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Review of the genera of the family Rhizophagidae (Clavicornea : Coleoptera) of the world.

T. Sengupta

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REVIEW OF THE GENERA OF THE FAMILY RHIZOPHAGIDAE (CLAVICORNIA : COLEOPTERA) OF THE WORLD

By

TAPAN SENGUPTA

Zoological Survey of India, Calcutta

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Introduction and Historical

Rhizophagidae Redtenbacher, 1845

The family Rhizophagidae belongs to the great superfamily Cucujoidea, section Clavicornia. The clavicorn beetles pose some of the most difficult problems in the classification of families in the order Coleoptera, particularly the characterisation and constitution of the family. Crowson (1955) commented that the characterisation of the family Rhizophagidae is not settled and Arnett (1968) suggested that the entire group needs to be studied in detail.

To obtain a phylogenetic classification, as many morphological and biological characters as possible need to be studied and larvae should be accorded equal importance with those of adults. The aims of of present work have been, first to, improve characterisation of the family, second, to review its internal hierarchy down as far as the generic level and third, to provide a comprehensive account of the family Rhizophagidae.

The oldest genus included in Rhizophagidae is *Rhizophagus* Herbst (1793), and the oldest name of the supergeneric group in the family is Rhizophagi Redtenbacher (1845), on which the present family is based. Lacordaire (1854), Jacquelin du Val (1857), Reitter (1872) and Crotch (1873) considered these as separate family, LeConte (1861) placed them under the family Nitidulidae and Sharp and Muir (1912) under Cucujidae. In Junk Coleopterorum Cotatalogus Méguignon (1914) listed only three genera, namely, *Rhizophagus* Herbst, *Pararhizophagus* Me'guignon and *Lenax* Sharp under the family Rhizophagidae, Crowson (1955) transferred the genera of Monotominae from the family Cucujidae to it and excluded the genus *Smicrips* LeConte and treated the letter genus as a sepaprate family Smicriphidae placed near to the family Nitidulidae.

Systematic Position

A close relationship between the families Rhizophagidae and Nitidulidae has been accepted by all the earlier workers. Rhizophagidae is allied to the Nitidulid-Cateretid group. Crowson (1955) placed Rhizophagidae near to Nitidulidae for their similar types of uninverted

Cucujoid-type of aedeagus and truncated elytra. The present study also agrees with the above view. The chief differences of above two families are as follows :

Rhizophagidae	Nitidulidae
1. General appearance narrow-elongate	General appearance usually rather broad.
2. Elytra leaving only 1 tergite uncovered.	Elytra leaving at least two tergites uncovered.
3. Front tibiae usually devoid of any keel or denticles on outer edge.	Outer edges ol front tibiae keeled and denticulate.
4. Antenna 10-jointed with 1 or 2 jointed characteristic club.	Antenna 11-jointed with 3-jointed compact club.
5. Tarsi simple.	Tarsal segments 2 and 3 lobed below.
6. Abdomen with 7 pairs of spiracles.	Abdomen with 5 or 6 pairs of spiracles.
7. Maxilla with a distinct finger-like galea.	Maxilla usually without galea, if present, ventrite 5 or 4 markedly longer than preceding one.

The representatives of the genera of the sub-family Monotominae (as listed in Junk Coleopterorum Catalogus) show some superficial resemblences with Cucujidae and heteromerous family Colydiidae. They can be easily separated from Cucujidae by their elytra being distinctly truncated at apex, maxillary galea poorly developed and finger-like, wing never with 5 anal veins, antennal club characteristic (Figs. 1-6), and from Colydiidae in having tarsal formula 5-5-5 in female 5-5-4 in male (except for the genus *Lenax* sharp), aedeagus univerted cucujoid-type, all the ventrites freely articulated and ventrite 1 markedly long, trochanters short and simple, dorsal surface of the body never rough and dull as found in majority of Colydiidae.

Classification

In Junk's Coleopterorum Catalogus, Méquignon (1914) and Hestschko (1930) listed 22 genera namely, **Rhizophagus* Herbst, *Pararhizophagus* Me'quignon, *Lenax* sharp, **Monotoma* Herbst, **Mono-*

tomopsis Grouvelle, *Monotopion* Reitter, **Mimemodes* Reitter, *Phyconomus* LeConte, *Platycephala* Montrz, *Pycnotomina* Casey, *Hesperobaenus* LeConte, **Europs* Wollaston, *Aneurops* Sharp, **Eporus* Grouvelle, *Macreurops* Casey, *Bactridium* LeConte, *Leptipsius* Casey, *Ixion* Reitter, *Tristaria* Reitter, *Thione* Sharp, *Smicrips* LeConte and **Shoguna* Lewis. Of these genera only seven (marked with asterisk) are so far known from India. In the present work three new genera namely, *Malabica* gen. nov., *Renuka* gen. nov., *Malinica* gen. nov. and the genus *Tarunius* Sen Gupta have been added to the family Rhizophagidae from India. The genus *Smicrips* has been shifted to constitute a separate family *Smicriphidae* Crowson (1955). The genera *Tristaria* and *Platycephala* belong to the families Lyctidae and Curculionidae respectively. The genus *Rhizophagoides* Nakane does not belong to Rhizophagidae as they do not have Rhizophagid-type of antennal club. Crowson (1955) classified Rhizophagidae into four subfamilies namely, Rhizophaginae, Monotominae, *Thioninae* and Lenacinae. Arnett (1968) classified North American Rhizophagidae into four subfamilies Rhizophaginae. Monotominae, Smicripinae and Hypocoprinae. In my Ph.D. thesis (unpublished, 1967) and in other joint work with R.A. Crowson, I have treated the genera *Smicrips* and *Hypocoprus* under the family Nitidulidae and Cryptophagidae respectively, which would be published elsewhere. In the present work the Rhizophagidae has been classified into two subfamilies Rhizophaginae (=*Rhizophagus*) and Monotominae, the latter subfamily has been classified into four tribes Monotomini (=*Monotoma*), Europini (=*Europs* and allied genera), Thionini (=*Thione* and *Shoguna*) and Lenacini (=*Lenax*). The chief differences of the subfamilies and tribes are included in the key.

Genera of RHIZOPHAGIDAE

Genus	*No. of species* (in Junk Catalogue)	*Distribution*
1. Subfamily : RHIZOPHAGINAE		
1. *Rhizophagus* Herbst	34	Temperate region of Old and New World.
2. Subfamily : MONOTOMINAE		
1. 1. Tribe : MONOTOMINI		

	Genus	*No. of species* (in Junk Catalogue)	*Distribution*
	2. *Monotoma* Harbst	39	Cosmopolitan
2.	Tribe : EUROPINI		
	3. *Pararhizophagus* Me'quignon	1	Malacca
	4. *Malinica* gen. nov.	1	India
	5. *Monotomopsis* Grouvelle	2	Oriental and Australian
	6. *Tarunius* Sengupta	1	India
	7. *Renuka* gen. nov.	1	India
	8. *Leptipsius* Casey	2	North and Central America
	9. *Malabica* gen. nov.	1	India
	10. *Monotopion* Reitter	1	Japan
	11. *Europs* Wollaston	50	Tropical zones of Old and New World
	12. *Eporus* Grouvelle	1	India
	13. *Mimemodes* Reitter	10	Oriental and Australian
	14, *Aneurops* Sharp	1	South America
	15. *Hesperobaenus* LeConte	7	North aed Central America
	16. *Bactridium* LeConte	31	New World
	17. *Pycnotomina* Casey	1	North America
	18. *Macreurops* Casey	1	North America
	19. *Phyconomus* LeConte	5	North and Central America
3.	Tribe : THIONINI		
	20. *Thione* Sharp	6	Central and South America and Australia
	21. *Shoguna* Lewis	7	Oriental and Madagasca
4.	Tribe : LENACINI		
	22. *Lenax* Sharp	1	New Zealand

HABIT AND HABITATS

There appear to be two basically different ways in which the adult beetles can adopt to spend most of their life under bark of trees—the 'flat' and the 'burrowing' modes—together with various intermediate adaptive types. Typical 'burrowing' types may be seen in some

Rhizophagidae e.g. *Lenax, Thione* and *Shoguna,* forms are more or less cylindrieal, with relatively large and elongate prothorax, short legs with rather stout apically widened tibiae which bear spines or denticles on outer edge, narrowly separated coxae, short and retractable antennae and with well marked club. *Rhizophagus* and some genera of Monotominae are more inclined towards the burrowing types in adult characters, having mouth parts rather of 'spore-eating' the 'mycelium-eating' type. Both adults and larvae of Rhizophagidae have primitive types of mouth parts to feed on fungal hypae and spore.

Most of the species are rather sluggish, usually live in pairs or in a small group under bark. I have collected them on several occasions in pairs or single but never in congregation. In India, the genus *Monotoma* was collected from haystack, vegetable garbage, and the genus *Mimomodes* from flowers (*Boga medula*) and haystack by the author. Other habitats from where various species of Rhizophagidae have been collected are rotten and fungus-infested wood. The larvae and adults of *Rhizophagus* have been recorded as predator on xylophagus insects and live in the tunnels of those insects. So far, Indian Rhizophagidae have been recorded from as high as 10,500 ft. Lolab Valley : Kashmir, and Tatrathach : Tharoch : Himachal Pradesh : (*Rhizophgus*) down upto the gangetic plane (Calcutta, *Europs*). In India, various species of *Rhizophagus* have been collected chiefly from the following trees : *Pinus* sp., *Cedrus deodara, Acer caesium, Abies pindrow* (twigs), *Quercus semecarpifolia, Betula utilts* ; *Malabica* from fire-wood ; *Mimemodes* from *Castanopsis tribuloides* and *Pinus* leaves ; *Malinica* from *Acer camphellii* ; *Monotomopsis* from *Duabangha sonneretioides, Shorea* sp. and Rani tree (local name) ; and *Europs* from *shorea* sp., *Bauhinia vahtii, Bombax* sp. and Kakar tree (local name).

GEOGRAPHICAL DISTIBUTION

The family Rhizophagidae occurs in all the zoo-geographical regions of the World. Although, several small genera of Rhizophagidae are spread over the warm climate zones, but majority of the species are hitherto recorded from warm-temparate zones, specially from Europe and North America. So far, a very few species were known from India and it was presumed that Rhizophagidae are rather rare in India. Recently, author has made extensive survey and collected several

thousands of microbeetles from fallen trees, dead trees, logs, haystack and vegetable garbage etc. from all over India. These collections represent several and varied Rhizophagidae and showed that the representatives of Rhizophagidae occur fairly abundently in India, specially along the foot-hills of Himalayas. The number of genera of Rhizophagidae are relatively more numerous than species and it is also noted that their distribution are rather restricted to specific climatic zone and in particular habitats. Most of the species are usually found in a small number. The habits of hiding in nature usually under moist bark or haystack, and their restricted and sluggish movement lead to the fact that they could not proliferate their speciation as seen in large families of Clavicornia. They exists in their specific nitches of typical climatic zones thus maintaining their dominance at the generic level. Only three genera namely, *Rhizophagus*, *Monotoma* and *Europs* are widely distributed in both the New and Old World, other genera are more or less restricted in their distribution.

The genera namely, *Eporus*, *Malinica*, *Renuka*, *Tarunius*, *Malabica*, *Aneurops*, *Monotopion*, *Pycnotomina*, *Macreurops*, *Pararhizobhgus*, *Lenax* are monotypic and are known to be endemic, of which the first five are from India and last six genera are from Japan, Guatimala, U. S. A., Malacca and New Zealand respectively. The genera *Monotomopsis*, *Mimemodes* and *Shoguna* are found predominantly in Oriental region, the last two genera are also recorded from Australia and Madagascar respectively. The other genera namely *Macreurops*, *Bactridium*, *Leptipsius*, *Hesperobaenus*, *Aneurops* and *Thione* are restricted to the New World, except for the genus *Thione*, of which one species has also been recorded from Australia.

Distribution of representatives of Rhizophagidae in India is noteworthy, of the 11 genera dealt with in the present study, only two genera *Monotomopsis* and *Monotoma* are represcnted from Southern India (Nilgiri hills), rest are restricted to Northern India, specially along the foot-hills of Himalayas. Distribution of the species of *Rhizophagus* are restricted to cold areas of the Himalayas and extend down as far as Dehra Dun and appear to be restricted to Western part of the Himalaya, except only one species of *Rhizophagus* (undescribed) which has also been recorded here from Nepal. On the

otherhand, the genera, namely *Eporus* (Assam), *Malabica* (Assam), *Malinica* (Darjeeling), *Renuka* (Sikkim), and *Tarunius* (Sikkim) are restricted to North Eastern India. Two genera namely, *Mimemodes* and *Monotomopsis* have been recorded from Eastern and Western part of foot-hills of Himalayas. Most widely distributed genus in India is *Monotoma*, members of which are found chiefly in haystack and vegetable garbage. I have collected *Monotoma* as far upto Jammu, and Chail (7494 ft.) : Himachal Pradesh in the North, Nilgiri-hills in the South, and Shillong and Kaziranga in the East, members of the genus has also been collected by the author from Gangetic plane (Calcutta and Gorakhpur) and Chotanagpur (Chaibasa).

SEXUAL DIMORPHISM

The male and female of majority species of the family are practically alike externally, but in some cases very striking differences occur. With exceptions of the genera *Shoguna*, *Thione* and *Lenax*, all the genera of Rhizophagidae have tarsal formula 5-5-5 in female and 5-5-4 in male. Male of Indian species of *Rhizophagus*, are usually slightly larger and prothorax of female shorter and their shape are different. Some species of *Mimemodes*, *Europs*, *Malabica*, male are larger in size with tempora of head markedly developed and prothorax short and relatively more strongly narrowed posteriorly (Figs. 13, 14), scape of antenna of male *Mimcmodes* markedly large (Fig. 43) and ventrite 1 with transverse row of distinct setae. Ventrite 1 of male of the genera *Europs*, *Lenax* and *Monotopion* have a distinct median rounded glandular pore (Fig. 151, 157) whereas in female this pore is absent.

Important characters for identification and classification

(1) *Size* : Majority species fall within the range 1.5 mm to 4.5 mm, larger species occur in the genera namely, *Rhizophagus*, *Hesperobaenus*, *Aneurops*, *Mimemodes*, *Lenax* and *Shoguna*. However size is very seldom a useful guide for identification.

(2) *Shape* : General appearance of the genera of Rhizophagidae is usually distinctive and definitely more useful character for identification than size and colour. The genera *Rhizophagus*, *Pararhizophagus*, *Malinica*, *Tarunius*, *Renuka*, *Monotoma*, *Monotomopsis*, *Shoguna* and *Lenax* have charasteristic appearance (Figs. 1, 2, 5,

6, 13, 20, 21), whereas *Thione* and *Shoguna* resemblence each other by their cylindrical forms. All the other genera more or less resemble *Europs* (Fig. 8). Male and female varies quite often in their shape, specially in Indian species of *Rhizophagus*, some species of *Mimemodes*, *Malabica* etc.

(3) *Colour* : More or less uniform throughout the family, except for some species of *Mimemodes* and *Monotoma*.

(4) *Head* : (a) *Neck constriction and Tempora* : Absent in *Rhizophagus*, *Shoguna* and *Thione*. Markedly well daveloped in *Lenax* and long in *Monotomopsis* (Figs. 52, 39).

(b) *Transverse line on vertex of head* (Fig. 49) : Present in the New World genera *Bactridium* and *Phycnotomia*.

(c) *Antennal cavity* (Figs. 38, 50) : Well developed and distinct only in *Rhizophagus*. In Monotominae cavity if present narrow on outer margin of genae.

(d) *Longitudinal grooves on anterior part of gular region* : Rarely present, in *Monotopion* these grooves are characteristic (Fig. 40).

(e) *Transverse groove on anterior part of gular region* (Figs. 41, 49). Present in most of the genera, absent in *Rhizophagus* and *Lenax*. In the genera *Malinica* and *Macreurops*, this groove is markedly developod and forming a V-shaped structure.

(f) *Labrum* (Fig. 1) not distinguishable in *Rhizophagidae*, except for the genera *Rhizophagus*, *Macreurops* and *Phyconomus*, where labrum is dorsal and separated from clypeus by a distinct suture.

(g) *Mandible*, *Maxilla* and *labium* : More or less uniform throughout the family, except for the genus *Monotoma*, where maxillary and labial palpi charaeteristic (Figs. 72, 95).

(h) *Antenna* : Although, earlier workers has often given much importance on antennal club, but only three types of variations occur in the family which are as follows : 1-jointed, 2-jointed and 2-joined with basal joint slightly larger than preceding joint. In *Lenax* apical joint of club markdly large and somewhat rounded.

(i) *Tentorium* (Figs. 38-52). Highly variable within the family Rhizophagidae. Tentorium of *Rhizophagus* (Fig. 38) is well

developed and if considered as primitive (lateral arms narrowed at middle and with median plate-like structuae), somewhat similar type of tentorium also found in *Hesperobaenus*, *Macreurops*, *Phyconomus* and *Mimemodes* (Figs. 47, 41, 50, 43), but these genera differ from *Rhizophagus* in having a distinct median pore on median plate. In *Phyconomus* anterior tentorial arms arising from a point whereas in other three genera *Leptipsius*, *Europs* and *Monotopion* lateral arms are united across middle by a transverse arm, in the former genus transverse arm possesses a median anterior short process, whereas in the latter two genera this median process is absent, but with a pair of small processes arising from inner margin of basal part of anterior arms. Similar type of pair of processes present in *Monotoma* (Fig. 45) but without a median transverse arm. Most of other genera of Rhizophagidae tentorium represented by two simple lateral arms, except for the genera *Lenax* (Fig. 52) and *shoguna* (Fig. 51), where it is characteristic.

(5) *Prothorax* (Figs. 97—112). Shape is often a useful character to recognise genera. Prothorax is cyllndrical in *Shoguna*, *Thione* and *Lenax* and their shapes are characteristic (Figs. 112, 20, 111). Shape of prothorax is characteristic in the genera *Renuka* (Fig. 6) and *Pycontomina* (Fig. 22). In *Monotomopsis* and *Tarunius* there is a distinct median longitudinal depressed area (Figs. 3, 5). Lateral margins of prothorax of *Rhizophagus* are almost smooth, whereas in most of other genera somewhat serrated, except for *Lenax*, *Shoguna*, *Thione* and *Pycnotomina*.

(6) *Mesocoxal cavities* (Figs. 113—127) : Distinctly open outwardly in *Rhizophagus*. Earlier workers mentioned that genera of Monotominae have closed mesocoxal cavities. In the present study, I have studied this structure by making slide preparation and found in all the genera mesocoxal cavities somewhat open outwardly and mesoepimera almost extending to the mesocoxal cavities. Mesocoxae usually narrowly separated, except for the genera *Monotoma*, *Monotomopsis*, where mesocoxae widely separated, in case *Pycnotomina* these are moderately widely separated.

(7) *Wing* (Figs. 128—138) : Most primitive-type and well developed

wing found in *Rhizophagus*, with 3 anal veins and front one running into subcubital fleck. Most of the other genera have single anal vein, except for the genus *Lenax*. Subcubital fleck occur only in the genera *Malabica* and *Macreurops*.

(8) *Metendosternite* (Figs. 113—127) : Primitive-type of metendostermite found in the genera *Rhizophagus* and *Malabica* (Figs. 113, 117). Somewhat similar type of metendostermite also observed in *Shoguna* ; in *Lenax* it is characteristic (Fig. 127). In other genera metendostermite represented by two simple apophysis.

(9) *Abdomen* : (a) *Intercoxal process of ventrite 1* (Figs. 140—157) : Usually narrow and its apex somewhat rounded, in the genera *Monotoma*, *Monotomopsis* and *Leptipsius* intercoxal proeess broad and its apex truncated. Intercoxal process of the genera *Shoguna*, *Thione* and *Lenax* are markedly narrow and pointed at apex.

(b) *Femoral lines on ventrite 1* (Figs. 146—154) : Often present, absent in the genera *Rhizophagus*, *Monotoma*, *Europs*, *Eporus*, *Macreurops*, *Renuka*, *Tarunius*, *Shoguna*, *Thione* and *Lenax*. Shape and length of femoral lines have some importance in identification of genera.

(c) *Aedeagus* (Fig 151—169) : Characteristic in *Rhizophagus*, *Malabica*, *Monotoma*. *Monotopion* and *Macreurops*, otherwise somewhat similar in other genera.

Definition of the family RHIZOPHAGIDAE :

General appearance (Figs. 1—22) somewhat uniform throughout the family, narrow-depressed, usually 2.5 to 4 mm in length,redish brown, with short antenna and characteristic Rhizophagidae-type of club (Fig. 38) and truncated elytra (Fig. 1).

Head (Figs. 38-45) usually exposed part of head as broad as long, neck constrictions often present with distinct tempora, if absent, posterior part of head progressively narrowed behind. Fronto-clypeal suture absent, antennal insertions lateral and partly hidden by projections of frons, rarely with a transverse line on vertex, a distinct impressed line present in frontal part of clypeus in *Rhizophagus*. Vertex of head usually smooth or punctured, sometimes with grooves or impressions (*Lenax* Fig. 52, *Monotoma* Fig. 45).

On ventral side, sometimes with well developed antennal cavities as found in *Rhizophagus* and *Lenax*, anterior part of gular region usually with slightly curved transverse groove, rarely with longitudinal lines as found in *Rhizophagus* and *Monotopion*. Genae well developed and projected, scape of antenna usually rests on outer margin of ganae at repose. Gular sutures widely separated. Tentorium is variable, often represented by two simple tentorial arms sometimes these two arms united by a median plate (*Rhizophagus*, Fig. 38 ; *Hesperobaenus*, Fig. 47) or a transverse bridge (Fig. 46), rarely with a median projection from transverse bridge or a pair of inner processes arising from basal part of anterior arms (Fig. 40). Tentorium of *Lenax* and *Shoguna* are characteristic (Figs.52, 51).

Mandible (Figs. 53-67) more or less uniform throughout the family, with well developed mola, usually with single apical tooth, sometimes with two and rarely with three apical teeth (*Malabica*). Mandibular cavity present in *Mimemodes*, traces in *Rhizophagus* and *Leptipsius*.

Maxilla (Figs. 68-83) with well developed lacinia, its inner and apical margin fringed with hairs and without apical spine, galea poorly developed, finger-like and with a few hairs at apex. Palpi normal, with segments 2 and 3 subequal and apical segment elongate, narrowed at apex and somewhat fusiform, except for the genus *Monotoma*, where segment 2 markedly large, segment 3 short and transverse and apical segment short and narrowed at apex.

Labium (Figs. 84-96) often elongate, mentum variable in shape, rarely with a pair of round pockets (*Lenax*) present on ventral surface of mentum, palpi normal with apical segment elongate, sometimes segment 2 markedly large with short apical segment (*Monotoma*), ligula sometimes distinguishable.

Antenna (Figs. 38-52) rather short, always 10-jointed with 1 or 2 jointed club, scape usually moderately large and oblong, sometimes in case of male scape markedly developed (Fig, 43), pedicel usually slightly shorter than joint 3, joints 4-8 or 9 subequal. Club always characteristic Rhizophagid-type.

Prothorax (97-112) variable in shape (often shape different in male and female) lateral margins sometime finely serrated, usually as broad as long, rarely markedly elongated (*Lenax*, *Shoguna*, *Thione* and

Monotompsis), without prebasal impressions, sometime pronotal disc depressed and with lateral longitudinal ridges (Fig. 109). Front coxal cavities usually rounded with hidden trochantins, rarely transverse with exposed trochantins (*Rhizophagus*), somewhat similar type of cavities as in *Rhizophagus* also found in Central American genus *Aneurops* and *Malinica* gen. nov. from India Front coxal cavities externally broadly closed behind and internally open. Prosternal process somewhat uniform, elongate, broaden towards apex, apical margin straight, sometimes lateral margins slightly ridged.

Meso-metathhrax (Figs. 113-127) well developed, mesocoxae usually closely situated, rarely contiguous or very widely separated, moderately widely separated in the genera *Monotoma* and *Monotomopsis*. Mesocoxal cavities open outwardly and mesoepimera extending to the mesocoxal cavities. Sternal fitting between mesocoxae with a single knob or a projection from metasternum. Mesocoxal lines absent, metasternum transverse, median impressed line usually extending to anterior two-thirds of its length. Hind coxae usualy moderately closely situated, rarely widely or very closely situated. Metendosternite well developed in *Rhizophagus,* with anterior tendons closely situated, somewhat similar type of metendosternite occur in the genera *Malabica* and *Shoguna*. In other genera metendosternite represents by two simple apophysis.

Elytra short, usually parallel-sided leaving last abdominal tergite uncovered, scutellary striole absent, with 9 rows of distinct punctures, interstices sometimes raised, usually glabrous to sparsely pubescent, epipleura narrow and complete up to apices.

Wing (Figs. 128-138) usually with single anal vein, raerely with 3 anal veins (*Rhizophagus*), subcubital fleck present only in the genera *Rhizophagus*, *Malabica* and *Macreurops*, in former two genera the front anal vein running into subcubital fleck. Radial cell absent and r-m cross often distinct.

Legs (Figs. 114-127), rather short, trochanters simple, short, sometimes approaching heteromeroid-type, femora variable, tibiae broadened at apex with normal two spurs, tarsi simple, apical segment as long as preceding one together, segment 1 minute and usually not distinguishable, tersal formula 5-5-5 in female and 5-5-4 in male, except for *Lenax*, *Shoguna* and *Thione*, former genera have tarsal formula 4-4-4 in both

sexes, whereas latter two genera have 5-5-5 in both sexes, claws simple.

