8*a*. Ditto Head from the side, × 2.

,, 9.—*Taeniocerus bicuspis* (regd. no. $\frac{6375}{14}$). 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. $\frac{6120}{20}$). Head from above, × 2.

,, 13.—*Pleurarius brachyphyllus* (regd. no. $\frac{6385}{14}$). Head from above, × 2.

,, 13*a*. Ditto Mentum, etc., × 4.

,, 14.—*Tiberioides kuwerti* (regd. no. $\frac{6443}{14}$). 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. $\frac{9479}{18}$ and $\frac{9481}{18}$). Frontal area, etc., × 3, showing the variability of the shape of this area.

,, 19*a*. Abnormal mentum of another specimen (regd. no. $\frac{9483}{18}$) × 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. $\frac{9110}{1}$). 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.

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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. $\frac{3268}{19}$). 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. $\frac{9261}{1}$). Head from above, × 2.

,, 28*a*. A large specimen of the same species and subspecies (regd. no. $\frac{3032}{19}$). Head from above, × 2.

,, 28*b*. Left mandible of a similar specimen to the last from above, ×4.

,, 29.—Left mandible of another specimen of the same sub-species (regd. no. $\frac{8758}{5}$) from above, × 4.

,, 30.—*Aceraius grandis* var. *rectidens* (from a specimen 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. $\frac{9522}{1}$). Head from above, × 2.

,, 32*a*. Ditto Mentum, etc., × 4.

,, 33.—*Aceraius möschleri* (regd. no. $\frac{2836}{19}$). 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. $\frac{5810}{16}$). 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.

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. $\frac{9465}{1}$). 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. $\frac{9925}{18}$). Head from above, ×2.

,, 44.—*Macrolinus waterhousei* (regd. no. $\frac{2621}{19}$). 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. $\frac{3809}{19}$). 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. $\frac{3973}{19}$). Head from above, ×2.

,, 49*a*. *Gnaphalocnemis monticulosus* (regd. no. $\frac{9315}{1}$). Head from above, ×2.

,, 50.—*Gnaphalocnemis tridens* (from a specimen in Mr. Andrewes' collection). Head from above, ×2.

,, 50*a*. Ditto Mentum, etc., ×4.

,, 51.—*Leptaulax humerosus* (regd. no. $\frac{989}{19}$). Head from above, ×2.

,, 52.—*Leptaulax dentatus*, large specimen (regd. no. $\frac{7900}{4}$). 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. $\frac{906}{19}$, $\frac{924}{19}$, $\frac{957}{19}$) from other colonies, × 2.

,, 52*d*. Small specimen of the same species (regd. no. $\frac{963}{19}$). Head from above, ×2.

,, 53.—*Leptaulax cyclotaenius*, s. str. (regd. no. $\frac{9451}{1}$). Head from above, × 2.

,, 54.—*Leptaulax macassariensis* subsp. *anibarbis* (regd. no. $\frac{6206}{19}$). 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. $\frac{9205}{1}$). 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. $\frac{4113}{5}$). Head from above, × 2.

,, 58.—*Leptaulax planus* (regd. no. $\frac{6393}{14}$). Head from above, × 2.


40.


41.


42.


40a.


41a.


42a.


43.


44.


45.


46.


47.

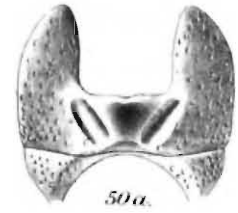

47a.


48.


50.


49.


49a.


50a.


51.


52.


52a.


52b.


52c.


52d.


53.


54.


55.


56.


56a.


57.


58.

P. Sas Vigel.

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ORIENTAL PASSALIDAE.