Abdomen (Figs. 140-157) narrow-elongate, slightly narrowed posteriorly, at least last tergite is uncovered by elytra. Ventrite 1 markedly longer than ventrite 2, ventrites 2-4 equal in length, ventrite 5 distinctly longer than ventrite 4. Intercoxal process usually narrow, rarely sharply pointed (*Shoguna*, *Thione*) or broad and truncated at apex (*Monotomopsis* and *Monotoma*) ; femoral lines often present, usually parallel-sided and sometimes diverging posteriorly. A median glandular pocket sometimes present on ventrite 1. Tergite 7 markedly long, 6 pairs of spiracles usually lying on the edges of first 6 tergites, tergite 7 devoid of spiracles. Aedeagus (Figs. 158-169) short, of uninverted Cucujoid-type, tegmen complete or incomplete and without parameres, usually with a pair of long thread-like median struts, in resting condition usually oriented normally, rarely turned in one side (*Rhizophagus*). Ovipositor (Figs. 170-171) well developed with separate paraprocts, valvifers, coxities and styli attached at the apex of coxites.

Key to the subfamilies, tribes ana genera of adult RHIZOPHAGIDAE

1. Front coxal cavities distinctly transverse with exposed trochantins (Fig. 97); mesocoxal cavity open outwardly (Fig. 113) ; transverse suture on anterior part of gular region absent (Fig. 38) ; antennal cavities well developed and strongly converging (Fig. 38) ; wing with 3 anal veins (Fig. 128) ; neck constriction absent ; labrum exposed (Fig. 38) ; aedeagus turned on one side. Temparate zone of New and Old World. Subfamily Rhizophaginae ... *Rhizophagus* Herbst

1′ Front coxal cavities round with hidden trochantins (Fig. 107) ; mesocoxal cavities almost closed to open outwardly ; transverse suture on anterior part of gular region present (Fig. 41) ; antennal cavities comparatively poorly developed and diverging (Fig. 40) ; wing usually with 1 anal vein (Fig. 130) ; neck constriction usually prominent (Fig. 39) ; labrum usually fused with clypeus ; aedeagus not turned on one side. Subfamily Monotominae 2

2(1′)	Tarsal formula 5-5-5 or 4-4-4, in both sexex ; species narrow or cylindrical (Figs. 18, 19, 20, 21) ; coxae almost contiguous (Fig. 37) ...	3
2′	Tarsal formula 5-5-4 in male and 5-5-5 in female ; species different in shape ; coxae well separated at least not contiguous ...	5
3(2)	Tarsal formula 4-4-4 in both sexes ; head with distinct tempora ; fornt margin of clypeus evenly rounded, with a transverse line on vertex and latter characteristcally excavated (Fig. 52) ; elytra characteristically sinuate near middle ; wing with 2 anal veins (Fig. 133) ; prothorax (Fig. 21) somewhat pear-shaped. New Zealand. Trible Lenacini ...	*Lenax* Sharp
3′	Tarsal formula 5-5-5 in both sexes ; head (Figs, 19, 20) markedly long, front margin of clypeus notched, without transverse line and excavation on vertex ; elytra parrallel-sided (Figs. 19, 20). Tribe Thionini ...	4
4(3′)	Ventrite 5 almost equal to ventrite 4 (Fig. 156). Central America and Australia ...	*Thione* Sharp
4′	Ventrite 5 markedly long (Fig. 155). South East Asia and Africa ...	*Shoguna* Lewis
5(2′)	Maxillary palpi and labial palpi with segment 2 markedly enlarged (Figs. 74, 95). Prothorax characteristic (Figs. 23A, 107), lateral sides usually narrowly explanate and its margin serrated and setiferous ; pronotum and head usually with a pair of exavations and head with a median distinct groove (Fig. 23A), Cosmopolitan. Tribe Monotomini ...	*Monotoma* Herbst
5′	Maxillary and labial palpi with segment 2 normal (Figs. 71, 86). Tribe Europini nov. ...	6
6(5′)	Front angles of prothorax excavated (Fig. 27) and basal part of gular region of head bulging. Malacca ...	*Pararhizophagus* Méquignon
6′	Front angles of prothorax not excavated and basal part of gular region of head not bulging and normal ...	7
7(6′)	Antennal club 1-jointed (Fig. 44) ...	8
7′	Antennal club 2-jointed (Fig. 39) ...	13

8(7) Head (Fig. 43) markedly large with very prominent tempora especially in male ; mandible with a dorsal cavity (Fig. 57) ; intercoxal process of ventrite 1 narrow and femoral lines very short. India, South East Asiatic countries, Japan and Australia ... *Mimemodes* Reitten

8′ Head normal with poorly developed tempora (Fig. 33) ; mandible without dorsal cavity (Fig. 67) ; intercoxal process usually broad with well developed femoral lines (Fig. 34) ... 9

9(8′) Prothorax distinct-type (Fig. 5), parallel-sided and slightly elongate ; formoral lines absent (Fig. 29) ; coxae closely situated, Sikkim ... *Tarunius* Sen Gupta

9′ Prothorax different ; femoral lines present (Fig. 33) ; coxae usually more widely separated 10

10(9′) Prothorax characteristic (Fig. 22) ; species broadly elongate (Fig. 22) ; coxae widely separated, mesocoxal lines and femoral lines diverging and intercoxal process of ventrite 1 markedly broad (Fig. 23). North America. ... *Pycnotomina* Casey

10′ Prothorax different ; species narrowly elongate (Figs. 16, 17), coxae less widely separated, mesocoxal lines absent, femoral lines not diverging (Fig. 33), intercoxal process of ventrite 1 less broad ... 11

11(10′) Neck constriction of head and antennal cavities absent (Fig. 49) ; basal part of gular region behind eyes with a transverse line ; prothorax broadest across middle and lateral margins rounded (Fig. 16). North and South America *Bactridium* LeConte

11′ Head (Fig. 17) with neck constriction and tempora distinct ; antennal cavities present (Fig. 44) or absent ; basal part of gular region without a transverse line ; prothorax narrowed posteriorly (Fig. 12) ... 12

12(11′) Antennal cavities (Fig. 44) present ; wing with a subcubital fleck (Fig. 130) ; metendosternite with a pair of anterior tendons (Fig. 117) ; intercoxal process of ventrite 1 narrow and pointed at apex (Fig. 146). India ... *Malabica* gen. nov.

12′ Antennal cavities absent (Fig. 48) ; wing without subcubital fleck (Fig. 136) ; metendosternite (Fig. 123) with only two simple apophysis ; intercoxal process of ventrite 1 broadly rounded (Fig. 33). North America ... *Leptipsius* Casey

13(7′)	Shape of prothorax not like *Europs* ...	14
13′	Shape of prothorax *Europs*-type (Fig. 8) ...	17
14(13)	Prothorax *Rhizophagus*-type (Fig. 2), shape somewhat elongate, front-angle rounded, lateral margin smooth. Ventrite 1 with a pair of well developed femoral lines ; front coxae with partly exposed trochantins. Darjeeling ...	*Malinica* gen. nov.
14′	Shape of prothorax different ...	15
15(14′)	Shape of prothorax characteristic (Fig. 6), broadest at anterior one-third and narrowed in front and behind ; ventrite 1 without femoral lines ; antennal cavities (Fig. 30) present. Sikkim ...	*Renuka* gen. nov.
15′	Shape of prothorax different ...	16
16(15′)	Prothorax distinctly long, somewhat parallel-sided (Fig. 15) ; femoral lines absent ; wing with subcubital fleck and 2 anal veins (Fig. 129) ; labrum exposed (Fig. 15) ; transverse line on anterior part of gular region distinctly triangular (Fig. 41). North America ...	*Macreurops* Casey
16′	Prothorax somewhat elongate, broadest at middle and evenly narrowed in front and behind (Figs. 3, 4) ; pronotum characteristically sculptured (Figs. 3, 4) ; wing (Fig. 132) without subcubital fleck and one anal vein ; labrum not exposed ; 7th interval of elytra carinate (Fig. 3) ; femoral lines (Fig. 150) well developed and intercoxal process of ventrite 1 broad. India, South East Asiatic countries and Australia ...	*Monotomopsis* Grouvelle
17(13′)	Elytral puncturation irregular (Fig. 24). North and Central America ...	*Phyconomus* LeConte
17′	Elytral puncturation in regular rows ...	18
18(17′)	Anterior part of gular region with a pair of well developed longitudinal grooves converging towards centre (Fig. 40) ; ventrite 1 with a pair of well developed long femoral lines and a median pore in male (Fig. 151) ; tentorium as figured (Fig. 40). Japan ...	*Monotopion* Reitter
18′	Anterior part of gular region without longitudinal grooves but with a transverse line (Fig. 47) ; femoral lines if present short (Fig. 153) ; tentorium (Fig. 47) different ...	19

19(18′)	Antenna with pedicel shorter than joint 3 and joint 10 markedly large (Fig. 9); prothorax almost parallel-sided, as broad as long and squarish (Fig. 9); basal part of fronto-clypeal region with a pair of depressed area. Assam : India ...	*Eporus* Grouvelle
19′	Antenna with pedicel and joint 3 equal in length and joint 10 not markedly large; prothorax narrowed posteriorly; basal part of fronto-clypeal region without depressed area ...	20
20(19′)	Ventrite 1 with short femoral lines (Fig. 153); antennal cavities present (Fig. 47) ...	21
20′	Ventrite 1 without femoral lines; antennal cavities absent; ventrite 1 with a median pore in male (Fig. 143); wing with subcubital fleck (Fig. 131); transverse line on vertex of head behind tempora on gular region often present (Fig. 46); metendosternite with a pair of anterior tendons (Fig. 114). India, South East Asiatic countries, Africa and North and South America ...	*Europs* Wollaston
21(20′)	Front coxal cavities with partly exposed trochantins (Fig. 31); antennal joint 9 transverse (Fig. 7). Guatemala ...	*Aneurops* Sharp
21′	Front coxcal cavities with fully covered trochantins (Fig. 100); antennal joint 9 rather long and conical (Fig. 10). North America, Hawaii, Tahiti and Sandwich Island ...	*Hesperobaenus* LeConte

Larval characters of the Family RHIZOPHAGIDAE

General from usually fusiform, sometimes markedly narrowed posteriorly (*Lenax*), dorsal surface with or without tuberosites, antenna short and urogomphi usually characteristically nodose or bifid (Figs. 172, 179).

Head (Figs. 173, 175, 180) transverse, frontal sutures often distinct and of Cucujoid-type, without metopic suture and endocarnia. Dorsal surface smooth or with tuberosities, clypeus rather short and broad and fused with frons, labrum articulated with clypeus. On ventral side hypostomal rods indistinct. Ocelli 2 or 3 on each side of head or absent. Antennae (Frgs. 173, 175, 183) short, joint 1 strongly transverse, joint 2 equal to or slightly longer than joint 3, sensory appendage

about half of the length of joint 3. Mandible (Figs. 174, 176, 182) with two apical teeth which are dentate on inner margin, sometimes one of them nondentate and divided apically, mola well developed, its ventral side with rows of asperites and dorsal side with faint rows of ridges, prostheca narrow, its apex usually pointed at apex or bifid and caudal margin sometimes with a row of fine short setae-like processes, ventral crushing tubercle well developed. Maxilla (Figs. 173, 178, 181) with mala falciform and as long as or longer than palpi, dorsal row of setae on inner margin extending almost to base of mala with dorsal groups of denticles on base of mala and palpiger, usually with a rounded process on inner margin of stipes. Cardo moderately large, forming a sharp angle with stipes ; maxillary articulating area well developed and somewhat oval. Labium rather broad, palpi one or two-segmented, hypopharyngeal bracon well developed.

Thorax and *Abdomen* : Porothorax slightly longer and narrower than mesothorax. Meso-and metanota similar to abdominal segments, body usually broadest across 3rd or 4th abdominal segments, except in *Lenax*, where it is broadest across meso-and metathorax. Tergites often with tuberosities bearing short and blunt setae or spines, often tergites anteriorly with a transverse keeled line, sometimes with patches of asperites, occassionally each segment of body with lateral complex processes directed posteriorly, *Lenax* (Fig. 179). Abdominal segments 7-9 psogessively narrower and more or less equal in length. Urogomphi usually rather short and characteristic (Fig. 172), except in *Lenax*, where urogomphi are more or less simple (Fig. 179), pregomphal process often present near the base of urogomphi. Segment 10 forming a somewhat projecting rounded pygopod.

Spiracles and *Legs* : Spiracles placed either on body surface or on short projections, bicameral (Fig 172) or annular. Legs rather short, coxae more closely situated than Cucujidae, claw simple with two tarsungular setae, lying side by side (Fig. 172).

Key to the larvae of the subfamilies of RHIZOPHAGIDAE

1. Labial palpi two-jointed (Fig. 173). Tergal plates not armed with tuberosities or asprites, setae simple ... Rhizophaginae (*Rhizophagus*)

2. Labial palpi one-jointed (Fig. 181). Targal plates armed with tuberosities or densely asperated (Fig. 179) or with fan-shaped or blunt setae ... Monotominae (*Monotoma, Lenax, Hesperobaenus*)

1. **Rhizophagus** Herbst

Rhyzophagus Herbst 1793, *Käf* 5 : 18.
Rhyzophagus Gyllenhal 1813, *Ins. Svec.* : 420.
Lyctus Fabricius 1792, *Ent. Synt.* I (2) : 502.
Colydium Fabricius 1801, *Syst. El.* 2 : 557.
Synchita Hellow 1792, *ap. Schneid. Mag.* : 404.
Ips. Olivier, 1790, *Entom. II*, gen. 18 : 7.

Type species : *Rhizophagus bipustulatus* (Fabricius) (locality-Europe).

Herbst (1844) established the genus *Rhizophagus*, Méguignon (1914), in Junk Coleopterorum Catalogus listed 34 species from the World. Recently, Tozer (1968) has described one more species of *Rhizophagus* from Greece. Only one species from India was known since the discovery of second species from India by Sen Gupta and Biswas (1977). In present study a series of *Rhizophagus* specimen from different parts of Himalayas have been studied, which will be dealt elsewhere. The representatives of this genus strictly restricted to the cooler climatic zone of the New and Old Worlds. In India this genus is restricted to base of Himalaya, predominate in North-West Himalayas and extending up to Darjeeling District of West Bengal. *Rhizophagus* has been subdivided into four gubgenera viz., *Rhizophagus* s. str., *Eurhizophagus* Méquignon, *Anomolophagus* Reitter and *Cyanostolus* Gangulbauer. All the Indian species fall under the subgenus *Rhizophagus* s. str., species being non-metallic in colour and second elytral interstices not broadly widened. Unlike European species *R. picipes* (Olivier), *R. ferruqineus* (Paykull), *R. perforatus* Erichson and *R. parallelocollis* Gyllenhall, Indian species have third antennal joint one and half times longer than pedicel. Indian species of *Rhizophagus* are nearest to the species *R. nitidulus* (Fabricius) and *R. simplex*, but can be easily separated from former two species by their eyes being small, last abdominal segment simple and pronotum narrowed posteriorly.

Representatives of this genus can be easily distinguishable from other genera of Rhizophagidae by its front coxal cavities being

transverse with exposed trochantins, head without distinct neck constrictions, labrum exposed (Fig. 38), lateral margins of prothorax smooth, femoral lines on ventrite 1 absent, wing (Fig. 128) with three anal veins, aedeagus (Fig. 158) and tentorium (Fig. 38) well developed and characteristic.

General appearance (Fig. 1) depressed, elongated more or less parallel-sided or slightly narrowed in front and behind, dorsal surface shiny and usually blackish brown, length varies from 2.00 mm. to 4.70 mm.

Head (Fig. 38) broadest across eyes and progressively slightly narrowed in front and behind, eyes normal, not projecting and somewhat finely faceted, antennal inseriion hidden, clypeus broad and separated from labrum with a curved impressed line, vertex without transverse line. On ventral side of head, antennal cavities well developed and converging posteriorly, anterior part of gular region longitudinal and transverse impressed line absent, basal part of gular region often with a median curved small groove. Mandible (Fig. 53) with 2 apical teeth, mola well developed but not projected. Maxilla (Fig. 68) with a narrow, elongated finger-like galea, lacinia well developed with its inner margins fringed with hairs, palpal segment 2 slightly longer than segment 3 and apical segment fusiform. Labium with palpal segments 2 and 3 elongate and almost equal, Antenna (Fig. 38) rather short, 10-jointed, scape moderately large and elongate, pedicel short, joint 3 about one and half times longer than pedicel and broadened at apex, joints 4-9 short, transverse and subequal, joint 10 forming a compact, typical rhizophagid-type club.

Prothorax (Fig. 97) usually elongate and slightly narrowed posteriorly, lateral margins smooth except near hind angles with four small teeth (Fig. 1), prebasal impressions absent, pronotum usually more sparsely punctured. Front coxal cavities rather closely situated, cavities obliquely transverse with trochantins fully exposed, cavities internally and externally closed behind. Prosternal process narrow at base and broadened at apex.

Meso-metathorax (Fig. 113) : Mesocoxae narrowly separated, sternal fitting between them with a single knob, cavities distinctly open outwards and mesoepimera extending to mesocoxal cavities. Metacoxae rather narrowly separated, median impressed line extending

to anterior two-thirds, metendosternite well developed and anterior tendons rather closely situated.

Elytra and Wing : Elytra elongate, almost parallel-sided, truncated at apex exposing last abdominal tergite, puncturation arranged in regular rows, epipleura narrow and complete upto apex. Wing (Fig. : 128) well developed with 3 anal veins, front one running into subcubital fleck, anal and redial cell absent.

Legs (Fig. 1) rather short, trochanters short and simple, each trochanter with a single distinct large seta, tibiae broadened at apex, outer apical angle with a pair of two distinct spurs, more prominent on front tibiae, outer margins of tibiae armed with 3 small spines, tarsi simple, segment 1-4 almost equal, tarsal formula 5-5-5 in female and 5-5-4 in male, claws simple.

Abdomen (Fig. 140) elongate, ventrite 1 markedly long, ventrites 2-5 almost equal, ventrite 1 without femoral lines, intercoxal process nerrow and somewhat pointed at apex. Tergite 7 markedly long, 6 pairs of spiracles lying on edges of tergites, tergites 7 devoid of spiraeles. Aedeagus (Fig. 158) uninverted cucujoid-type, without articulated parameres, in resting condition turned in one side, tegmen complete, median stttuts single and moderately long. Ovipositor with paraprocts, valvifers, coxities and styli minute attached near apex.

Larval characters : Böving and Craighead (1931) described the larva, chief characters of larva are : head with cucujoid-type of frontal sutures ; ocelli 2 on either side of head ; mandible with two apical teeth, mola well developed, prostheca slender and pointed at apex ; maxillary mala falciform ; maxillary articulating area well developed ; labial palpi 2-segmented ; urogomphi short and characteristically branched (Fig. 172) ; spiracles bicameral ; legs short, claws simple with two tarsangular setae lying side by side.

Habitat : Larvae and adults are predaceous on xylophagous insects. Live under bark of logs and fallen dead trees in forest, also found in rotten and fungus infested wood.

Geographical distribution : Cooler climatic zones of the New and Old Worlds, [not represented in S. America, Australia, Southern part of Africa, Madagascar and Southern India.]

Subfamily : *MONOTOMINAE*

Tribe : MONOTOMINI nov.

2 **Monotoma** Herbst

Monotoma Herbst 1793, Käf. V : 22.

Type species : *Monotoma picipes* Herbst, 1793, Käf. V. : 24 (Locality —Europe).

This is one of the largest genera of the family Rhizophagidae, Hetschko (1930) listed 39 species under this genus and cosmopolitan in distribution. So far, only one species *M. hindustana* was known from India, another three species recorded here from India which are *M. picipes* Herbst (Calcutta), *M. spinicollis* Aubé (Calcutta), *M. diecki* Reitter (Chaibasa : Bihar).

Monotoma is a distinct genus, unlike other genera segment 2 of maxillary and labial palpi markedly enlarged, moreover, disc of pronotum characteristically excavated. Here the genus *Monotoma* is treated as a separte tribe under subfamily Monotominae.

General appearance (Fig. 23A) elongated, not very or slightly depressed, narrowed in front and behind, dorsal surface brownish to brown, dull to slightly shiny, and covered with moderately dense and semierect short setae.

Head (Fig. 45) elongate, labrum fused with clypeus, transverse line behind tempora on vertex present or absent, tempora well developed, vertex often excavated, antennal insertions lateral, anterior part of gular region with a transverse line, a transverse impressed line present at basal part of gular region behind the eyes, eyes rather small and slightly projected, tentorium (Fig. 45) represented by two arms. Antenna rather short, scape large and globular, pedicel smaller than scape and globular, joint 3 narrower than pedicel and elongated, joints 4-8 short and equal, joint 9 slightly larger than joint 8, joint 10 forming a single-jointed compact club. Mandible (Fig. 59) with well deoeloped mola and single bifid apical tooth. Maxilla (Fig. 74) with well developed lacinia, galea narrow and finger-like, palpi with segment 2 markedly large, segmet 3 transverse, apical segment rather short, elongated and somewhat parallel-sided. Labium (Fig. 95) with transverse mentum, palpi with segment 2 markedly large and apical segment minute.

Prothorax (Fig. 107) slightly transverse to elongate, lateral margin

finely serrated, pronotum excavated, front coxae round, cavities broadly closed behind, prosternal process moderately broad and its apical part broadly rounded.

Meso-metathorax (Fig. 125) : Mesocoxae moderately widely separated, sternal fitting between them with a single broad knob, mesosternal process moderately broad, mesocoxal cavities externally partly open outwardly. Metasternum slightly elongate, metacoxae widely separated, median impressed line extending slightly more than half of its length. Metendosternite reduced, represented by two appophysis.

Wings and elytra : Wing (Fig. 137) with single anal vein and r-m cross vein but without subcubital fleck. Elytra broadest at middle and slightly narrowed in front and behind, punctunations arranged in irregular rows, dense and interstices not distinct.

Legs (Fig. 125) moderately long and rather slender, trochanter short and simple, femora swollen at middle, tibiae not broadered at apex and with two normal spurs, tarsi short and simple, claws simple.

Abdomen (Fig. 145) elongate and narrowed at apex, ventrite 1 longest, without femoral lines, intercoxal process broad and its apical margin slightly rounded, ventrite 2-4 short and equal, ventrite 5 longer than ventrite 4. Aedeagus (Fig. 169) short and broad with long, thread-like, widely separated median struts.

Larva known : *Monotoma producta* LeConte.

Habitat : Leaf-litter and vegetable garbage.

Geographical distribution : Cosmopolitan.

Tribe : **Europini** nov.

3. **Pararhizophagus** Méquignon

***Pararhizophagus*, Méquignon 1913.** ***Bull. Soc. ent. Fr.*, p. 44.**

Type species : *Pararhizophagus Grouvelli* Mèquignon 1913. *Bull. Soc. ent. Fr.*, p. 44 ; (Locality : Malacca).

Méquignon (1913) established this monotypic genus from Malacca. This is very distinct genus, unlike others front angles of prothorax excavated, basal part of gular region bulging. Méquignon mentioned that *Pararhizophagus* is allied to the genus *Lenax* Sharp.

General appearance (Fig. 27) elongate, moderately convex, strongly punctured above and deep brown.

Head elongate, with distinct neck, tempora well developed and subparallel, vertex with a strong transverse depression, eyes small. Antenna 10-jointed and short, scape moderately large, pedicel elongate but smaller than scape, joint 3 slightly narrower but as long as pedicel, joints 4—8 short and equal, joint 9 slightly larger than joint 8, club 1-jointed and hairy. Mouth parts not studied ; apical segment of maxillary palpi and labial palpi elongate and oblong respectively. On ventral side antennal cavities well developed and parallel-sided, basal part of gular region bulging.

Prothorax rather convex, elongate, narrowed posteriorly, lateral margin uniformly curved and smooth, front angle of prothorax on ventral surface excavated, front coxal cavities slightly transverse with partly exposed trochantins, coxae moderately closely seperated, prosternal plocess not broaden at apex.

Wing and elytra : Wing not studied. Elytra truncated exposing the pygidium, sutural striae absent, punctures arranged in 10 rows.

Meso-metathorax : Meso and metacoxae moderately closely separated, median impressed line on metasternum extending slightly more than half of its length. Legs not studied.

Abdomen : Elongate, ventrite 1 distinctly longer than segment 2, without femoral lines, intercoxal process narrow and moderately pointed at apex, ventrite 2-4 short and equal in length, ventrite 5 elongate and narrowed posteriorly. Aedeagus not studied.

Larva : Not known.

Habitat : Not known.

Geographical distribution : Malacca.

4. **Malinica** Gen. nov.

Type species : *Malinica ranjana* sp. n. (locality—Darjeeling)

This monotypic genus is quite unlike to other genera, have very distinct type of prothorax (Fig. 2), rather similar to the genus *Rhizophagus*, its front angles broadly rounded, shape somewhat elongate, lateral margin smooth, front coxal cavities with partly exposed trochan-

tins, ventrite 1 with a pair of distinct and well developed femoral lines. Partly exposed front trochantins and slightly transverse front coxal cavities are similar to that of Central American genus *Aneurops* Sharp, but shape of prothorax especially rounded front angles is different and also lateral margins of prothorax smooth and form narrow-elongate (Fig. 2).

Grouvelle (1903) described a species *Europs indica* from Darjeeling, based on a single specimen, which well might be a number of this genus, having similar type of prothorax with front angles strongly rounded. The author is unable to examine this species, Grouvelle did not mention in his description, place where type specimen has been deposited. The new species described below differs from *Europs indicus* Grouvelle in having elongated prothorax, dorsal surface deep brown (freshly hatched specimans are pale yellowish brown) and form (Fig. 2) narrow, elongate and not parallel-sided.

General appearance (Figs, 2, 28) narrow, elongate, dorsal surface deep brown and almost glabrous.

Head (Figs. 2, 28) longer than broad, tempora well developed and its posterior angles rounded, eyes moderately large and finely faceted, labrum fused with clypeus, antennal insertions partly open and lateral, transverse line on anterior part of gular region imerginate posteriorly (Fig. 28), antennal cavities present, transverse line behind tempora on ventral surface absent, tentorium not studied. Antenna (Fig. 2) 10-jointed, scape moderately large, pedicel broadly elongate and smaller than scape, joint 3 narrow, elongate and slightly shorter than pedicel, joints 4-8 short and equal, joints 9 and 10 forming a distinct 2-jointed club. Mouth-parts not dissected, mandible apparently with single apical tooth, maxillary and labial palpi normal.

Prothorax (Fig. 2, 28) longer than wide, narrowed posteriorly, front angles rounded, lateral margins smooth, front coxae broadly closed behind, cavities slightly transverse with exposed part of trochantins slit-like, prosternal process narrow at base and broad at apex, its apical margin almost straight (Fig. 28).

Meso-metathorax (Fig. 28), mesocoxae moderately widely separated, sternal fitting between them in a single distinct knob from metasternum, mesocoxal cavities distinctly open outwardly and mesoepimera extending to mesocoxal cavities. Metasternum slightly transverse, medium

impressed line extending to more than half of its length, metacoxae moderately closely situated. Metendostermite not studied.

Elytra (Fig. 2) broadest at middle, with 8 rows of strial punctures, epipleura narrow and complete upto the apex. Wing not studied.

Legs (Fig. 2) rather short, trochanter short and simple, femora swollen towards anterior two-thirds, tibiae slightly broad at apex, tarsi simple and short, tarsal formula 5-5-5 in female and 5-5-4 in male claws simple.

Abdomen (Fig. 28) elongate, narrowed posteriorly, ventrite 1 longer than ventrite 2, ventrites 2-4 short and equal, ventrite 5 longer than ventrite 4, ventrite 1 with a pair of well developed moderately widely separated femoral lines, intercoxal process moderately broad at base, narrowed towards apex and roundedly pointed at apex. Genitalia not studied.

Habitat : Under bark of *Acer Campbellii.*

Geographical distribution : Darjeeling District, West Bengal : India.

5. **Malinica ranjana** sp. n.

Measurement of holotype : Total length 4.85 mm, width of head across eyes 0.90 mm ; length of antenna 0.90 mm ; width of prothorax across anterior one-third 1.00 mm ; length of elytra 2.25 mm and width across middle 1.28 mm.

General appearance as figured (Fig. 2), dorsal surface uniformly deep brown (newly hatched form pale yellowish brown), coarsely punctured, almost glabrous and shinny.

Head elongate, puncturation of vertex coarse and moderately dense, that of towards front progressively finner and sparser. Eyes moderately large and black. Tempora well developed, its length equal to width of each eye. Triangular emergination across antennal base poorly developed and only prominent at base. Antenna moderately long and slender, club densely and finely pubescent, joints 1-8 sparsely pubescent. *Prothorax* broadast across anterior one-third, distinctly narrowed posteriorly, front angle broadly rounded, hind angle less so, lateral, front and hind margin narrowly bordered and smooth. Punctuation on pronotum uniform, moderately coarse and dense, medium longitudinal impunctate area narrow and parrallel-sided. *Scutellum*

moderately large, as broad as long, narrowed posteriorly and apical angle somewhat round, glabrous and impunctate. Elytra broadest at middle, slightly norrowed in front and more so posteriorly, humral angles rounded, puncturation deep in rows, moderately large, width of each puncture broarder than width of interstices when look at dorsally, each puncture bear a short récumbent seta directing posteriorly, interstices narrow and glabrous. Last exposed abdominal tergite uniformly and coarsely punctured and very finely pubescent. *Legs* paler. Prosternum, metasternum, ventrites 1 and 5 coarsely and sparsely punctured, ventrites 2-4 with a transverse row of punctures (Fig. 28).

Sexual diamorphism :

	Male	Female
1.	Larger	Smaller
2.	Tempora of head large	Tempora of head small
3.	Tarsal formula 5-5-4	Tarsal formula 5-5-5
4.	Head and prothorax glabrous	Head and prothorax finely pubescent

Types : Holotype ♂ and Paratype ♀, Debrepani 6000 ft., Darjeeling, West Bengal, J. C. M. Gardner Coll., 19.IX.1929, ex. *Acer campbellii*, Holotype in deposited Forest Research Institute, Dehradoon and paratype in the Zoological Survey of India, Calcutta.

6. **Monotomopsis** Grouvelle

Monotomopsis Grouvelle, 1896. *Ann. Mus. Genova* (2), 16 (36) : 38.

Type species : *M. Monotomoides* Grouvelle (locality—Tasmania).

Grouvelle (1896) established this genus based on single species *M. monotomoides* but did not gave a detail description of the genus, in 1908 he added the second species *M. andrewesi* from Nilgiri hills. This is a distinct genus, can be easily separated from other genera by its characteristic shape of prothorax (Figs. 3, 4), coxae comparatively widely separated, intercoxal process of ventrite 1 broad and its apex straight (Fig. 148), head markedly elongated (Fig. 39). The species *Monotomopsis monotomoides* is recorded here for the first time from India (Rajabhatkawa and Sukna : Northern part of West Bengal). The species *M. andrewesi* is sole species of the family Rhizophagidae known

to occur in South India (Nilgiri hills), all the other known species are restricted to base of Himalayas.

General appearance (Figs. 3, 4) narrow, elongated, depressed, dorsal surface dark brown, shiny, and deeply and coarsely punctured.

Head (Fig. 39) markedly elongate, almost parallel-sided, tempora distinct and neck constrictions marked, vertex without transverse line, eyes moderately large, clypeus rather elongate, gular region behind eyes without transverse impressed line, antennal insertions lateral, anterior part of gular region with a transverse curved impressed line, tentorium represented by two simple arms. Mandible (Fig. 60) with two distinct apical teeth, mola and prostheca well developed. Maxilla (Fig. 76) with well developed lacinia, galea narrow and finger-like, palpi with at segments 2 and 3 subequal, apical segment long and slightly narrowed apex. Labium (Fig. 94) with mentum slightly elongate, palpi with apical segment largest and slightly narrow towards apex. Antenna (Fig. 39) 10–jointed and rather short, scape large and globular, pedicel smaller than scape, joint 3 slightly narrower than scape and longer than joint 4, joints 4-8 equal, joint 9 and 10 forming a 2-jointed distinct club, joint 9 slightly transverse and joint 10 globular.

Prothorax (Figs. 108, 109) elongate, lateral margins finely serrated, pronotum characteristically punctured (Fig. 109), front coxae rather widely separated, cavities rounded, internally open and externally broadly closed behind, prosternal process narrowed at base and markedly broad at apex.

Meso-metathorax (Fig. 122) : Mesocoxae widely separated, sternal fitting between them wiih a single markedly broad projection from metasterum, mesocoxae somewhat open outwardly, mesoepimera extending to mesocoxal cavities. Metasternum slightly elongate, median impressed line extending slightly more than half of its length, metacoxae rather short and widely separated, metendosternite represented by two simple apophysis and anterior tendons widely separated.

Wings and Elytra : Wing (Fig. 132) with single anal vein, r-m cross vein distinct, without radial cell and subcubital fleek. Elytra broadest at middle, slightly narrowed in front and more so posteriorly, a part of pygidium only exposed, puncturation on elytra arranged in 8 regulars distinct row, interstices between row 6 and 7 finely carinate, epipleura well developed upto the apex.

Legs (Fig. 122) moderately long, trochanter short and simple, femora narrowed at base and markedly broadened towards apex, tibiae slightly broad at apex and with two normal spurs, tarsi short and simple, claws simple.

Abdomen (Fig. 148) elongate, distinctly narrowed at apex, ventrite 1 longest, with well developed femoral lines, almost extending to apex, intercoxal process broad and its apical margin almost straight, ventrites 2-4 short and equal, ventrite 5 larger than ventrite 4. Oviporitor (Fig. 170) well developed with paraprocts, coxities and minute styli attached latterally. Aedeagus not studied.

Habitat : Under bark.

Geographical distribution : Eastern and South India ; South East Asian countries and Australia.

7. **Tarunius** Sengupta

Tarunius Sengupta 1977. *Oriental Ins.* 11 (4) : 531-535.

Type species : *Tarunius punctatus* Sengupta 1977, *Oriental Ins. 11* (4) : 531-535 (locality-Gangtok : Sikkim : India)

Sengupta (1977) established this genus based on single new species from Sikkim. This is a distinct genus nearest to *Monotomopis* and can be easily distinguished by its general appearance (Figs 5 ; 29) being different, femoral lines on ventrite 1 absent, sixth elytral interstices not carinate and hind coxae closely situated.

General appearance (Fig. 5) rather narrowly elongate, depressed, somewhat parallel-sided, and dorsal surface strongly punctured.

Head slightly elongate, tempora well developed, neck constriction marked, eyes moderately large and finely faceted, labrum not distinguishable, antennal insertions partly hidden, anterior part of gular region with a almost straight transverse impressed line, antennal cavities short where scape rest at repose, genae moderately well developed. Antenna (Fig. 5) rather short, scape moderately large and broadly elongate, pedicel smaller than scape and elongate, joint 3 narrower and shorter than pedicel and elongate, joints 4-8 short and equal, joint 9 slightly wider than joint 9, joint 10 elongate and forming 1-jointed club. Mandible well developed, maxillary and labial palpi normal.

Prothorax (Figs. 5, 29) almost as broad as long, lateral margins finely

serrated and slightly narrowed posteriorly, disc of pronotum with a large median quadrangular shallow depression, front coxae somewhat closely situated, small and rounded, trochantins hidden, cavities externally broadly closed behind, prosternal process narrow at base and rather markedly broadended at apex.

Meso-and metathorax : Mesocoxae moderately widely separated, sternal fitting between them with a single projection from mestasternum, metacoxae closely situated, median impressed line grooved and extending to half of the length of metasternum. Elytra slightly narrowed posteriorly and truncate at apex, with 8 rows of punctures, epipleura narrowed posteriorly but complete.

Legs (Fig. 29) short, trochanter short and simple, femora narrowed at base and strongly swollen towards apex, tibiae broadened at apex and with two normal spurs, tarsal segments 1-4 markedly short, simple and their underside hairy, claws simple.

Abdomen : almost as broad as long, ventrite 1 markedly long, femoral lines absent, intercoxal process narrow and pointed at apex, ventrites 2-4 short and equal, and ventrite 5 longer than 4. Ovipositor and aedeagus not studied.

Habitat : Under bark

Geographical distribution : Sikkim : India

8. **Renuka** gen. nov.

Type species : *Renuka rita* sp. n. (locoality—Sikkim)

This is a distinct genus, having characteristic prothorax (Fig. 6), dorsal and ventral surface densely punctured and pubescent. This is nearest to the genera *Monotomopsis* and *Tarunius*. It differes from *Monotomopsis* by its elytra devoid of carina on 6th interstices, shape of prothorax (Flg. 6, 30) different, pronotal disc not demarketed, ventrite 1 without femoral lines, coxae closely situated, intercoxal process of ventrite 1 narrow, prosternal process narrow and slightly broadered at apex. It can be easily separated from *Tarunius*, by its prothorax being broadest at anterior one-third and rather sharply narrowed in front, anternal club distinctly 2-jointed, prosternal process narrow and not markedly broadered at apex, pronotum without distinct disc, and ventral surface densely pubescent.

General appearace (Fig. 6) moderately large, elongated, slightly narrowed in front and behind, dorsal surface heavily punctured and densely pubescent.

Head (Figs. 6, 30) as broad as long, tempora moderately large, labrum fused with clypeus and its apical margin slightly sinuate, antennal insertion lateral but partly exposed, space between antennae slightly raised and angularly emarginate, antennal cavities moderately well devaloped, transverse line one anterior part of gular region slightly curved. Mouth-parts not dissected, mandible, maxilla and labium with their palpi aparently normal.

Prothorax (Fig. 6, 30) abruptly broadest at anterior one-third and narrowed in front and behind, lateral margin finely serrated, front angle obtuse and hind angles slightly truncated. Front coxae moderately closely situated, cavities rounded and broadly closed behind, prosternal process narrow, slightly broader towards apex and longitudinally grooved at middle.

Meso-metathorax (Fig. 30) : Mesosternum short, mesocoxae moderately closely situated, sternal fitting between them with a single projection from metasternum, mesocoxal cavities open outwardly and mesoepimera extending to mesocoxal cavities. Mestasternum as broad as long, coxae slightly widely separated, median impressed line extending to more than half of its length. Metendosternite not studied.

Elytra (Fig. 6) broadest at middle, coarsely and deeply punctured in 8 regular rows, epipleura complete upto the apex. Wing not studied.

Legs (Fig. 30) rather short, trochanters simple and short, femora swollen at middle, tibiae slightly broadened at apex, tarsi rather broad, simple and densely hairy, claws simple.

Abdomen (Fig. 30) elongate, narrowed posteriorly, ventrite 1 markedly long, ventrities 2—4 short and equal, ventrite 5 longer than ventrite 4, intercoxal process of ventrite 1 slightly broad and its apical margin rounded, femoral lines absent ; aedeagus not studied.

Habitat : Under bark.

Geographical distribution : Sikkim : India.

9. **Renuka rita** sp. n.

Measurements : Total length 4.64 mm, width of head across eyes

1.00 mm ; length of antenna 1.00 mm ; width of prothorax across auterior one-third 1.10 mm ; length of elytra 2.25 mm and width across middle 1.20 mm.

General appearance (Fig. 6) elongate, rather narrow and depressed, dorsal surface with punctures deep and coarse, covered with whitish moderately long semierect pubescence, head and pronotum black and elytra reddish brown.

Exposed part of head subtriangular, vertex of head with coarse punctures, apical part of clypeus finely punctured, pubescence of vertex dense, long and projecting portiriorly towards middle line, that of clypeus pubescence short, sparse and projected forward and towards middle line. Eyes black, length of tempora slightly shorter than width of each eye. Antennae reddish brown and moderately densely pubescent. Prothorax as broad as long, lateral margins not prominent, front, hind and lateral margins narrowly bordered. Punctuation of pronotum similar to that of vertex of head. Pronotal disc sparsely punctured with a median narrow elongate unpunctured area, which is broadest at middle, lateral sides of pronotum more densely punctured, pubescence of pronotum similar to that of vertex of head and projecting towards middle line slightly towards front, lateral margins finely serrated and pubescent. *Scutellum* blackish, shiny, impunctate and glabrous, slightly longer than broad, little broader posteriorly and apical margin rounded. *Elytra* reddish brown, shiny, puncturations in rows rather small, modeately deep and striae, narrow interstices glabrous, flat and distinctly broader than width of each row of striae, each puncture with a moderately long and semirecumbent setae, setae of the rows 1—5 projected outwardly and posteriorly and that of 6—8 projected inwardly and posteriorly. *Last visible abdominal tergite* rather short, black, coarsely punctured and pubescent. *Ventral surface* deep-reddish brown, legs slightly paler. Prosternum wingkled and sparsely punctured, metasternum, ventrite 1 and ventrite 5 irregularly and coarsely punctured and pubescent, ventrites 2—4 with two transverse rows of setiferus punctures.

Types : Holotype ♂, Singiam, Sikkim, 26.IV.1978, A. R. Bhaumik, Col. and 1 Paratype, Gangtok, Sikkim, 7.III. 1979, S.K. Saha Col. ; deposited in the Zoological Survey of India, Calcutta.

8. **Leptipsius** Casey

Leptipsius Casey, 1916 : *Mem. Col*, 7 : 93.

Type species : *Leptipsius striatus* (LeConte) 1858, *Proc. Acad. Philad* : 65 (locality—California : U.S.A.).

Casey (1916) established the genus *Leptipsius* based on the species *Bactridium striatus* LeConte, in the same work he added second species *Leptipsius dilutus* Casey from Illinois (U.S.A.) to it. So far known. this genus is restricted to North and Central America, which can be easily separated from *Europs* by its antenna being 1-jointed. It has close similarities and little differences from *Bactridium* LeConte and can be separated by its shape of prothorax (Fig. 104), head with short but distinct tempora, gular region of head behind eyes with a trace of transverse impressed line. This genus is also related to the Indian new genus *Malabica* and their differences dealt under latter genus.

General appearance (Fig. 17) elongate, depressed, shinning, reddish, length about 2.30 mm.

Head (Fig. 48) as broad as long, tempora short, labrum fused with clypeus, antennal insertions hidden, genae well developed, eyes moderately large and on ventral side slightly notched, anterior part of gular region with a transverse curved impression, a trace of transverse impressed line present on basal part of gular region behind eyes, tentorium characteristic (Fig. 48). Antenna (Fig. 17) short, scape moderately large and broadly elongate, pedicel narrower than scape and its length almost equal to length of scape, joint 3 narrower and shorter than pedicel, joint 4-8 short and equal, joint 9 slightly larger than joint 8, club 1-jointed and large. Mandible (Fig. 54) with single apical apical tooth, mola and prostheca well developed, a trace of mandibular cavity present as in *Bactridium*. Maxilla (Fig. 79) with fan-like lacinia, its inner margin fringed with dense hairs and without apical spine, galea finger-like and with a few satae at apex, palps with segment 2 and 3 subequal and apical segment somewhat fusiform. Labium (Fig. 87) with apical segment of palpi largest and narrowed at apex.

Prothorax (Fig. 104) almost as broad as long, slightly narrowed posteriorly and lateral margins finely serrated, coxae moderately widely seperated, cavities internally open and externally broadly closed behind, prosternal process broad at apex.

Meso-metasternum (Fig. 123) : Mesocoxae moderately widely separated, sternal fitting between them a single knob, cavities externally somewhat open outwardly, metasternum as broad as long, median impressed line extending slightly more than half of its length, hind coxae moderately widely separated, metendosternite represented by two apophysis.

Wing and eiytra : Wing (Fig. 136) with single anal vein and slight trace of r-m cross vein. Elytra truncated at apex and with regular 8 rows of punctures.

Legs (Fig. 123) with simple and short trochanter, femora swollen towards apex, tibiae slightly broad at apex and with two normal spurs, tarsi simple, segment 1 and 4 minute, claws simple.

Abdomen (Fig. 33) elongate, ventrite 1 markedly long, femoral lines well developed and parallel-sided, intercoxal process of ventrite 1 broadly rounded, ventrite 2-4 short and equal, ventrile 5 markedly long. Aedeagus (Fig. 166) short with short tegmen and a pair of thread-like median struts.

Habitat : Under bark.

Geographical distribution : U. S. A ; Canada and Mexico.

9. **Malabica** gen. nov.

Type species : *Malabica tatai* sp. n. (locality : Shillong).

This new monotypic genus is nearest to the New World genus *Leptipsius* and can be easily separated in having wing with subcubital fleck, head with antennal cavities, intercoxal process of ventrite 1 narrow and pointed. General appearance is similar to *Europs* but differs from latter in having 1-jointed club.

General appearance (Fig. 12) small, depressed, *Europs*-like.

Head (Fig. 44) as broad as long, tempora short and poorly developed, transverse line on vertex and transverse line behind tempora on ventral surface absent, eyes moderately large, antennal insertion lateral, anterior part of gular region with a transverse and semicircular impressed line, antennal cavities deep and short, tentorium represented by two simple arms. Mandible (Fig. 67) short and broad, with three apical teeth, mola and prostheca well developed. Maxilla (Fig. 75)

with broadly elongate lacinia, galea narrow and finger-like, palpi with segments 2 and 3 subequal, and apical segment fusiform. Labium (Fig. 89) with mentum as broad as long and narrowed at apex, palpi normal. Antenna (Fig. 44) short, 10-jointed with 1-jointed club, scape moderately large and globular, pedicel short and globular, joint 3-8 smaller than pedicel and equal, joint 9 slightly larger than joint 8, joint 9 forming large, broad, slightly elongate club and its apical margin almost rounded.

Prothorax (Fog. 102) slightly elongate, weakly narrowed posteriorly, lateral margins finely bordered, coxae moderately closely situated, cavities internally open and externally broadly closed behind, prosternal process moderately broad, parallel-sided and its apical margin almost straight.

Meso-and metathorax (Fig. 117) : Mesocoxae closely situated, sternal fitting between them with distinct single knob, mesocoxal cavities open outwardly and mesoepimena extending to the to mesocoxal cavity, metacoxae rather narrowly separated, metendosternite well developed with anterior tendons closely situated.

Elytra and Wing : Elytra rather long, incomplete and exposing a part of last visible tergite, punctuntion moderately large and arranged in 6 regular rows. Wing (Fig. 130) with single anal vein, subcubital fleck and r-m cross vein.

Legs (Fig. 117) rather short, trochanter short and simple, femora swollen at middle, tibiae broadened at apex and with two apical spurs, tarsi short and simple, tarsal formula 5-5-5 in female and 5-5-4 in male, claws simple.

Abdomen (Fig. 146) narrow, elongate, ventrite 1 markedly long, femoral lines well developed, long and parallel-sided, intercoxal, process narrow and pointed at apex, ventrite 2-4 short and equal, ventrite 5 longer than ventrite 4. Aedeagus broad and its shape as figured (Fig. 168).

Habitat : Unknown.

Geographical distribuiion : Meghalaya : India.

Malabica tatai sp. n.

Measurement of holotype : Total length 1.6 mm. ; length of antenna

0.3 mm. ; width of head across eyes 0.3 mm. ; width of prothorax across anterior one-fourth 0.4 mm. ; length of elytra 0.8 mm.

General appearance (Fig. 12) reddish brown, somewhat parallel-sided, dorsal surface depressed, almost glabrous and sparsely punctured.

Exposed part of head subtriangulae, sparsely and finely punctured ; eyes small and finely facetted. Antenna as long as width of head across eyes. *Prothorax* elongate, uniformly narrowed posteriorly, front angles moderately rounded, hind angles obtusely rounded, lateral margins black and very finely serrated. Pronotum sparsely punctured and punctures arranged as figured (Fig. 12), a short, dark median transverse depression present at the base. *Scutellum* minute and triangular. *Elytra* parallel-sided, with six rows of punctures, width of each puncture narrower than width of interstices, each puncture with a very minute seta, interstices slightly raised.

Types : Holotype and 6 Paratypes, Shillong, Meghalaya, 28. xi. 1974, T. Sen Gupta, Coll., deposited in the Zoological Survey of India, Calcutta.

10. **Monotopion** Reitter

Monotopion, Reitter, 1885. *Wien. Ent. Zeit.*, 3 : 272,

Type species : *Monotopion ferrugineum* Reitter, 1885. *Wien. Ent. Zeit.*, 3 : 272. (locality-Japan).

This monotypic genus includes one species from Japan, which is nearest to the genus *Europs* but unlike latter genus it has well developed femoral lines and gular region with a pair of characteristic longitudinal grooves (Fig. 40) which is not found in any other genera of Rhizophagidae.

General appearance (Fig. 11) small, somewhat similar to *Europs*.

Head (Fig. 40) as baoad as long, labrum fused with clypeus, eyes moderately large, tempora short but distinct, neck constriction poorly developed, anterior part of gular region without a transverse groove but a pair of longitudinal grooves, which are converging posteriorly, genae well developed, antennal cavities narrow and deep, tentorium (Fig. 40) with corpotentorium and lateral arms. Antenna (Fig. 11) short, scape moderately broadly elongate, pedicel short, joint 3 slightly elongate, shorter and narrower than pedicel, joints 4-8 short and equal,

club 2-jointed, joint 9 transverse and joint 10 globular. Mandible (Fig. 66) short and broad, with 2 apical teeth, inner one bidentate, mola and prostheca well developed. Maxilla (Fig. 72) with short and narrow lacinia, galea narrow and long, palpi with segments 2 and 3 subequal apical segment broadly elongate and narrowed at apex. Labium (Fig. 93) elongate, palpi with apical segment largest, broadly elongate and slightly narrowed at apex.

Prothorax (Fig. 101) almost as long as broad, slightly narrowed posteriorly, lateral margin finely serrated, front coxae somewhat closely situated, cavities externally broadly closed and internally open behind, prosternal process progressively broadened towards apex.

Meso-metathorax (Fig. 119). Mesocoxae mgderately closely situated, sternal fitting between them in a single knob, mesocoxal cavities open outwardly, metasternum almost as broad as long, median impressed line extending half of its length, metacoxae rather closely situated, metendosternite short and simple.

Wing and elytra : Wing with single anal vein and without subcubital fleck. Elytra slightly narrowed posteriorly, punctures arranged in 8 regular rows.

Legs (Fig. 119) rather short, trochanter short and simple, femora swollen in middle, tibiae slightly broadered at apex and with two normal spurs, tarsi simple, tarsal formula 5-5-5 in female and 5-5-4 in male, claw simple.

Abdomen (Fig. 151) elongate and narrowed posteriorly, ventrite 1 markedly long, femoral lines well developed, intercoxal process narrowed at apex and somewhat pointed, male with a median roundish glandular pore, ventrites 2-4 short and equal, ventrite 5 slightly elongate and narrowed at apex. Aedeagus rather narrow and as figured (Fig. 160).

Larva : Not known.

Habitat : Not know to author.

Geographical distribution : Japan.

Europs Wollaston

Enrops Wollaston, 1854. *Ins. Mader.*, 149.

Type species : *Europs impressicollis* Wollaston (locality-Madeira)

Wollaston (1854) established this genus based on single species *E. impressicollis* from Madeira. This is one of the large genera, Hetschko (1930) listed 50 species from the World. So far, four species, known from Indian subregion, namely *E. alutaccus* Champion (Almora), *E. indicus* Grouvelle (Darjeeling) and *E. harmandi* Grouvelle (Darjeeling), *E. birminicus* Grouvelle (Burma). Sen Gupta (1976) transferred the species *E. harmandi* to the genus *Mimemodes*. In the present study several examples of *Europs* have been collected by author from Assam, West Bengal, Uttar Pradesh and Himachal Pradesh, which will be dealt elesewhere. So far, distribution of this genus restricted to base of Himalayas, it is yet to be recorded beyond Calcutta, moreover, the logs from which the beetles are collected in Calcutta are actually from North-East India (timbers brought to Calcutta). This genus is restricted to tropical part of Old and New World, not yet recorded from New Zealand and Australia. *Europs* can be easily separated from *Tarunius*, *Mimemodes*, *Pycnotomina*, *Bactridium*, *Malabica* and *Leptipsius* having 2-segmented antennal club and from *Monotopion*, *phyconomus*, *Hesperobaenus* and *Malinica* by its ventrite 1 devoid of any femoral lines.

General appearance (Fig. 8) elongate, depressed, small to moderately large, dorsal surface distinctly punctured and finely pubescent with semierect short setae.

Head (Fig. 46) as broad as long, labrum fused with clypeus, apical margin of clypeus slightly sinuate, transverse line on vertex of head present but incomplete, tempora well developed, antennal insertions hidden, eyes moderately large and finely faceted, transverse line behind tempora on ventral surface of head present or absent, anterior part of gular region with curved transverse line, genae well developed and projected, antennal cavities not distinguishable, tentorium well developed and as figured (Fig. 46). Antenna (Fig. 46) rather short, with large scape, pedicel broadly elongate, joint 3 slightly to moderately long, joints 4-8 short and equal, joints 9 and 10 forming a 2-jointed distinct club, joint 9 cup-shaped and joint 10 broadly elongate. Mandible (Fig, 58) elongate, with single apical tooth and mola large and well or poorly developed. Maxilla (Fig. 69) with fan-like lacinia, galea long and finger-like, palpi with segments 2 and 3 almost equal, apical segment narrowed at apex. Labium (Fig. 90) markedly elongate and its palpi long.

Prothorax (Fig. 98) almost as broad as long, often slightly narrowed posteriorly, lateral margins finely serrated, front coxae somewhat closely situated, cavities internally open and externally broadly closed behind, shape of prosternal process variable, usually moderately broad and its apical margin almost straight.

Meso-metathorax (Figs. 114, 115) : Mesocoxae moderately closely situated, sternal fitting between them with a single projection from metasternum, mesocoxal cavities narrowly open outwardly. Metasternum slightly elongate, median impressed line extending more than half of its length, metacoxae closely situated, metendosternite represented by two simple apophysis or well developed with anterior tendons.

Wing and Elytra : Wing (Fig. 131) with single anal vein, a distinct r-m cross vein, a trace of subcubital fleck present. Elytra rather short, truncated at apex and with distinct rows of strial punctures.

Legs (Fig. 115) rather short, trochanter simple, femora narrowed at base and swollen anteriorly, tibiae broadered at apex and with two normal spurs, tarsi simple and short, tarsal formula 5-5-5 in female and 5-5-4 in male, claws simple.

Abdomen (Figs. 143, 144) elongate, ventrite 1 longer than ventrite 4, ventrite 1 without femoral lines, intercoxal process narrowed at apex and roundedly pointed at apex. Sometimes ventrite 1 of male with a median setiferous pore. Aedeagus short and as figured (Fig. 163).

Habitat : Under bark.

Geographical distribution : Warm climate zone of the Old and New World, in India it is mainly restricted to the foot hill of Himalaya.

12. **Eporus** Grouvelle

Eporus Grouvelle, 1897. *Ann. Mus. Genova* **18** (38) : 374.

Type species : *Eporus insignis* Grouvelle, 1890. *Ann. Mus. Genova* **18**(38) : 374 (locality Mount Patkai ; Assam).

Grouvelle (1890) established this monotypic genus from Mount Patkai : Assam, is near to *Europs* but can be easily separated by its apical segment of antennal club being markedly enlarged, dorsal surface of head near antennal base with a depressed area, margin of tempora behind eyes grooved. Unlike other genera of Monotominae

antennal joint 3 in *Eporus* distinctly longer than pedicel. This genus also shows some similarities with the genus *Mimemodes*.

General appearance (Fig, 9) somewhat near to *Mimemodes*, slightly broader and squarish than *Europs*.

Head as broad as long, vertex without transverse line, tempora short but distinct with its margins grooved, vertex sparsely punctured, eyes moderately large, basal part of antenna depressed, apical part of mandible exposed, labrum fused with clypeus. Mouth parts and ventral side of head not studied. Antenna short, scape moderately large and elongate, pedicel short and roundish, joint 3 elongate and distinctly longer than pedicel and joint 4, joints 4-8 short and transverse, club 2-jointed, joint 9 strongly transverse and apical one markedly large and globular.

Prothorax squarish, as broad as long, hind angles more obtuse than front angles, side margins smooth, pronotum with a median depressed pear-shaped area. Ventral surface with front coxal cavities, meso-metathorax, wings and ventrites not studied. *Elytra* broadly elongate, truncated and with exposed pygidium, puncturation arranged in 7 rows, each punctur with a small setae.

Habitat : Not known.

Geographical distribution : Assam : India.

13. **Mimemodes** Reitter

Mimemodes **Reitter, 1876.** *Deutsche Ent. Zeitschr.*, **20 : 296-297.**
Mimemodes monstrotus **(Reitter), 1874.** *Verh. zool. bot. Ges. Wien*, **24 : 514 (locality-Japan).**

Reitter (1876) established this genus, Hetschko (1930) listed 10 species from the World. *Mimemodes* is a Old World genus, recorded chiefly from South East Asiatic countries extending upto Australia and New-Guinea. Recently, Sen Gupta (1976) added three new species from India and transferred the species *Europs harmandi* Grouvelle to the genus *Mimemodes*. Nakane (1956) dealt with Japanse species and published a key to the Japanse species of *Mimemodes*. So far, 5 species are known from India, four of them are recorded from Eastern India, only species *M. megalocephalus* Champion from Western India, Almora : U. P.

The type species of the genus was described under the genus, *Bactridium*. It differs from the latter genus in having distinct tempora on head, hind coxae more closely situated and intercoxal process of ventrite 1 narrow. This genus also shows resemblances with *Phyconomus LeConte* in having tempora of head well developed. Hetschko (1930) in Junk Coleopterorum Catalogus placed *Mimemodes* immediately before *Phyconomus*. *Mimemodes* differs from the latter genus in having distinct 8 rows of punctures on each elytron, whereas elytra are irregularly punctured in *Phyconomus*, and unlike *Mimemodes* its antennal club is distinctly 2-jointed.

General appearance (Figs. 13, 14) elongate, depressed, elytra truncated at apex leaving last abdominal segment uncovered, antenna 10-jointed with 1-jointed club and tempora of head well developed.

Head (Fig, 43) with well marked neck constriction, tempora well developed and converging posteriorly, in ♂ tempora markedly developed than in ♀, without fronto-clypeal suture, sometime with a median longitudinal carina between eyes, often frons between eyes raised and emarginate posteriorly, clypeus often sinuate in front, eyes large and moderately finely faceted, transverse line on vertex and behind eyes on ventral surface and antennal cavities absent. Antenna rather short, scape large, often triapizoidal in ♂, pedicel knob-like, joint 3 less transverse than joint 4, joints 4-8 transverse and more or less equal, joint 9 distinctly wider than joint 8, joint 10 forming a distinct large compact 1-jointed club. On ventral side, genae well developed and anterior part of gular region with a distinct transverse groove. Tentorium as figured (Fig. 43). Labrum not distinguishable ; mandible (Fig. 57) large projected forwards and inwards, mandible of ♂ usually distinctly larger than in ♀, basal part of mandible with a distinct cavity (mycangia) opening dorsally as in Boganiidae (Sen Gupta and Crowson 1966), mola moderately developed, apical tooth bifid at apex, and its inner margin smooth ; maxilla (Fig. 77) with well developed sword-like lacinia and its inner margin densely hairy, galea reduced and finger-like with few setae at tip, palpi with segment 2 slightly longer than 3, apical segment elongate and fusiform ; labium (Fig. 86) with slightly elongate triangular mentum, ligula not distinguishable, palpi with apical segment elongate and narrowed at apex.

Prothorax (Fig. 99) usually slightly narrowed posteriorly, lateral margins usually finely serrated, front coxal cavities rounded, trochantins hidden, intercoxal process broad at apex.

Meso-metathorax : Mesocoxae closely situated, sternal fitting between them with single projection, mesocoxal cavities narrowly closed outwardly, matasternum almost equal in length and breadth, median impressed line extending to two-thirds of length of metasternum, metacoxae slightly more widely separated than mesocoxae.

Wing and elytra : Wing with single anal vein, incomplete radial cell, r-m cross vein and subcubital fleck absent. Elytra more or less parallel-sided with 8 rows of punctures, without scutellary striole, epipleura narrow but complete up to the apex.

Legs rather short, trochanter short and simple, femora rather strongly widened at middle, tibiae short, broadened at apex and with two normal spurs, tarsal formula 5-5-5 in ♂ and 5-5-4 in ♀ , segments 1 markedly short, often not easily visible, segments 2 and 3 transverse, segment 4 minute and knoblike, segment 5 longer than rest together, claws simple.

Abdomen elongate, ventrite 1 longer than ventrite 2, ventrites 2-4 short and equal, ventrite 5 distinctly longer than ventrite 4, intercoxal process of ventrite 1 short, narrow and its apical margin rounded, femoral lines short and widely separated. Aedeagus (Fig. 165) normally normally oriented in retracted condition, tegmen reduced, without parameres, with a pair of long, thread-like widely separated median struts.

Habital : Haystack and flowers.

Geographical distribution : Predominant in South East Asiatic countries including Eastern India and Japan, and also recorded from Australia and New Guinea.

14. **Aneurops** Sharp

Aneurops Sharp, 1900. *Biol. Centr.-Amer.*, Col. II, 1 : 573.

Type species : *Aneurops championi* Sharp, *Biol. Centr.-Amer. Col.* II, 1 : 573 (locality : Guatemala).

Sharp (1900) described this monotypic genus from Cemtral America, since then no addition of species under this genus. Author has studied

one of the example *A. championi* lend by British Museum, Natural History, London. Form is similar in appearance to *Europs* but head of *Aneurops* with distinct antennal cavities and front coxal cavities with partly exposed trochantins and ventrite 1 with very short femoral lines.

General appearance (Fig. 7, 31) somewhat parallel-sided, shiny, dark brown and glabrous.

Head (Figs. 7, 31) broadly elongate, tempora well developed and parallel-sided, eyes rather small and not projected, vertex with a transverse line, labrum not distinguishable ; on ventral side antennal cavities well developed, anterior part of gular region with a slightly angled transverse line, gular region behind eyes with faintly marked transverse line. Antenna (Fig. 7) moderately long, scape normal, pedicel narrow-elongate shorter than scape, joint 3 slightly shorter than pedicel, joints 4-8 short, equal and slightly shorter than segment 3, club 2-jointed and both the segments well developed. Mouth parts not disected and apparently normal, apical part of mandible exposed.

Prothorax (Figs. 7, 31) almost as broad as long, slightly narrowed posteriorly, lateral margins not serrated, front coxae more or less closely situated, posternal process broadest at apex, cavities slightly transverse with portly exposed trochantins and externally broadly closed behind.

Meso-metathorax (Fig. 31) : Mesocoxae moderately closely situated, sternal fitting between them with somewhat broad knob from metasternum, mesocoxal cavities open outwardly and mesoepimera extending to mesocoxal cavities. Metasternum as long as broad, median impressed line extending almost upto apex, metacoxae rather closely situated.

Wing and elytra : Wing not studied. Elytra with 7 rows regular punctures, first 5 rows striat.

Legs (Fig. 7) moderately long, trochanters short and simple, femora swollen near middle, tibiae broadened at apex and with normal two spurs, tarsal segments short and simple, segments 1 and 4 smallest, claws simple.

Abdomen (Fig. 31) elongate, ventrite 1 markedly long, femoral lines distinct but very short, intercoxal process narrow and apically almost pointed, ventrites 2-4 short and equal, ventrite 5 longer than ventrite 4. Aedeagus or ovipositor not studied.

Larva : Not known.

Geographical distribution : New World (Guatemala).

15. **Hesperobaenus** LeConte

Hesperobaenus LeConte, 1861. *Classif. Col. Amer.*, 86.

This is a small genus, Hetschko (1930) listed six species from the New World and one species from the Old World (Honolulu). This genus is somewhat near to *Europs* Wollaston and can be distinguished by its anternal joint 9 being rather long and conical, ventrite 1 with short femoral lines, wing without subcubital fleck, ventrite 1 with glandular pore (Fig. 143), tentorium different (Fig. 46).

General appearance rather broadly elongate and subdepressed (Fig. 10) usually piceous, 3 mm in length.

Head (Fig. 47) as broad as long, tempora well developed, eyes moderately large, somewhat finely faceted, labrum separated by a indistinct impressed line, antennal insertions hiddened under projection of frons, vertex without transverse line, genae well developed, antennal cavities moderately developed, anterior part of gular region with a transverse line, gular region behind eyes devoid of transverse line, tentorium (Fig. 47) well developed and different than in *Phyconomus* (Fig. 50). Antenna (Fig. 47) 10-jointed, scape moderately large, pedicel slightly shorter than scape and narrower, joint 3 slightly shorter and narrower than pedicel, joints 4-8 shorter than joint 3 and equal, club 2-jointed, joint 9 distinctly shorter the joint 10. Mandible (Fig. 62) with well developed mola, single apical tooth and prostheca rather poorly developed. Maxilla (Fig. 70) with large fan-like lacinia, its inner margin densely pubescent and without apical teeth, galea finger-like, narrow, elongate and glabrous, palpi with segment 2 slightly larger than segment 3 and apical joint large and fusiform. Labium with elongated mentum, ligula poorly developed and palpi with apical segment largest and somewhat fusiform.

Prothorax (Fig 100) as broad as long, slightly narrowed posteriorly, lateral margins finely serrated, front coxae closely situated, prosternal process broad at apex, cavities externally broadly closed and internally open behind.

Meso-metathorax (Fig. 118): Mesocoxae moderately closely situated, sternal fitting between them with a distinct knob, mesocoxal cavities open outwardly and mesoepimera extending to mesocoxal cavities. Metasternum elongated, median impressed line

extending slightly more than half of its length, metendosternite represented by two apophysis, hind coxae moderately widely separated.

Wing and elytra : Wing Similar as in *Phyconomus.* Elytra with 9 regular rows of punctures.

Legs (Fig 118) moderately long, trochanter short and simple, femora swollen towards apex, tibiae broadened at apex and with two normal spurs, tarsal segments more or less simple and short, segments 2 and 3 slightly broad and slightly lobed, joint 4 minute, claws simple.

Abdomen (Fig. 153) elongated, vertrite 1 markedly long, femoral lines short but distinct, and intercoxal process moderately broad and its apical margin rounded, ventrites 2-4 short and equal, ventrite 5 markedly longer than 4. Aedeagus (Fig. 167) somewhat similar as in *Phyconomus.*

Larva : Larva described by Böving and Craighead (1931).

Habital : Not known to author.

Geographical distribution : North America ; Hawii ; Tahiti and Sandwich Island.

16. **Bactridium** LeConte

Bactridium LeConte 1861. *Classif. Col. N. Amer.*, : 86.

This genus was established by LeConte (1861), Hetschko (1930) listed 31 species under this genus, mostly from the New World, only two species namely, *B. orientale* (Reitter), *B. parvum* Grouvelle are from the Old World, New-Guinea and Sumatra respectively. *Bactridium* is nearest to *Malabica* and *Leptipsius* and can be separated by absence of neck constriction and tempora of head, and coxae more widely separated.

General appearance (Figs. 16, 34) elongate, subdepressed, ferruginius, usually 2.2 mm in length.

Head (Fig. 49) transverse, eyes large, labium fused with clypeus, tempora absent, transverse line on vertex absent, well developed, antennal insertions hidden under projection of frons, antennal cavities not distinguishable, gular region with transverse line behind the eyes, transverse impressed line on anterior part of gular region imerginate angularly, tentorium not studied. Antenna 10-jointed and club 1-jointed, scape moderately large, pedicel slightly shorter and narrower

than scape, joint 3 slightly shorter and narrower than pedicel, joints 4-5 short and equal, joints 7-9 short and progressively larger, joint 10 large and somewhat globular forming 1-jointed club. Mandible (Fig. 55) with well dexeloped mola and prostheca, single apical tooth. Maxilla (Fig. 71) with lacinia fan-iike, its inner margin fringed with dense hairs and without apical spine, galea finger-like with a few setae at apex, palpi normal with segments 2 and 3 almost equal. Labium (Fig. 91) with transverse mentum and palpi normal.

Prothorax (Fig. 103) almost as long as broad, lateral sides slightly rounded and finely serrated, front coxae moderately widely seperated, posternal process broad at apex, coxal cavities internally open and externally broadly closed behind.

Meso-metathorax (Fig. 124) : Mesocoxae moderate widely separated, sternal fitting between them in a single knob, mesocoxal cavity open outwardly, median impressed line extending to half of its length, hind coxae widely separated, metendosternite represented by two apophysis.

Wings and Elytra : Wing (Fig. 135) with single anal vein, poorly developed r-m corss vein and without subcubital fleck. Elytra with regular 5 rows of punctures.

Legs (Fig. 124) moderately long, trochanters short and simple, femora swollen towards apex, tibiae broader at apex and with two normal spurs, tarsal segments simple, segment 1 short, segments 2 and 3 equal, segmeut 4 minute and claws simple.

Abdomen (Fig. 34) broadly elongate, ventrite 1 longest, femoral lines well developed, parallel-sided and extending almost upto apex, ventrite 2-4 short and equal, ventrite 5 markedly long. Aedeagus (Fig. 164) with a pair of long thread-like median struts.

Larva : Not known.

Habitat : Not known to author.

Geographical distribution : New World ; New Guinea and Sumatra.

17. **Pycnotomina** Casey

Pycnotomina Casey 1916. *Mem. Coll.*, VII : 100.

Type species : *Pycnotomia cavicollis* (Horn) 1879. *Trans. Amer. Ent. Soc.*, 7 : 265. (locality : Pennsylvania : U.S.A.).

This monotypic distinct North American genus can be easily distinguished by its characteaistic shape of prothorax (Fig. 22), femoral lines broad and slightly diverging, all coxae widely separated, intercoxal process of ventrite 1 broad, neck constriction and tempora absent. Nearest genus is *Bactridium* LeConte. Casey (1916) establish the genus *Pycnotomina* for the species *Bactridium cavicolle* Horn, since then author has not seen any further addition of species under the genus.

General appearance broad and distinct, as figured (Figs. 22, 23), elytral striation obsolete, leaving simply the regular series of punctures.

Head (Fig. 42) as long as broad, tempora absent, eyes moderately large, labrum fused with clypeus, antennal insertions hidden under projection of frons, a distinct impressed transverse line present on basal part of gular region just behind the eyes, anterior part of gular region with a curved impressed line, tentorium not studied. Antenna 10-jointed, scape moderately large, pedicel shorter and narrower than scape, joint 3 slightly shorter and narrower than pedicel, joints 4-8 short and equal, joint 9 slightly larger than joint 8, joint 10 forming 1-jointed large club. Mandible (Fig. 56) with well developed mola, single apical tooth and prostheca moderately developed. Maxilla (Fig. 80) with fan-like lacinia, its inner margin fringed with dense hairs, galea finger-like with a few apical setae, palpi with segment 2 slightly shorter than segment 3, apical segment somewhat fusiform. Labium elongated, palpi with apical segment largest and somewhat fusiform.

Prothorax (Fig. 110) transverse, lateral margins smooth, front coxae widely separated, prosternum broad, coxal cavities internally open and externally broadly closed behind.

Meso-and metathorax (Fig. 121) : Mesocoxal cavities widely separated, sternal fitting between them with a board knob, mesocoxal cavities open outwardly, metasternum transverse, trace of mesocoxal lines present ; median impressed line extending slightly more than half of its length, hind coxae widely separated, metendosternite represented by two simple apophysis.

Wing and elytra : Wing similar as in *Bactridium* (Fig. 135) with single anal vein and a trace of r-m cross vein. Elytra broadly elongate and with regular rows of punctures.

Legs (Fig. 23) moderately long, trochanter short and simple, femora swollen in middle, tarsal segment 1 and 4 minute, claws simple.

Abdomen (Fig. 152) almost as broad as long, ventrite 1 markedly long intercoxal process broad, short and its apical margin slightly rounded, femoral lines well developed, widely separated and slightly projected outwards, ventrite 2 to 4 short, ventrite 5 long and its apical margin truncated. Aedeagus as figured (Fig. 161).

Habitat : Not known to author.

Geographical distribution : U.S.A.

18. **Macreurops** Casey

Macreurops Casey, 1916 : *Mem. Col.*, 7 : 96.

Type species : *Macreurops longicollis* (Horn), 1876. *Trans. Amer. Ent. Soc.*, 7 : 264. (locality : California : U.S.A.).

Casey (1916) estabsished this monotypic genus for the species *Europs longicollis* Horn. This is a distinct genus and can be easily recognishable from other Monotominae by its pronotum being markedly long and subparallel-sided, ventrite 1 without femoral lines, gular region with a markedly long triangular impressed line, wing with 2 anal veins aud labrum exposed.

General appearance elongate, subdepressed, reddish-brown and shining, 3.5 mm in length.

Head (Fig. 41) longer than wide, eyes moderately large, tempora well developed, labrum separated from clypeus by a rather indistinct line, anterior part of gular region with V-shaped impressed line, transverse line on vertex and on ventral side behind tempora absent, antennal cavities are not distinguishable, antennal insertions hidden under projection of frons, tentorium as figured (Fig. 41). Antenna 10-jointed, club 2-jointed, scape moderately large, pedicel almost as long as scape and narrower, joint 3 narrower and slightly shorter than pedicel, joints 4-8 short and equal, joint 9 slightly transverse and shorter than joint 10. Mandible (Fig. 65) with well developed mola, apical tooth single and bicuspid, prostheca moderately developed. Maxilla (Fig. 78) with fan-like large lacinia, its inner edge densely pubescent and without apical spine, galea narrow, elongated, finger-like and its apex with a few short setae, palpi with joint 2

slightly smaller than joint 3, apical segment fusiform. Labium with apical segment of palpi large and narrowed towards apex and mentum somewhat triangular.

Prothorax (Fig. 105) markedly long and subparallel-sided, lateral margins finely serrated, front coxae moderately closely situated, prosternal process moderately broad at apex, cavities externally broadly closed and internally open behind.

Meso-metathorax (Fig. 120) elongated, mesocoxae almost contiguous, sternal fitting between them narrow and with a single knob, mesocoxal cavity open outwardly ; metasternum elongate, hind coxae closely situated, median impressed line extending slightly more than half of its length, unlike *Hesperobaenus* metendosternite well developed, as figured (Fig. 120).

Wings and Elytra : Wing (Fig. 129) well developed with 2 anal veins and subcubital fleck but without r-m cross vein. Elytra with regular 9 rows of punctures.

Legs (Fig. 120) long and narrow, trochanter short and simple, femora swollen towards apex, tibiae slightly broadened at apex and with two short and slightly curved spurs, tarsi simple, segments 2 and 3 short and almost equal, segment 4 smallest, claws simple.

Abdomen (Fig. 141) narrow and elongated, ventrite 1 markedly long, intercoxal process rather narrow and its apical margin almost rounded, femoral lines on ventrite 1 absent, ventrites 2-4 short and equal, ventrite 5 slightly longer than ventrite 3 and 4 together. Aedeagus different and as figured (Fig. 159).

Habitat : Under bark of Oak tree.

Geographical distribution : So far, recorded from California, Nevada, Oregon, Washington : U.S.A. and British Columbia : Canada.

19. **Phyconomus** LeConte

Phyconomus LeConte, 1861. Classif. Col. N. Amer. 1 : 86.

Type species : *Phyconomus marinus* (LeConte), 1858, *Proc. Philad.*, **8** ; 64. (Locality ; California : U.S.A.)

LeConte (1861) established this genus for the species *Phyconomus marinus* (LeConte) ; Hetschko (1930) listed 5 species from North

and Central America and Kapland. Unlike other genera its elytral puncturation are irregular, tentorium distinct-type (Fig. 50) and other distinguishable characters are ventrite 1 with short femoral lines, antennae rather slender, intercoxal process of ventrite 1 rather broad with its apical margin broadly rounded.

General appearance (Figs. 24, 25) is somewhat like *Europs*.

Head (Fig. 50) with well developed tempora, eye moderately large and rather finely faceted, labrum demarketed by fine impressed line, markedly developed, transverse line on vertex and on ventral side below tempora absent, anterior part of gular region with a transverse impressed line, antennal cavities poorly developed, tentorium well developed and as figured (Fig. 50). Antennal insertions hidden,antenna (Fig, 50) 10-jointed, scape moderately large, pedicel smaller than scape, joint 3 equal but narrower than pedicel, joints 4-8 equal and shorter than joint 3, club 2-jointed, joint 9 broad at apex and distinctly shorter than joint 10. Mandible (Fig. 61) with single apical tooth, mola well developed. Maxilla (Fig. 73) with well developed fan-like lacinia and its inner margin densely fringed with hairs, galea narrow, elongate, glabrous and its apical margin fringed with hairs, palpi with segment 2 slightly larger than segment 3 and apical segment fusiform. Labium (Fig. 85) with distinctly visible ligula, palpi narrow-elongate, segments 2 and 3 almost equal in length.

Prothorax (Fig. 106) narrowed posteriorly, length and breadth almost equal, posterior angles rounded, lateral margins finely serrated, coxae closely situated, prosternal process moderately broad and cavities broadly closed behind externally, internally open behind.

Meso-metathorax (Fig. 116) : Mesocoxae moderately widely separated, sternal fitting between them with a single knob, mesocoxal cavities externally open outwardly, metasternum as broad as long, median impressed line extending three-fourth of its length, metendosternite represented by two apophysis, hind coxae widely separated.

Wing and elytra : Wing (Fig. 134) with single anal vein, without radial cell and subcubital fleck, r-m cross vein rather indistinct. Elytra (Fig. 24) irregularly punctured and epipleura narrow.

Legs (Fig. 116) well developed, trochanter short and simple, femora broadened towards apex, tibiae broad at apex and with two normal

spurs, tarsal formula 5-5-5 in male and 5-5-4 in female, segment 1 short, segments 2 and 3 broad and slightly lobed, segment 4 minute and claws simple.

Abdomen (Fig. 154) elongated and last segment exposed, ventrite 1 longest with a pair of short femoral lines, intercoxal process broad and its apical margin rounded, ventrite 2-4 short and equal, ventrite 5 distinctly longer than ventrite 4. Aedeagus (Fig. 162) short, without paramares and with a pair of long thread-like median struts.

Larva : Undescribed.

Habitat : Not known to Author.

Geographical distribution : North and Central America and Kapland.

Tribe Thionini

Crowson (1955) established the subfamily Thioninae for the genera *Thione* Sharp and *Shoguna* Lewis. Unlike Rhizophaginae, Monotomini and Lenacini, genera of Thionini have 5-5-5 tarsal formula, coxae contiguous and species are long and cylindrical. So far, they represented from Oriental region, Australia, Madagascar and Central America. I am unable to find any major differences between the genera *Shoguna* and *Thione* in their head stucture, antenna, mouth parts (mandible, maxilla and labium), shape of prothorax, front coxae with cavities and prosternum, meso-metasternum, wing, legs including tarsal formuia 5-5-5 in both sexes with segment 1 minute, metendosternite, shape of ventrites and abdomen and elytra. Only major difference noticed are : ventrite 5 almost equal to ventrite 4 in *Thione* but in *Shoguna* ventrite 5 distinctly longer than ventrite 4 and sharply narrowed posteriorly. No attempt has been made here to synonymise the genera but kept as it is based on above differences.

20. **Thione** Sharp

Thione **Sharp, 1899,** *Biol. Centr. Amer. Col.* **II (1) : 544.**

Type species : *Thione cephalotes* Sharp, *Biol. Centr. Amer.*, Col. II (1) : 545. (Locality : Nicaragua),

This is a small genus, Hetschko (1930) in Junk Coleopterorum

Catalogus listed 5 species, three of them are from Central America and two from Queensland : Australia.

General appearance (Figs. 20, 37) narrow, cylindrical, markedly long and somewhat parallel-sided.

Head (Figs. 20, 27) markedly long, labrum not distinguishable, clypeus slightly notched at apex, tempora markenly long and without neck constriction, eyes minute and not projected, transverse line on vertex and basal part of gular region and antennal cavities absent. Antenna (Fig. 20) short, scape large and broadly elongate, pedicel short, joint 3 narrower and shorter than pedicel, joints 4-8 shorter than joint 3 and equal, club distinctly 2-jointed, joint 9 transversely triangular, joint 10 large and narrowed at apex. Mannible elongate, with single apical tooth, prostheca minute and with a few hairs, mola rather short. Maxilla (Fig. 82) with well developed lacinia, galea narrow and short, palpi elongated and rather narrow, segment 2 slightly larger than segment 3, apical segment somewhat fusiform. Labium with palpi elongate, apical segment longest and slightly narrow at apex.

Prothorax (Fig. 20, 37) narrow and elongated, broad at apex and progressively narrowed posteriorly, lateral margins almost straight, front coxae rounded and almost contiguous, externally broadly closed and internally open behind, prosternal process moderately broad.

Meso-metathorax (Fig. 126) elongate, mesocoxae almost contiguous, sternal fitting between them in a single knob, mesocoxal cavities open outwardly. Metasternum elongate, hind coxae almost contiguous, median impressed line short, metendosternite elongate, with anterior tendons closely situated.

Wing and elytra : Wing (Fig. 138) with a trace of an anal vein and trace of r-m cross vein. Elytra narrow, somewhat parallel-sided and with regular rows of minute punctures.

Legs (Fig. 126) short, trochanters short and simple, femora rather short and markedly swollen at middle, tibiae strongly broadened apex and with two apical spines, trarsal formula 5-5-5 in male and female, segments simple, segment 1 minute, segment 2 markedly long, segments 2-4 progressively shorter, claws simple.

Abdomen (Fig. 156) elongate, ventrites almost equal in length, ventrite

1 without femoral lines, intercoxal process sharply pointed at apex. Aedeagus and ovipositor not studied.

Habitat : Not known to author.

Geographical distribution : Central America and Australia.

21. **Shoguna** Lewis

Shoguna Lewis, 1884 : *Ann. Mag. nat. Hist. London* (6) IV : 274.

Type species : *Shogunu rufotestacea* Lewss 1884. *Ann. Mag. nat. Hist. London*, (6) IV : 274. (locality : Japan).

This is a small genus closely related to *Thione* Sharp. Species are narrow, cylindrical and markedly long, predominate in South East Asia, Japan and Madagascar, in India they only occur in North Eastern States and Andaman Islands. Hetschko (1930) in Junk Coleopterorum Catalogus listed 7 species from the World. In present study two species namely *S. feae* Grouvelle and *S. longiceps* recorded from India for the first time.

General appearance (Figs. 18, 19) narrow, cylindrical and elongate.

Head (Fig. 51) markedly elongate, tempora absent, eyes small, labrum not distinguishable, apical margin of clypeus notched, antennal insertions hidden, transverse line on vertex absent, anterior part of gular region with a rather indistinct semicricular transvcrse impression, antennal cavities absent, tentorium elongate and as figured (Fig. 51). Antenna (Fig. 51) short, scape broadly elongate, pedicel smaller than scape, joint 3 elongate, snorter and narrower than pedicel, joints 4-8 short and equal, club large 2-jointed, joint 9 transverse and joint 10 slightly elongated and angularly narrowen at apex. Mandible (Fig. 63) narrow, elongate with single apical tooth and its inner margin with two small teeth, prostheca small and mola short but well developed. Maxilla (Fig. 31) with lacinia large, fan-like, galea short, narrow and finger-like, palpi with segment 2 rather markedly elongate, segment 3 shorter than segment 2, segment 4 elongated and slightly narrowed at apex. Labium (Fig. 92) distinctly elongate, palpi elongate, segment 2 narrowly elongate and segment 2 broadly elongated and narrowed at apex.

Prothorax (Fig. 112) markedly elongate and almost parallel-sided, front coxae rounded and closely situated, cavities exrernally narrowly closed behind.

Meso-metathorax elongate, meso-and meta coxae almost contiguous, sternal fitting between mesocoxae with a single knob from metasternum, mesocoxal cavities open outwardly, median impressed line on metasternum rather short, metedosternite narrow, elongate and with anterior tendons.

Wings and elytra : Wing (Fig. 139) reduced, with a trace of anal vein, radial cell and subcubital fleck absent, r-m cross vein present. Elytra narrow, elongate, somewhat parallel-sided, with longitudinal lines or distinct-type (Figs. 18, 19).

Legs short, trochanter short and simple, femora markedly swollen in middle, tibiae moderately broad at apex and with a pair of two normal spurs, outer angles with two large spines, tarsal formula 5-5-5, tarsal segment simple, segment 2 rather distinctly long, segments 1 and 4 minute, claws simple.

Abdomen (Fig. 155) narrow elongate, ventrite, 1 slightly longer than ventrite 2, ventrite 2-4 short and equal, ventrite 5 markedly long, intercoxal process of ventrite 1 narrow, long and pointed at apex, femoral lines on ventrite 1 absent.

Larva : Non known.

Habitat : Under bark.

Geographical distribution : North East India, Andaman Islands : India. South east Asiatic Countries ; Japan ; Madagascar.

Tribe Lenacini

Crowson (1955) established a seperate subfamily for the genus *Lenax* Sharp for its tarsal formula being 4-4-4 in both sexes, head with well developed antennal cavities, front coxae rounded and mesocoxal cavities closed outwardly. Larva of *Lenax* is peculiar and characteristic, will be described elesewhere.

22. **Lenax** Sharp

Lenax **Sharp**, 1877 : *Ent. Month Mag.*, : 269.

Type species, *Lenax mirandus* Sharp *Ent. Month. Mag.* **13** : 269. (locality : New Zealand).

Sharp (1877) established this monotypic genus from New Zealand

and so far, only known form New Zealand. General shape and morphological characters are peculiar and can be easily distinguished from other known genera Rhizophagidae.

General appearance (Fig. 21) narrow, elongate and somewhat cylindrical.

Head (Fig. 52) rather short, as broad as long, tempora well developed, neck constriction marked, labrum not distinguishable, transverse and longitudinal grooves on vertex of head as figured (Fig. 52), unlike other Rhizophagidae transverse line on anterior part of gular region absent, antennal cavities well developed narrow, long and parallel-sided, genae not projecting and normal, eyes moderately large and coarsely faceted, tentorium as figured (Fig. 52). Antenna (Fig. 52) short, scape globular, pedicel broadly elongate, joint 3 smaller than pedicel and slightly elongate, joints 4-8 short and equal, joint 9 strongly transverse, joint 10 forming a large rounded club. Mandible (Fig. 64) with two apical teeth, mola and prostheca well developed. Maxilla (Fig. 83) with large lacinia and narrow galea, palpi normal and with segment 2 slightly longer than segment 3. Labium (Fig. 96) rather small and elongated, mentum with a pair of glandular median cavities, palpi normal.

Prothorax (Fig. 111) markedly long, cylindrical, narrowed towards front, front coxae large, rounded and almost contiguous, cavities externally broadly closed behind, prosternal process broad at apex.

Meso-metathorax (Fig. 157) elongate, meso and metacoxae almost contiguous, mesocoxal cavities closed outwardly, mesoepimera not reaching to mesocoxal cavities, sternal fitting between mesocoxae with a single projection from metasternum, anterior part of metasternum with a median setiferous glandular pore, unlike other Rhizophagidae median impressed line absent, metendosternite simple and elongated (Fig. 127).

Wing and elytra : Wing (Fig. 133) with 2 anal veins, r-m cross vein distinct and without subcubital fleck. Elytra rather narrow, elongate with regular rows of punctures.

Legs (Figs. 127) short, trochanter short and simple, femora swollen at middle, tibiae short, broad, its outer and apical margin serrated and with normal two apical spurs, tarsal formula 4-4-4, tarsal segments simple, 1-3 short and equal, claws simple.

Abdomen (Fig. 157) elongated, narrowed posteriorly and strongly punctured, ventrite 1 long, ventrite 2-4 short and equal, ventrite 5 long and its apical margin trunctated and irregularly densely punctured, ventrite 1 without femoral lines, intercoxal process narrow, pointed and with a median glandular cavity. Aedeagus not studied. Ovipositor short with paraprocts, valvifers, coxities fused at middle and its apex characteristic (Fig. 171), styli absent.

Habitat : Under bark.

Geographical distribution : New Zealand.

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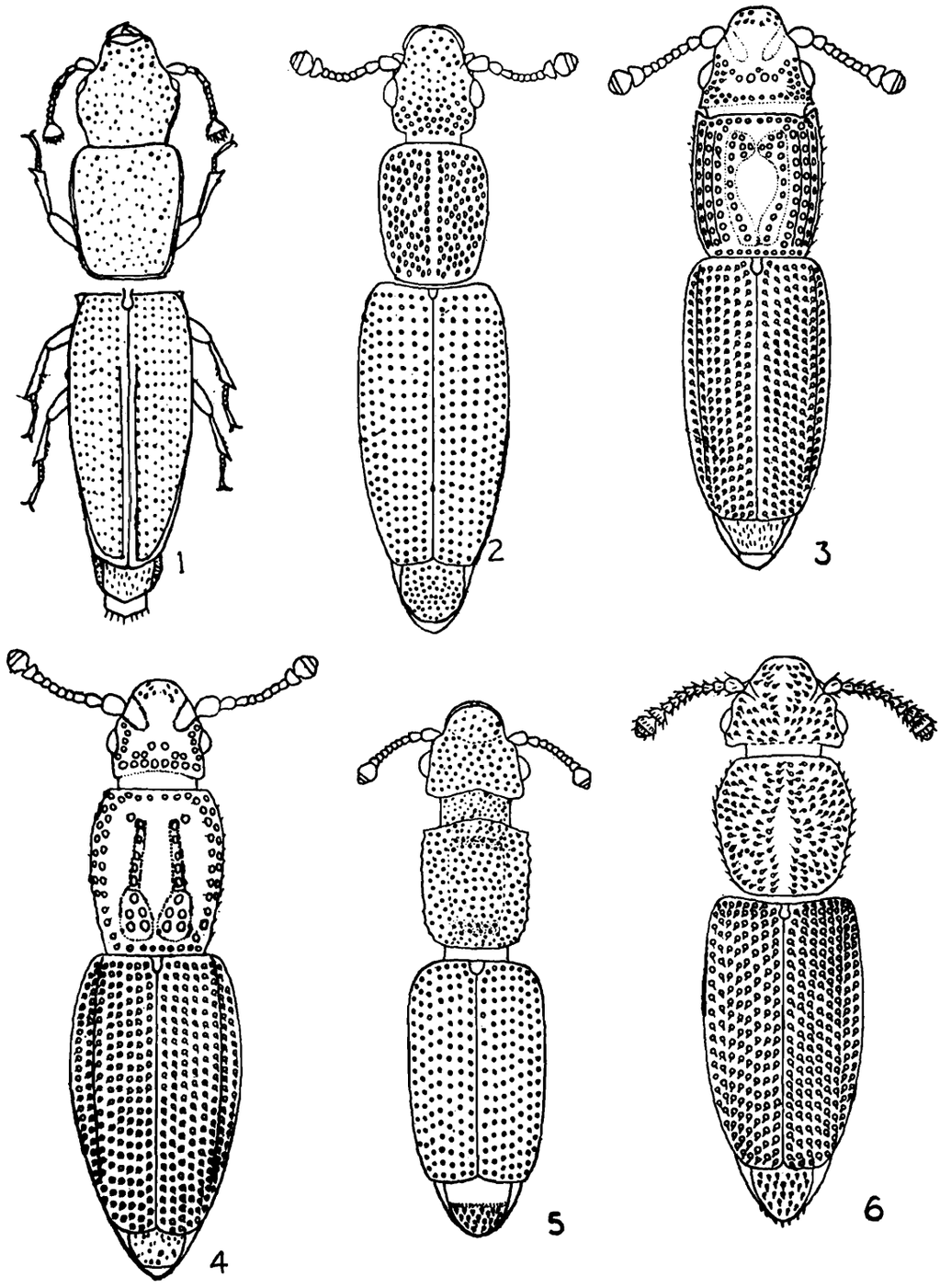
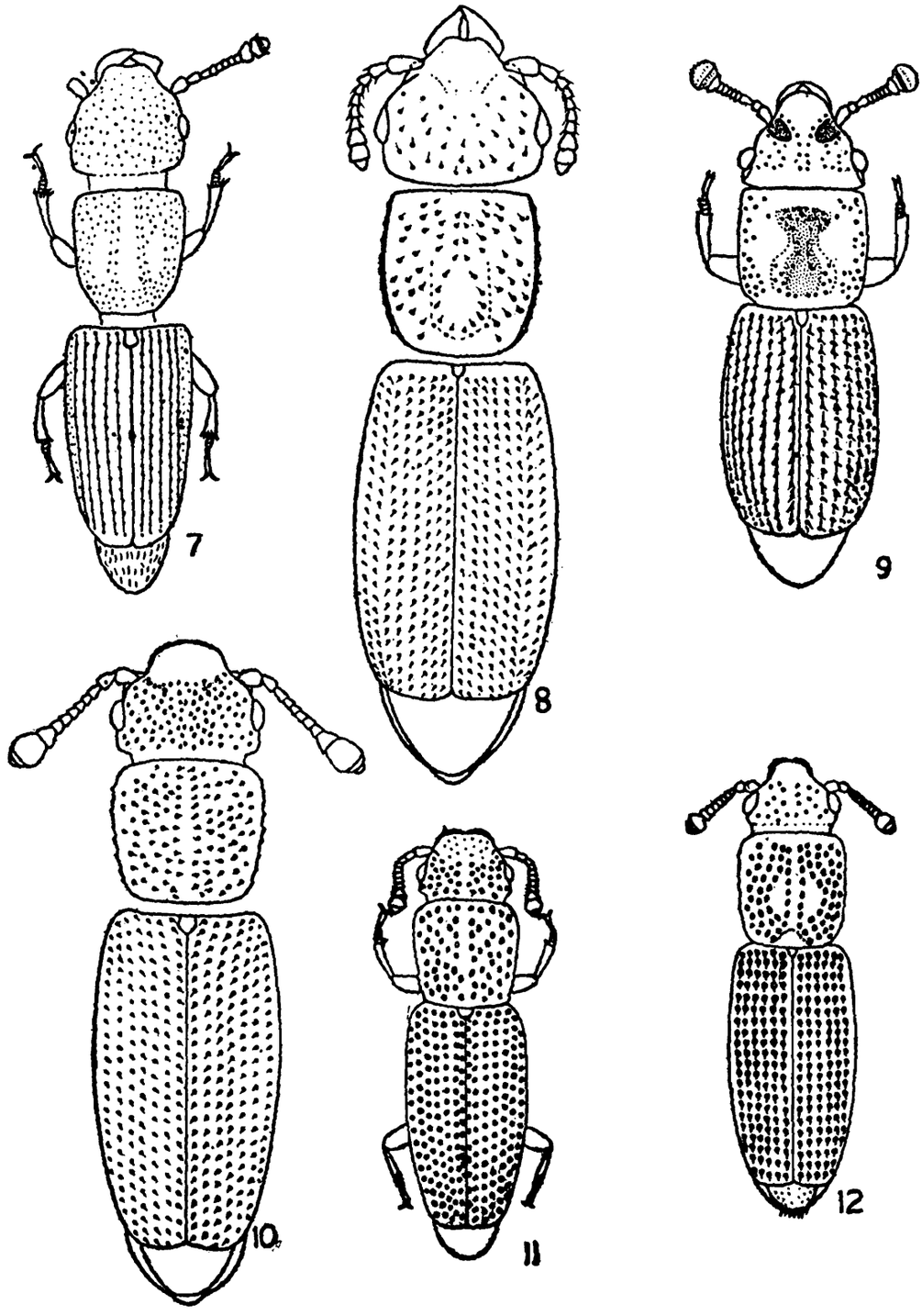
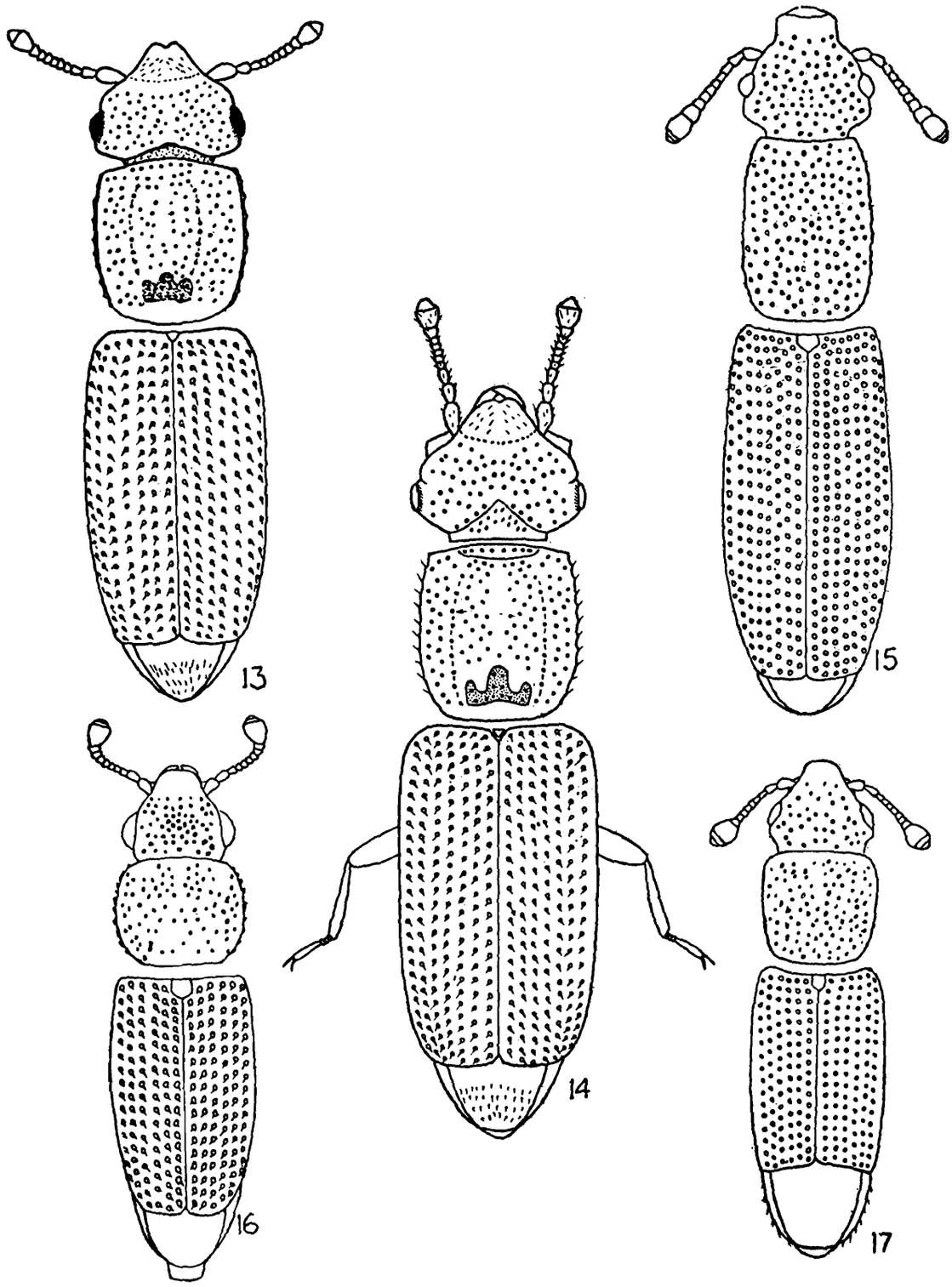
PLATES



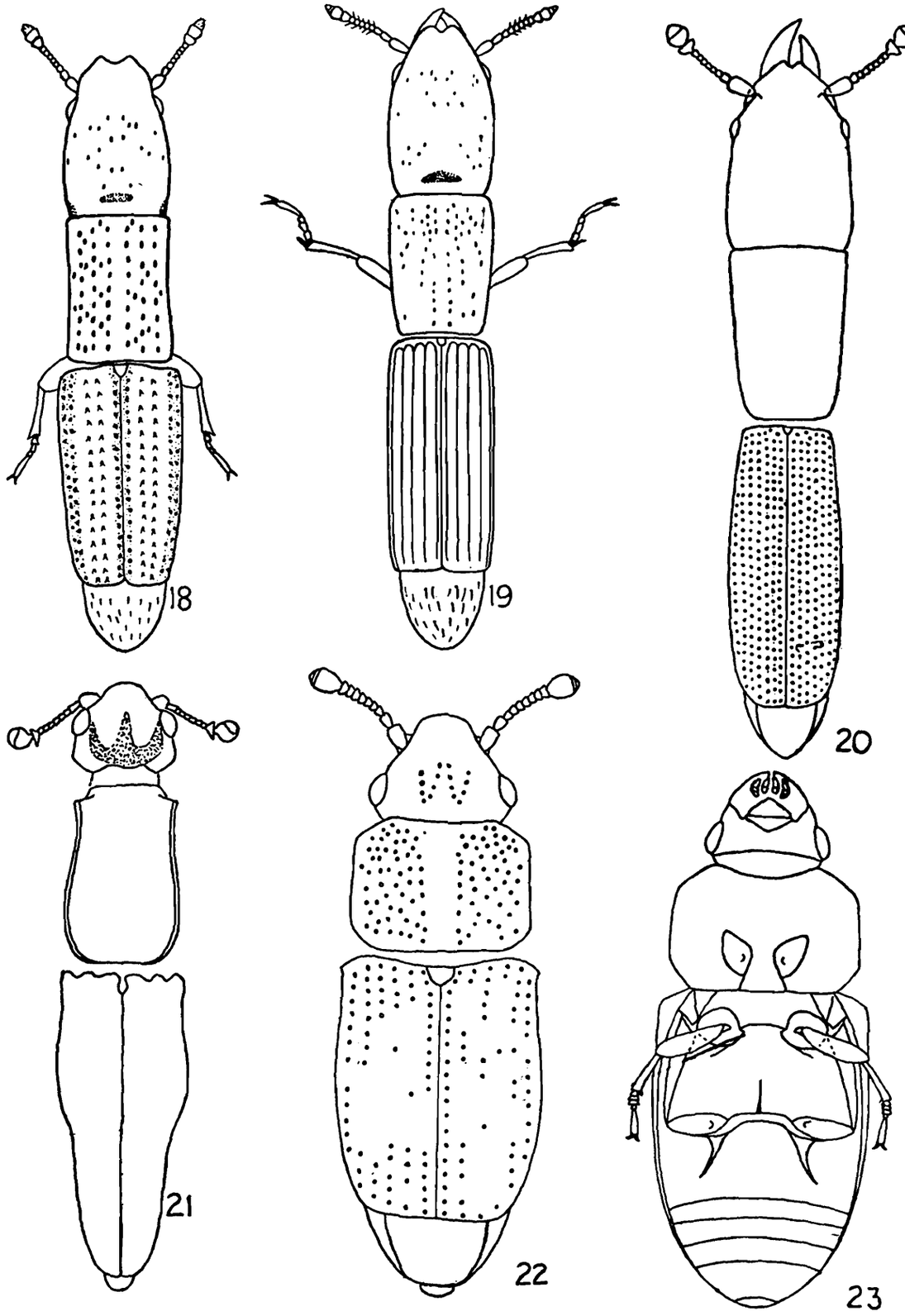
Figs. 1-6. Dorsal view. 1. *Rhizophagus pahalgamus* Sengupta & Biswas ; 2. *Malinica ranjana* n. sp.; 3. *Monotomopsis andrewesi* Grouvelle ; 4. *Monotomopsis monotomoides* Grouvelle ; 5. *Tarunius punctatus* Sengupta ; 6. *Renuka rita* n. sp.



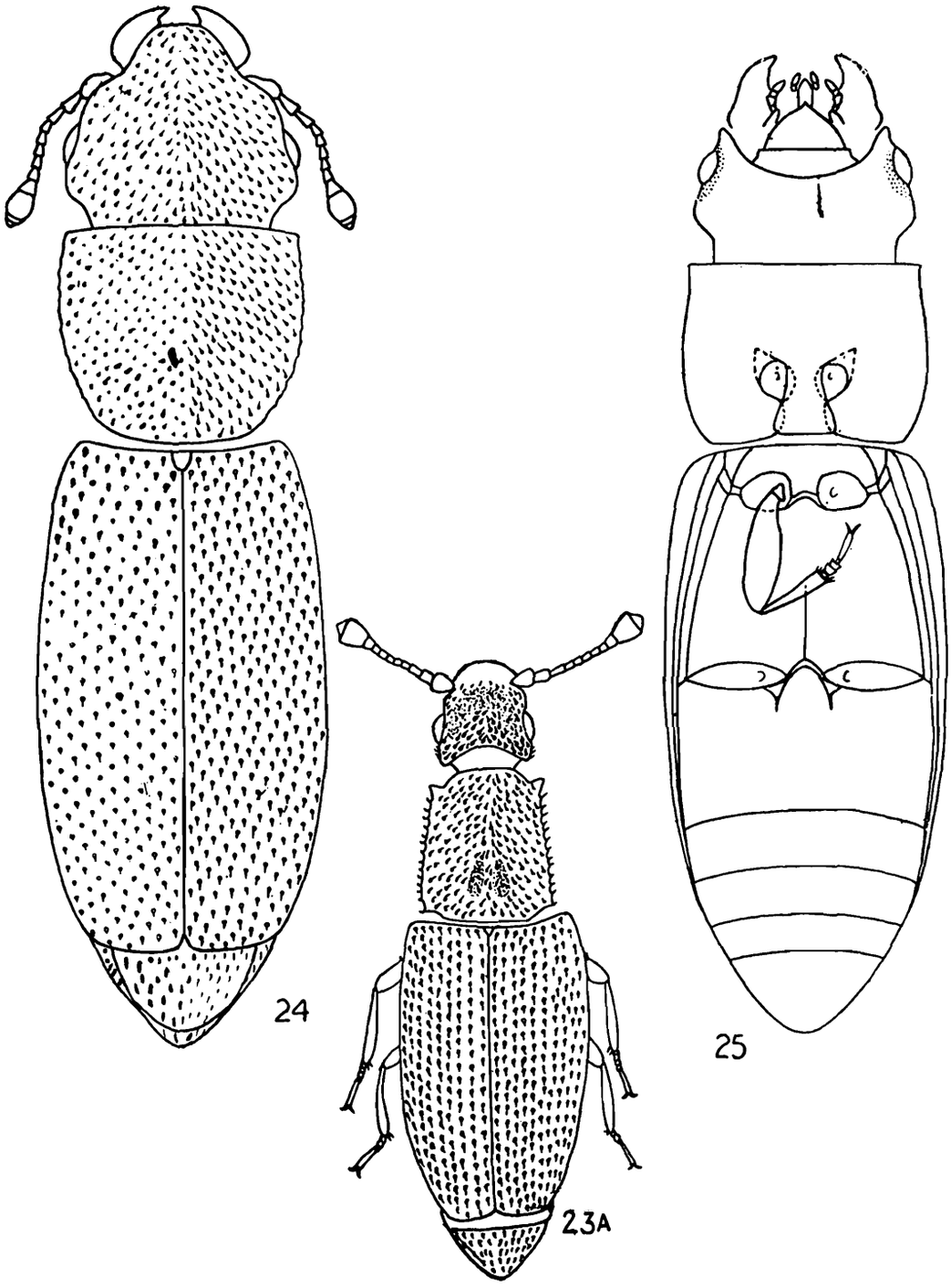
Figs. 7-12. Dorsal view. 7. *Aneurops championi* Sharp ; 8. *Europs depressus* Grouvelle ; 9. *Eporus insignis* Grouvelle ; 10. *Hesperobaenus abbreviatus* (Motschuisky) ; 11. *Monotopion ferugineum* Reitter ; 12. *Malabica tatai* n. sp.



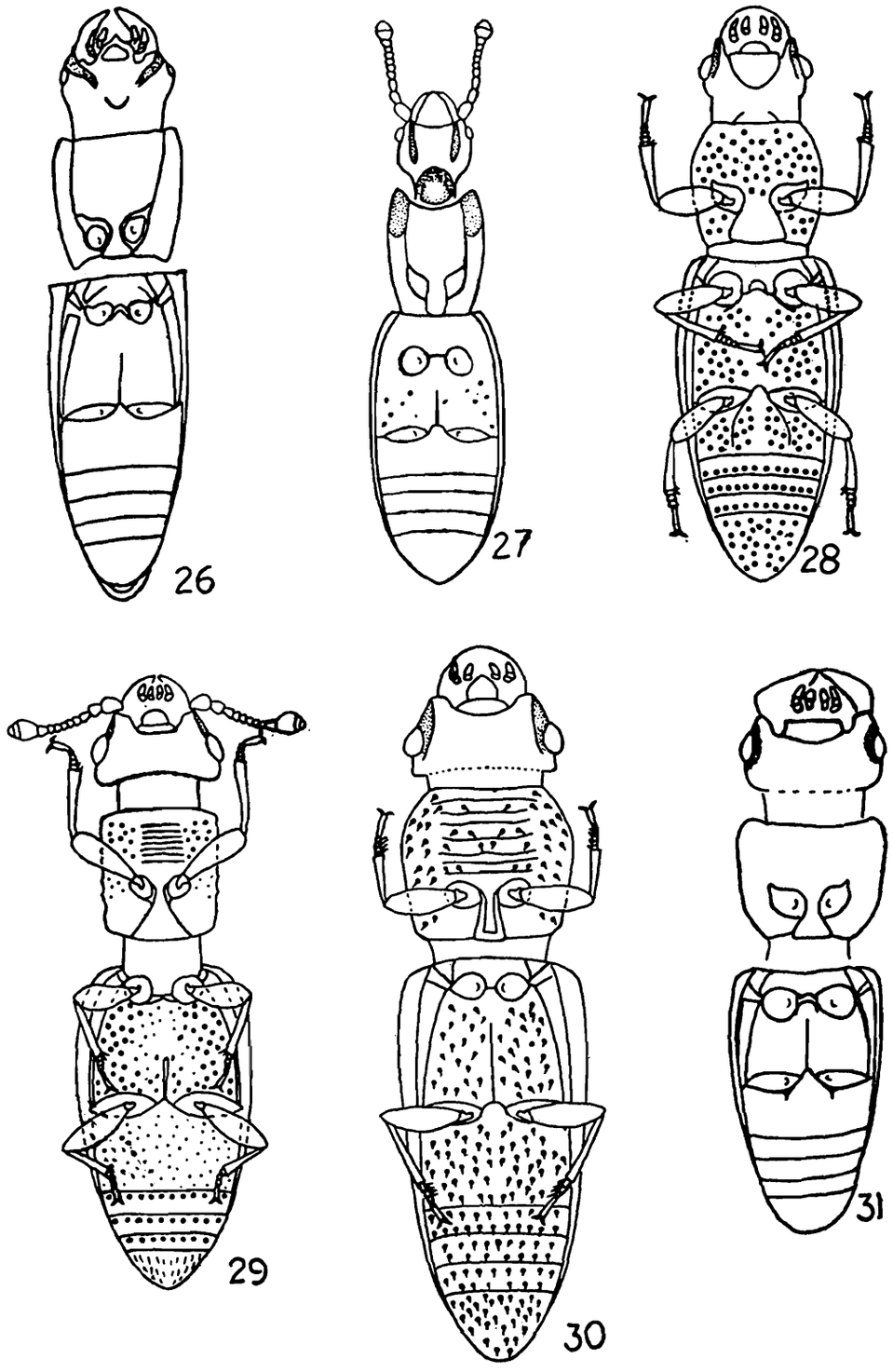
Figs. 13-17. Dorsal view. 13. *Mimemodes megalocephalus* Champion ; 14. *Mimemodes megalocephalus* Champion ; 15. *Macreurops longicollis* (Horn) ; 16. *Bactridium convexulum* Casey ; 17. *Leptipsius striatus* (LeConte).



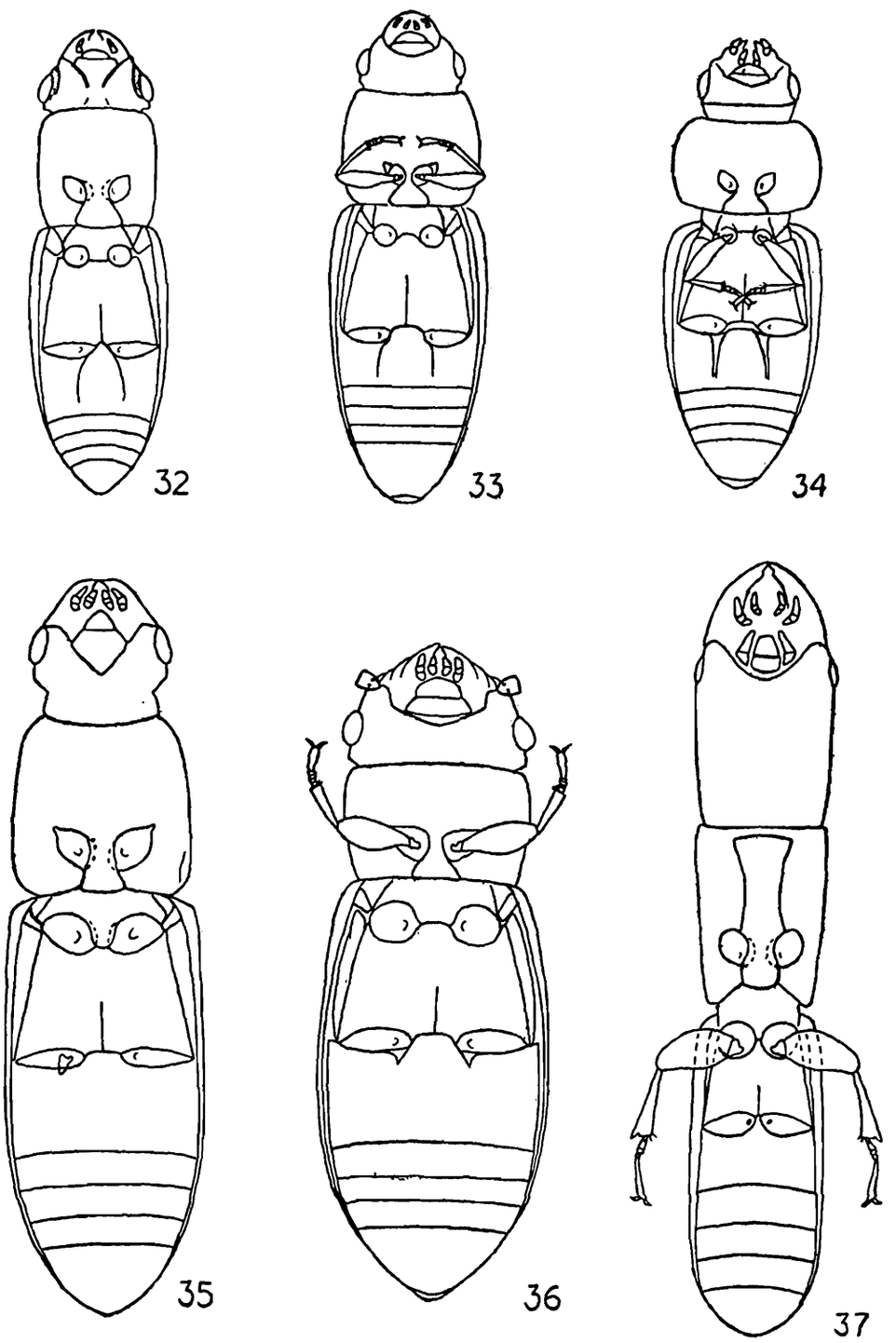
Figs. 18-23. Dorsal view. 18. *Shoguna termitiformis* (Fairmaire); 19. *Shoguna longiceps* (Grouvelle); 20. *Thione* sp. 21. *Lenax mirandus* Sharp; 22. *Pycnotomina cavicollis* (Horn); 23. *Pycnotomina cavicollis* Horn (ventral view).



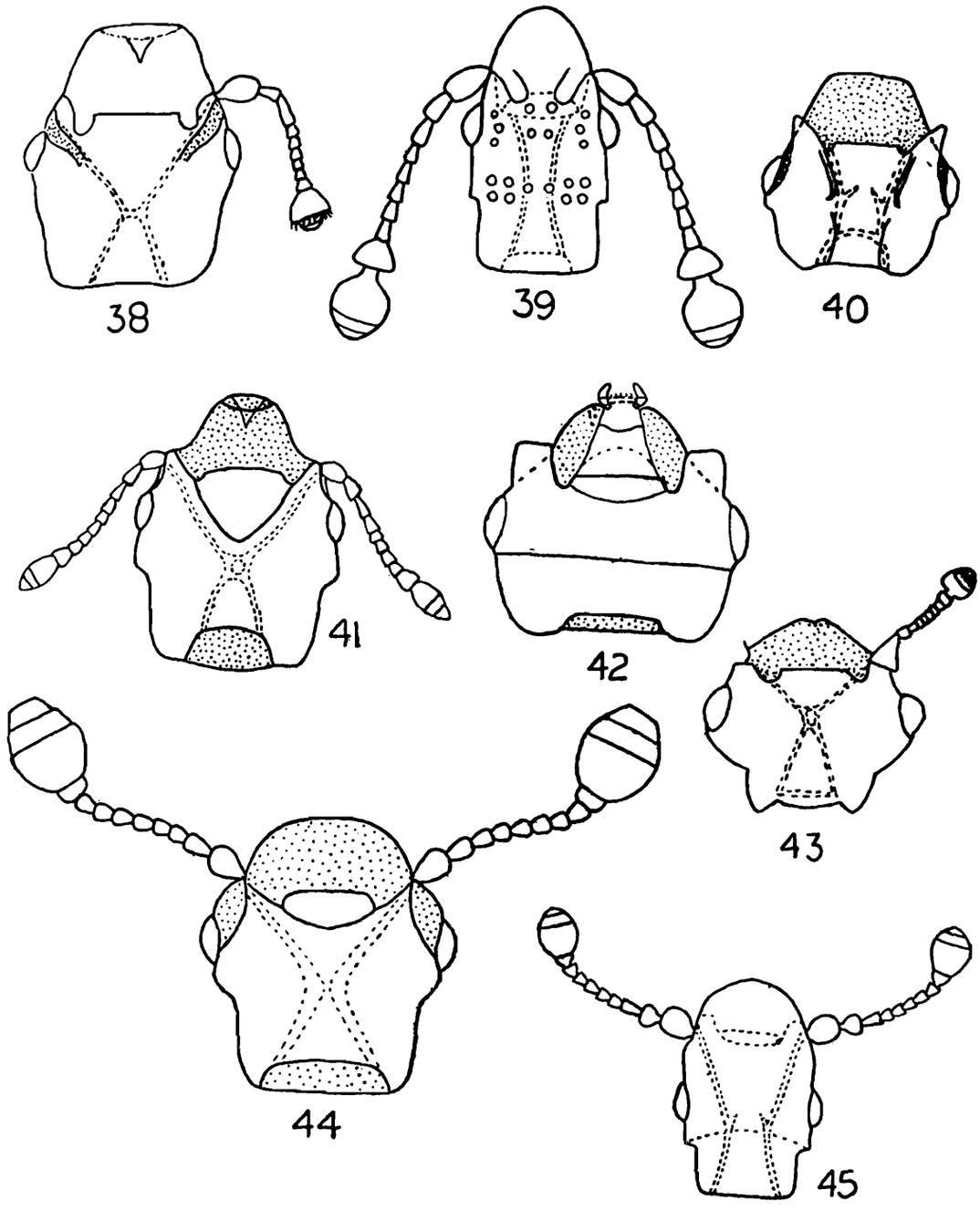
Figs. 23A-25. 23A. *Monotoma spinicollis* Aubé 24. *Phyconomus marinus* (LeConte) (Dorsal view); 25. *Phyconomus marinus* (LeConte) (ventral view).



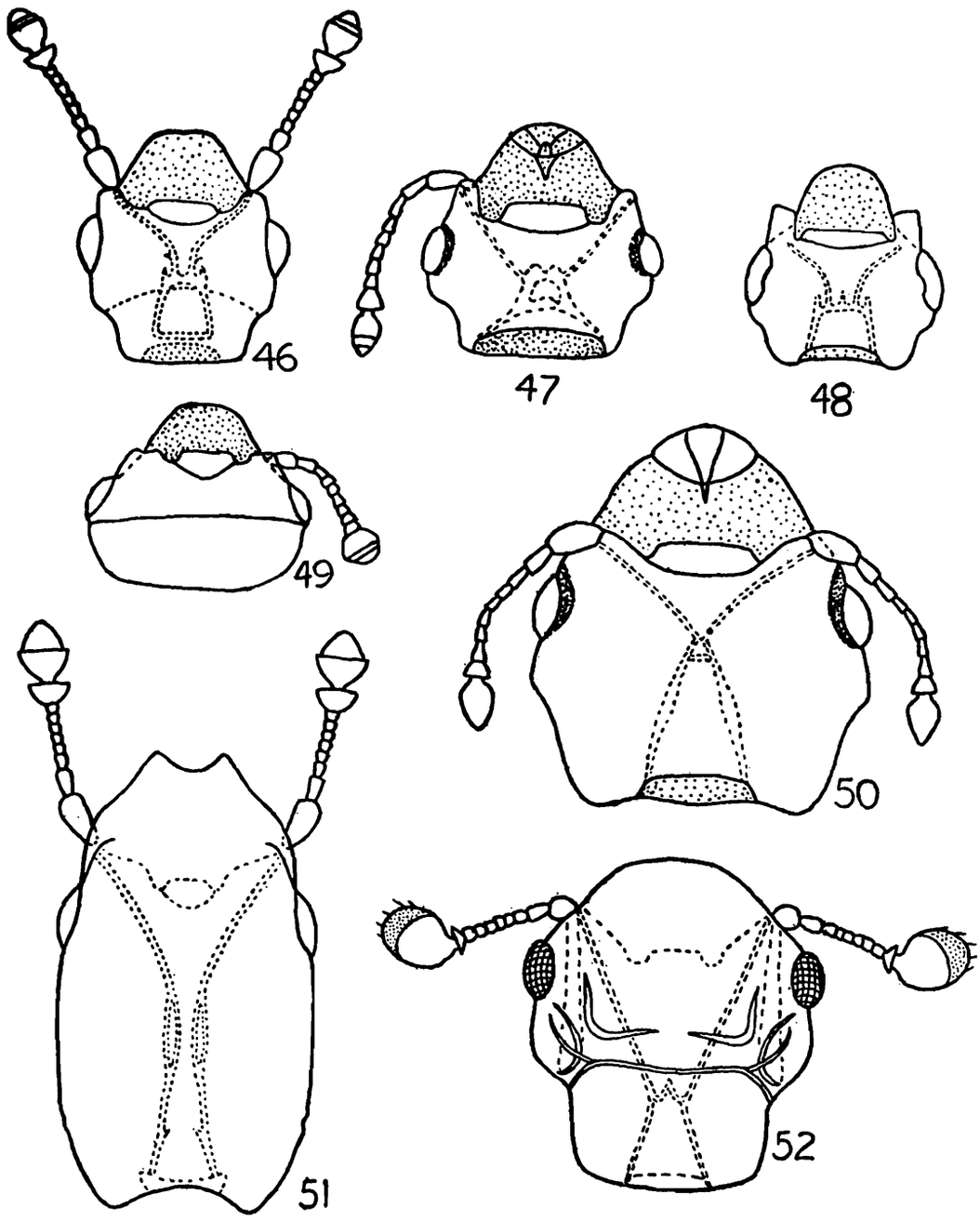
Figs. 26-31 (Ventral view). 26. *Rhizophagus pahalgamus* Sengupta ; 27. *Pararhizophagus grouvelli* Méquignon ; 28. *Malinica ranjana* n. sp. ; 29. *Tarunius punctatus* Sengupta ; 30. *Renuka rita* n. sp. ; 31. *Aneurops championi* Sharp.



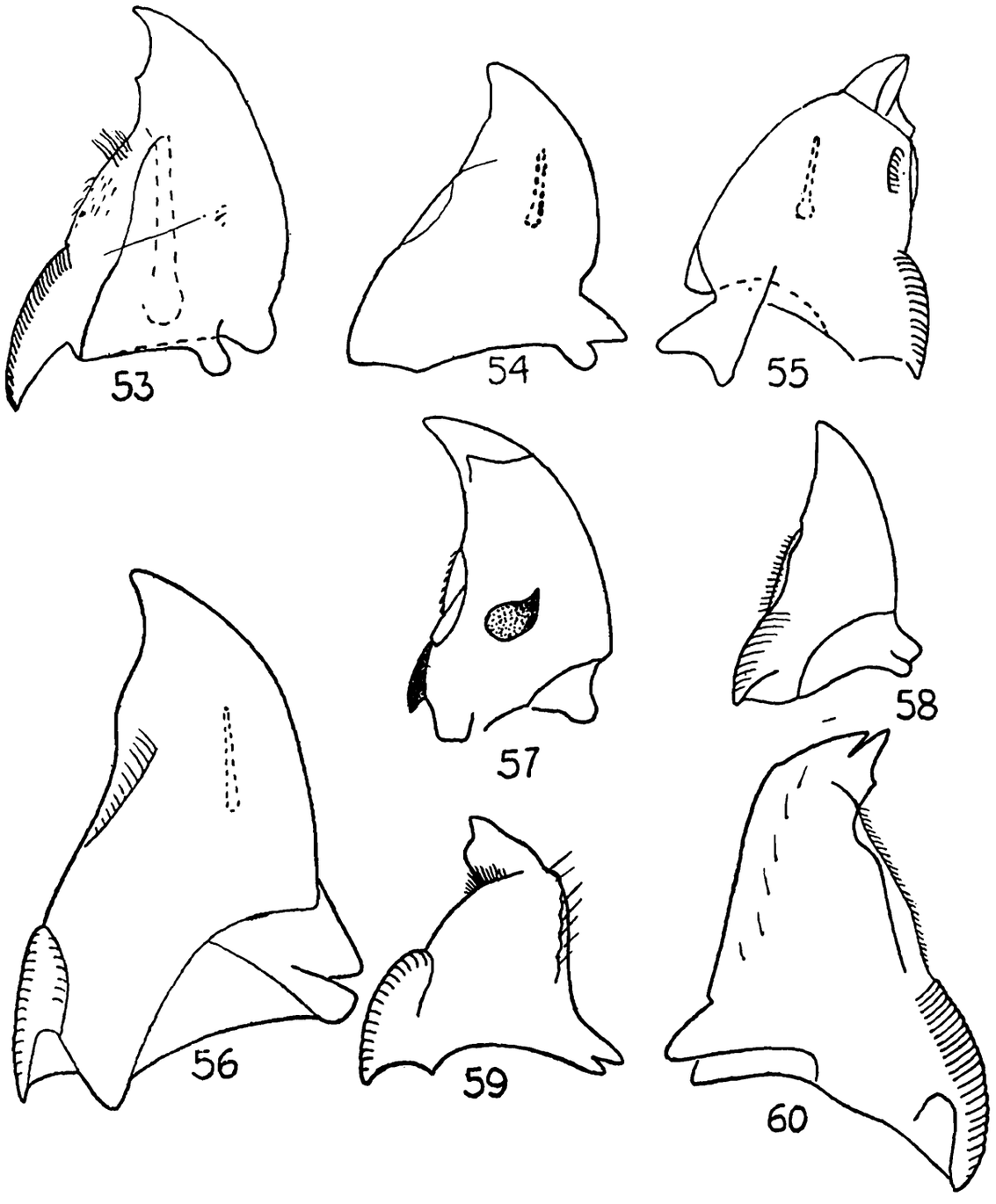
Figs. 32-37. (Ventral view). 32. *Monotopion ferrugineum* Reitter ; 33. *Leptipsius striatus* LeConte : 34. *Bactridium convexulum* Casey ; 35. *Macreurops longicollis* (Horn) ; 36. *Hesperobaenus abbreviatus* (Motschulsky) ; 37. *Thione* sp.



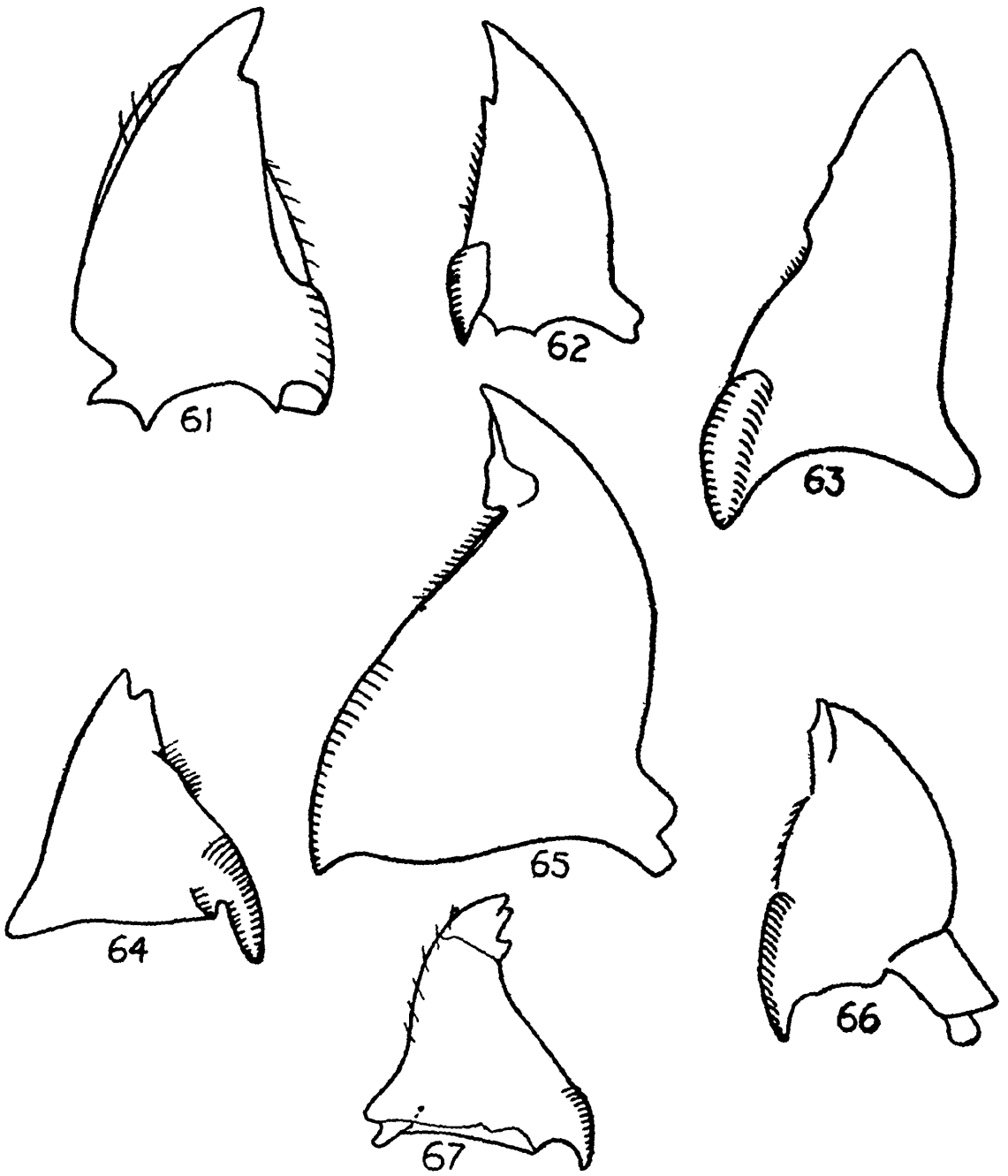
Figs. 38-45. Head, ventral view. 38. *Rhizophagus* sp. ; 39. *Monotomopsis monotomoides* Grouvelle ; 40. *Monotopion ferrugineum* Reitter ; 41. *Macreurops longicollis* (Horn) ; 42. *Pycnotomina cavicollis* (Horn) ; 43. *Mimemodes kimbhutus* Sengupta ; 44. *Malabica tatai* n. sp. ; 45. *Monotoma* sp.



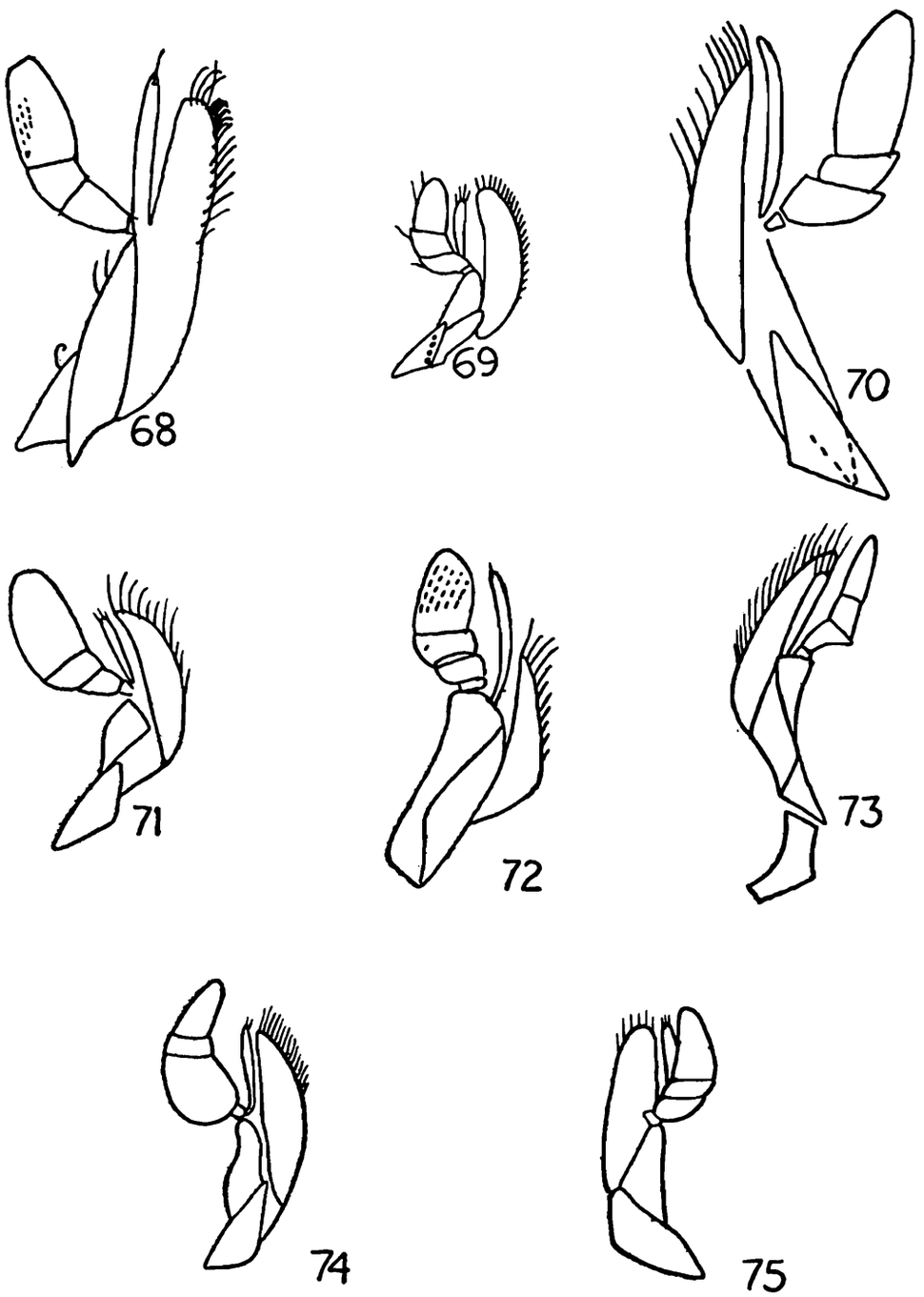
Figs. 46-52. Head, ventral view. 46. *Europs* sp.; 47. *Europs* sp.; 48. *Leptipsius striatus* LeConte; 49. *Bactridium convexulum* Casey; 50. *Phyconomus marinus* (LeConte); 51. *Shoguna* sp.; 52. *Lenax mirandus* Sharp.



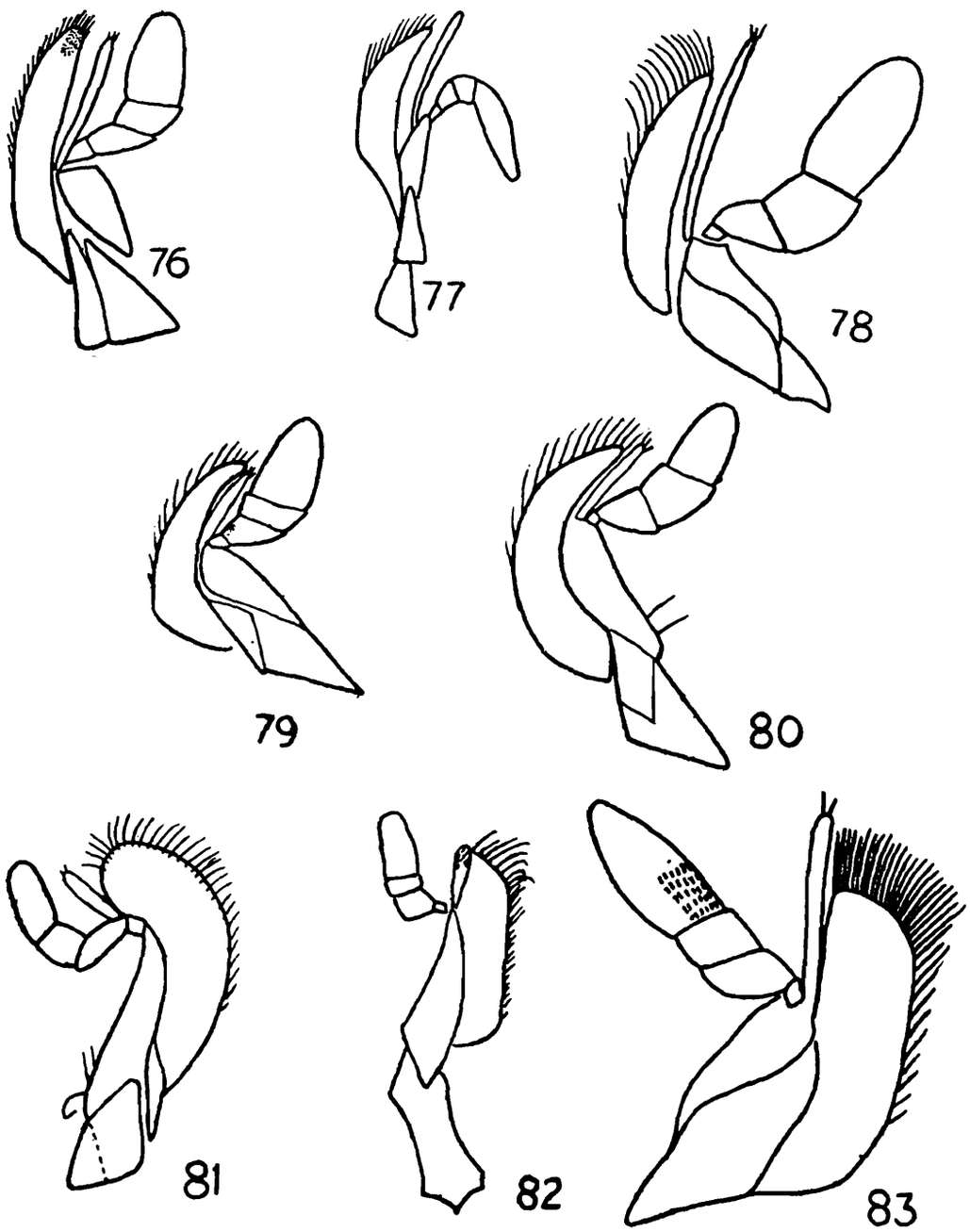
Figs. 53-60. Mandible. 53. *Rhizophagus* sp.; 54. *Leptipsius striatus* LeConte; 55. *Bactridium convexulum* Casey: 56. *Pycnotomina cavicollis* (Horn); 57. *Mimemodes kimbhutus* Sengupta; 58. *Europs* sp.; 59. *Monotoma* sp.; 60. *Monotomopsis monotomoides* Grouvelle.



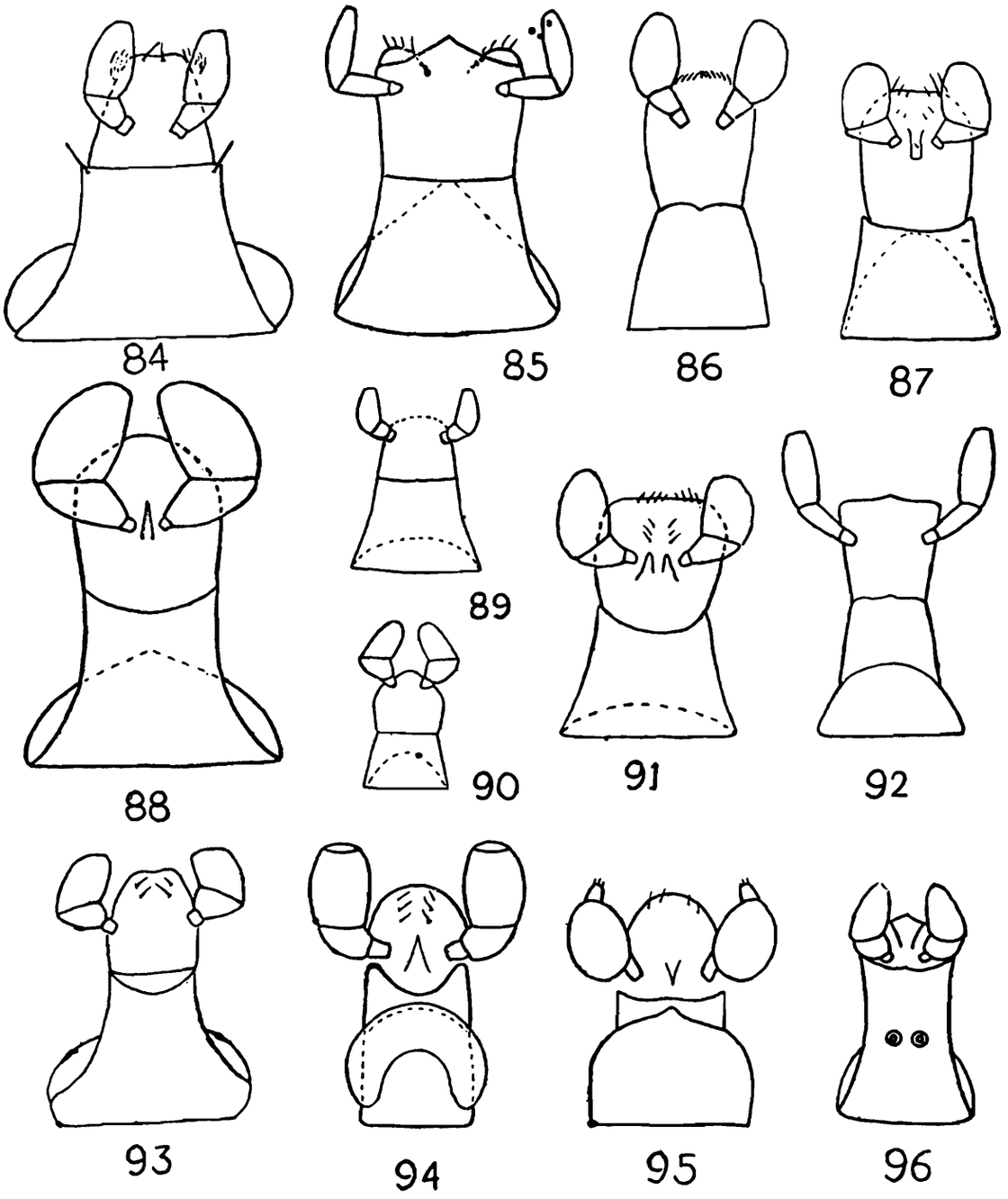
Figs. 61-67. Mandible. 61. *Phyconomus marinus LeConte*; 62. *Hesperbaenus abbreviatus* (Motschulsky); 63. *Shoguna* sp.; 64. *Lenax mirandus* Sharp; 65. *Macreurops longicollis* (Horn); 66. *Monotopion ferrugineum* Reitter; 67. *Malabica tatai* n. sp.



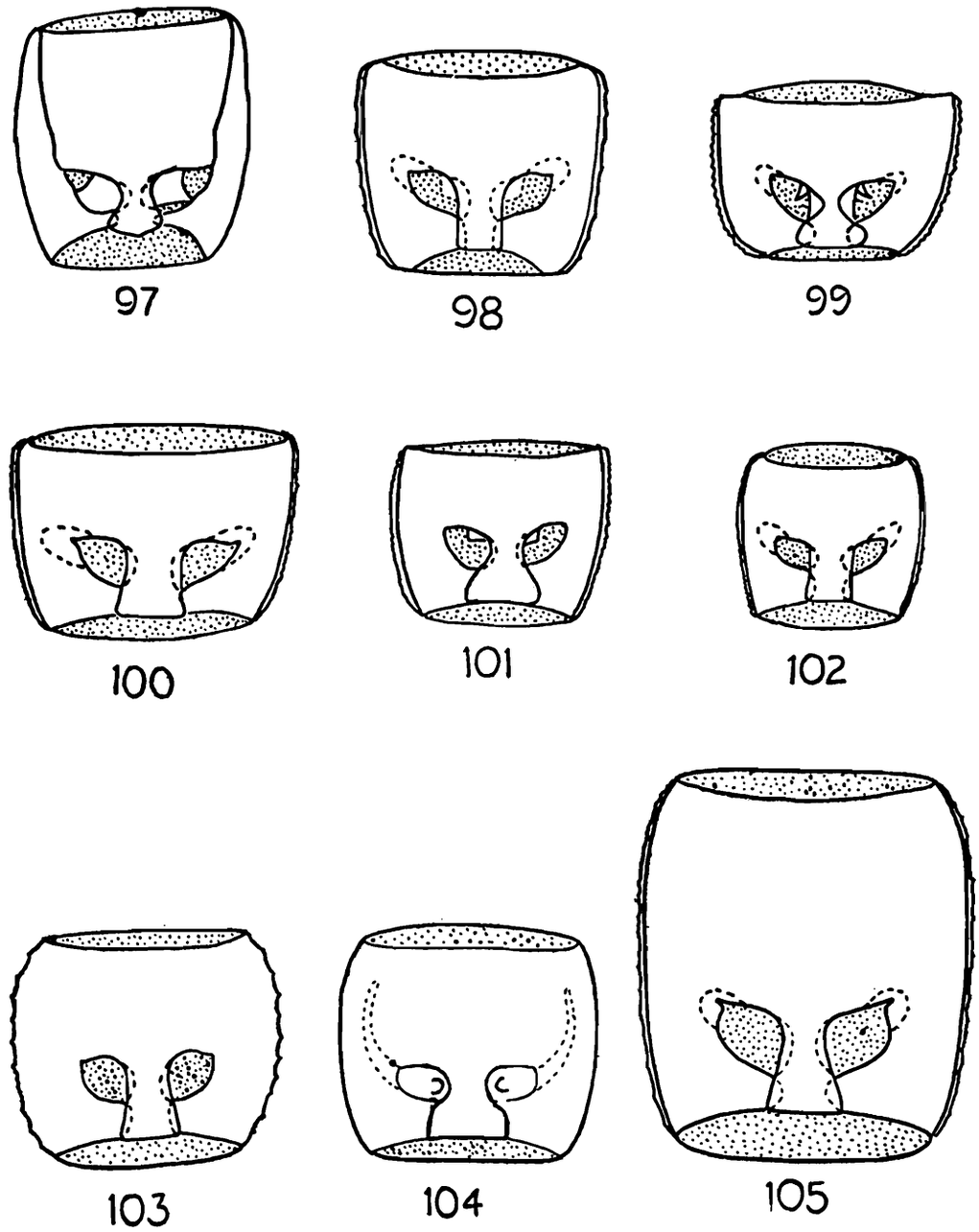
Figs. 68-75. Maxila. 68. *Rhizophagus* sp.; 69. *Europs* sp.; 70. *Hesperobaenus abbreviatus* (Motschulsky); 71. *Bactridium convexulum* Casey; 72. *Monotopion ferrugineum* Reitter; 73. *Phyconomus marinus* (LeConte); 74. *Monotoma* sp.; 75. *Malabica tatai* n. sp.



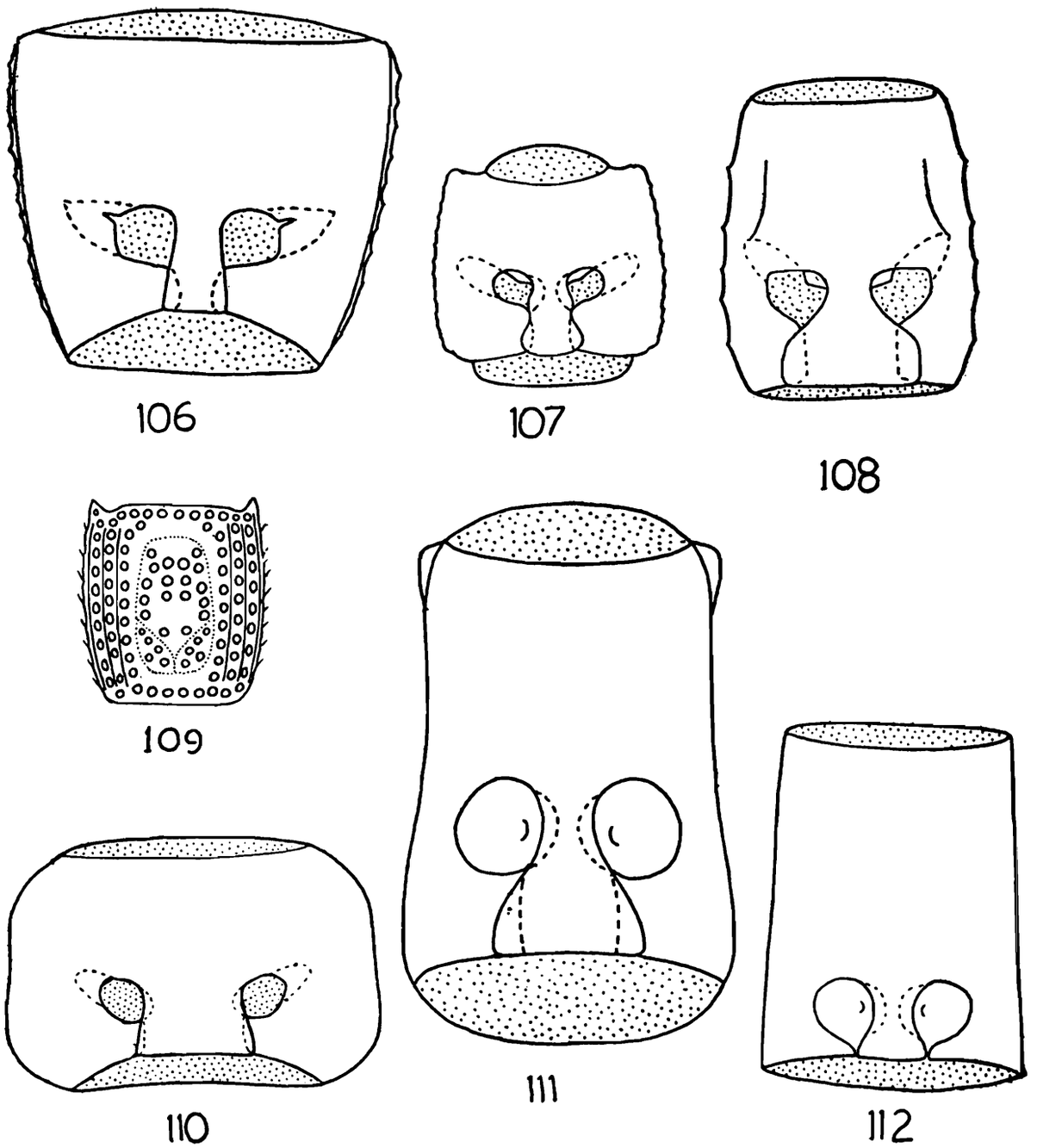
Figs. 76-83. Maxilla. 76. *Monotomopsis monotomoides* Grouvelle ; 77. *Mimemodes kimbhutus* Sengupta ; 78. *Macreurops longicollis* (Horn) ; 79. *Leptipsius striatus* (LeConte) ; 80. *Pycnotomina cavicollis* (Horn) ; 81. *Shoguna* sp. ; 82. *Thione* sp. ; 83. *Lenax mirandus* Sharp.



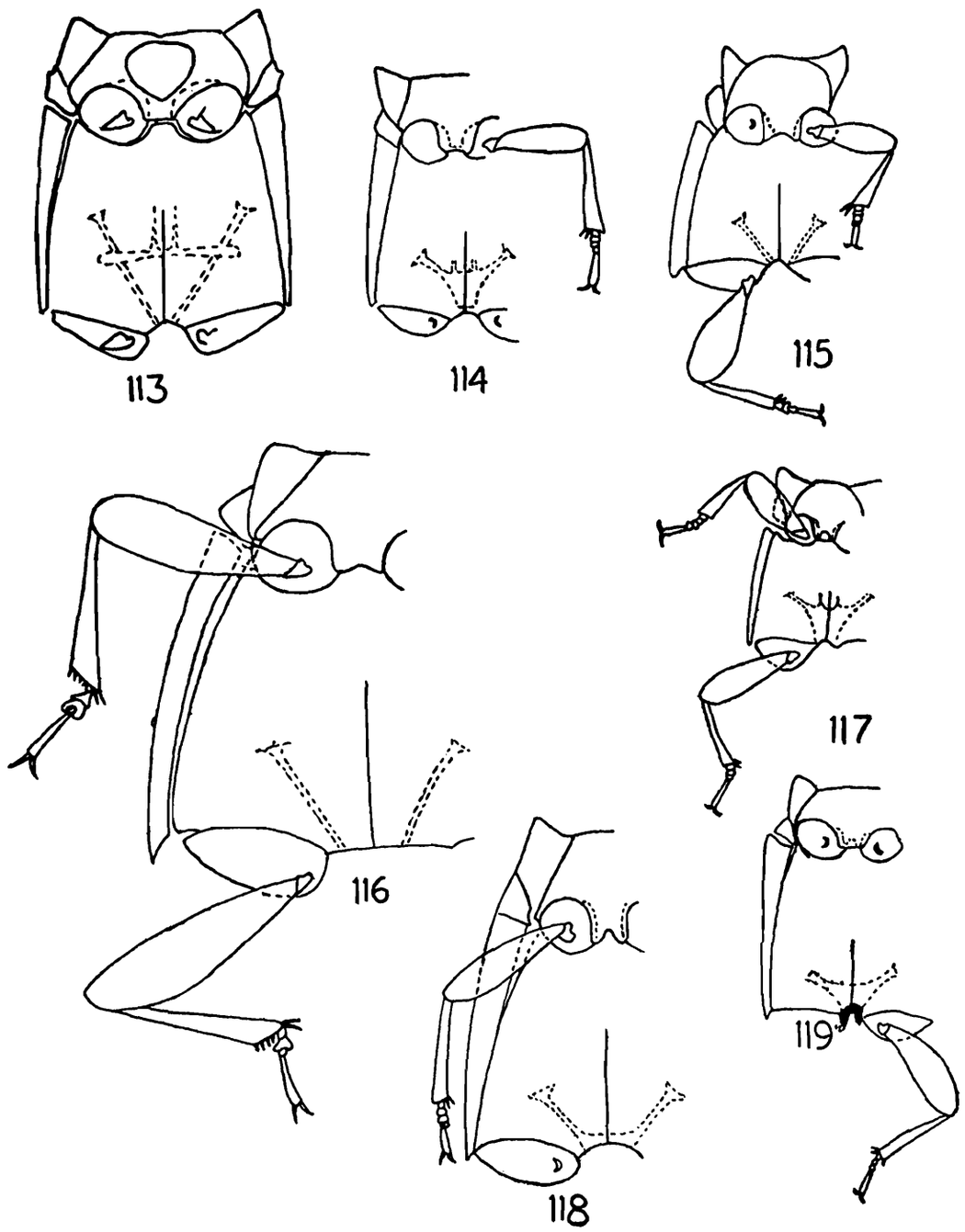
Figs. 84-96. Labium. 84. *Rhizophagus* sp.; 85. *Phyconomus marinus* (LeConte); 86. *Mimemodes kimbhutus* Sen Gupta; 87. *Leptipsius striatus* (LeConte); 88. *Macreurops longicollis* (Horn); 89. *Malabica tatai* n. sp.; 90. *Europs* sp.; 91. *Bactridium convexulum* Casey; 92. *Shoguna* sp.; 93. *Monotopion ferrugineum* Reitter; 94. *Monotomopsis monotomoides* Grouvelle; 95. *Monotoma* sp.; 96. *Lenax mirandus* Sharp.



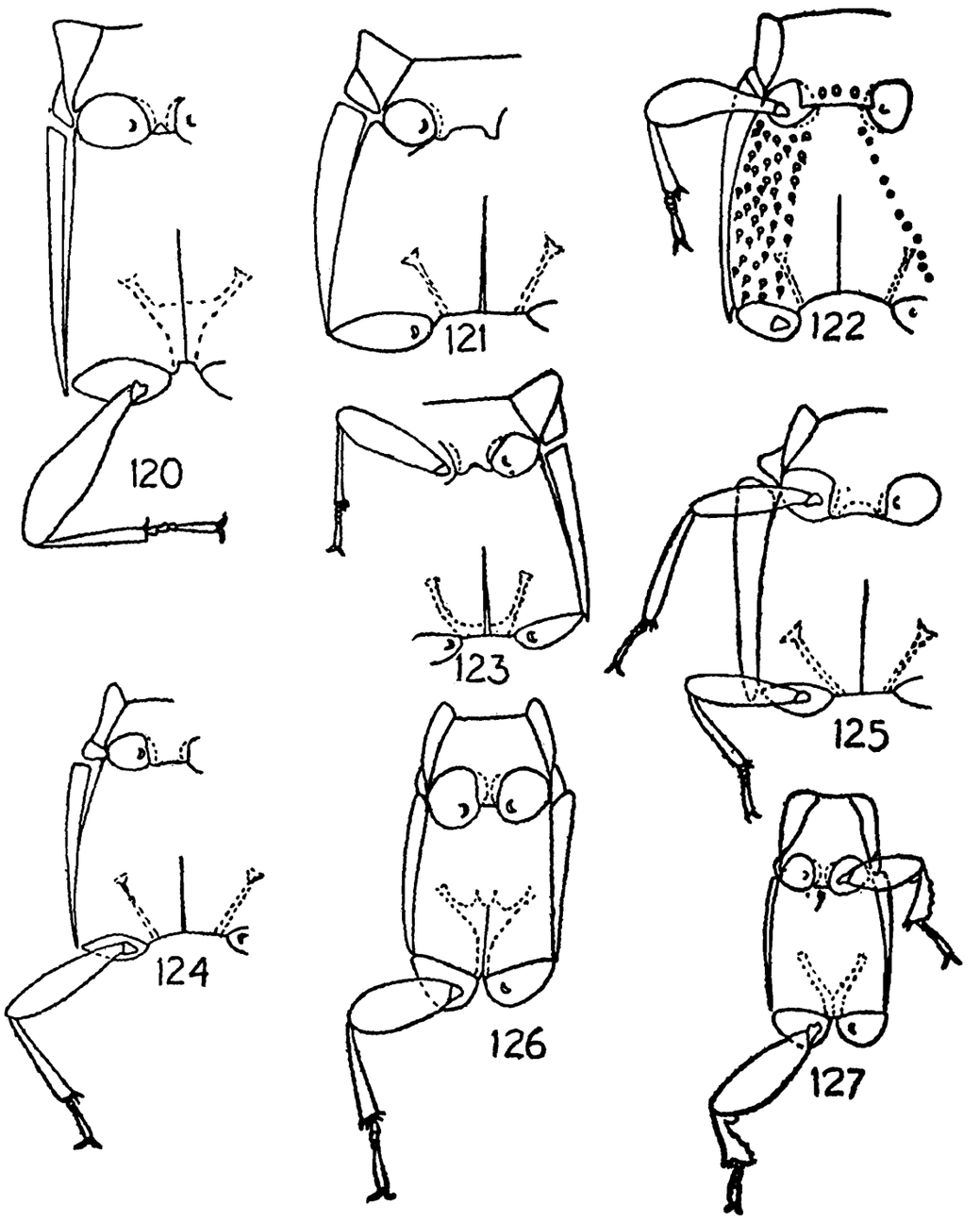
Figs. 97-105. *Prothorax* (ventral view); **97.** *Rhizophagus cribratus* Gyllenhal; **98.** *Europs sp.*; **99.** *Mimemodes kimbhutus* Sen Gupta; **100.** *Hesperobaenus abbreviatus* (Motschulsky); **101.** *Monotopion ferrugineum* Reitter; **102.** *Malabica tatai* n. sp.; **103.** *Bactridium convexulum* Casey; **104.** *Leptipsius striatus* (LeConte); **105.** *Macreurops longicollis* (Horn).



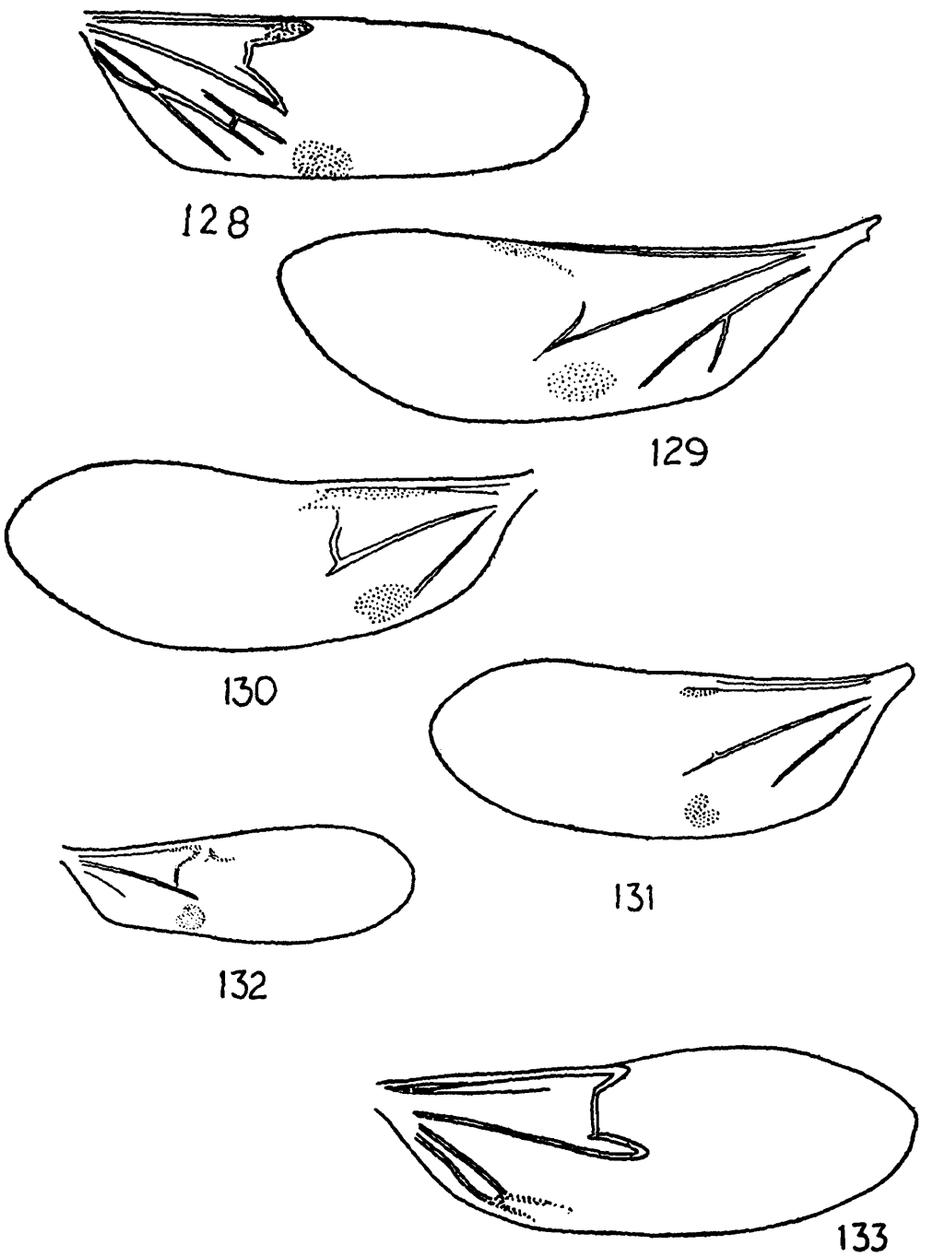
Figs. 106-112. Prothorax (ventral view). 106. *Phyconomus marinus* (LeConte) ; 107. *Monotoma* sp. ; 108. *Monotomopsis monotomoides* Grouvelle ; 109. *Monotomopsis andrewesi* Grouvelle (dorsal view) ; 110. *Pycnotomina cavicollis* (Horn) ; 111. *Lenax mirandus* Sharp ; 112. *Shoguna* sp.



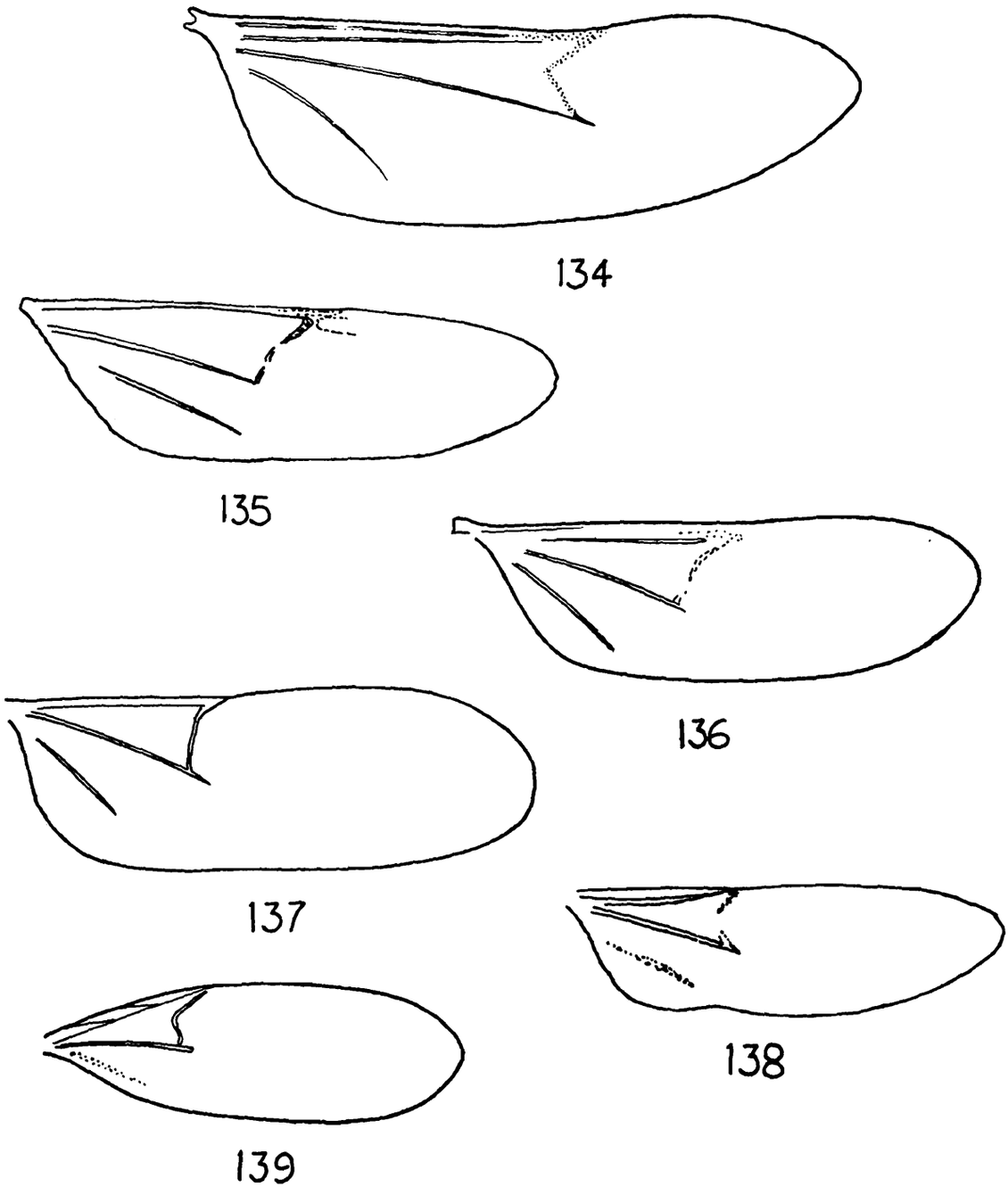
Figs. 113-119. Meso-metathorax. 113. *Rhizophagus* sp. ; 114. *Europs* sp. ; 115. *Europs* sp. ; 116. *Phyconomus marinus* (LeConte) ; 117. *Malabica tatai* n. sp. ; 118. *Hesperobaenus abbreviatus* (Motschulsky) ; 119. *Monotopion ferrugineum* Reitter.



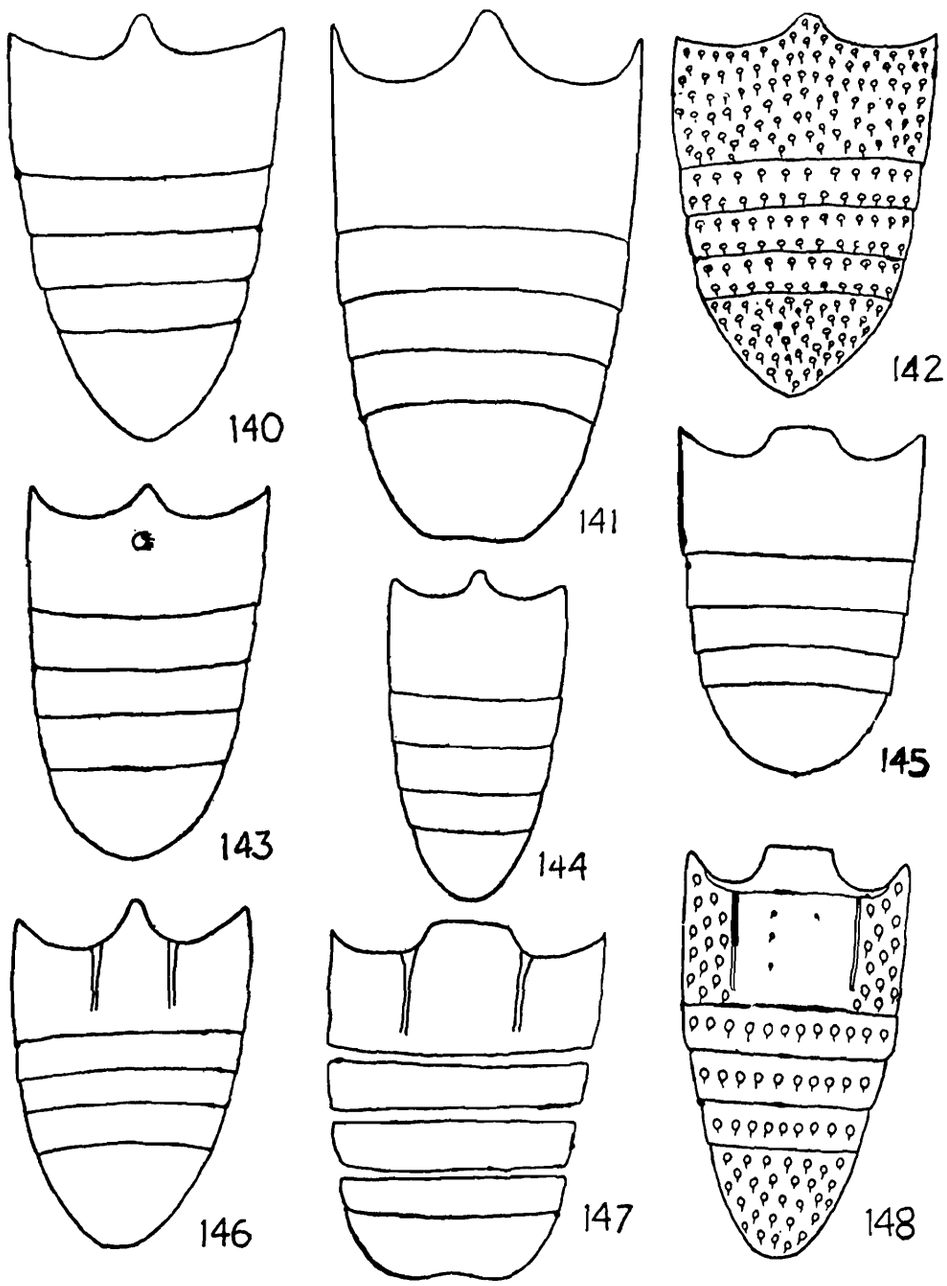
Figs. 120-127. Meso-metathorax. 120. *Macreurops longicollis* (Horn); 121. *Pycnotomina cavicollis* (Horn); 122. *Monotomopsis monotomoides* Grouvelle; 123. *Leptipsius striatus* (LeConte); 124. *Bactridium convexulum* Casey; 125. *Monotoma* sp.; 126. *Thione* sp.; 127. *Lenax mirandus* Sharp.



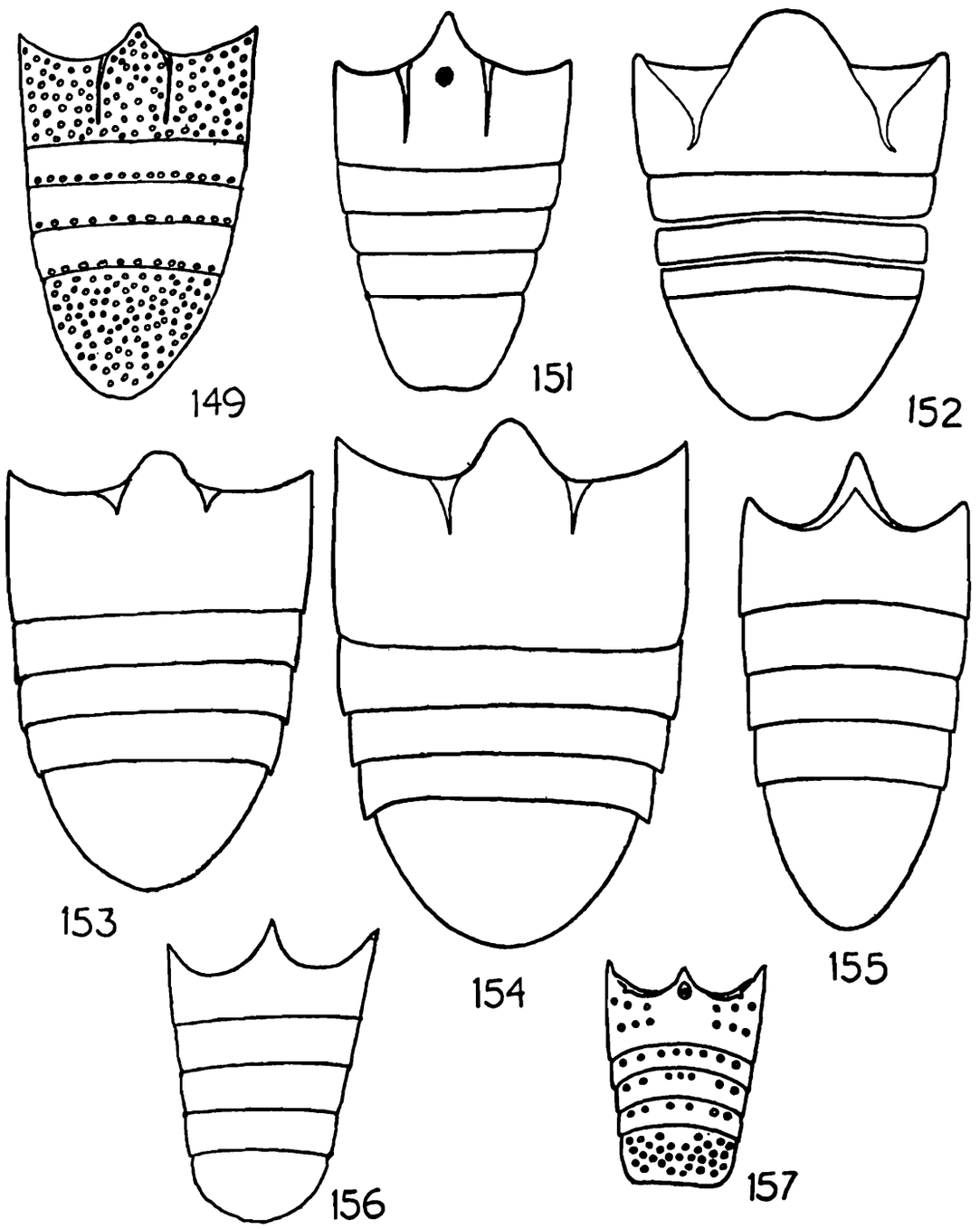
Figs. 128-133. Wing. 128. *Rhizophagus* sp. ; 129. *Macreurops longicollis* (Horn) ; 130. *Malabica tatai* n. sp. ; 131. *Europs* sp. ; 132. *Monotomopsis monotomoides* Grouvelle ; 133. *Lenax mirandus* Sharp.



Figs. 134-138. Wing. 134. *Phyconomus marinus* (LeConte) ; 135. *Bactridium convexulum* Casey ; 136. *Leptipsius striatus* (LeConte) ; 137. *Monotoma* sp. ; 138. *Thione* sp. ; 139. *Shoguna* sp.



Figs. 140-148. Ventrite. 140. *Rhizophagus* sp. ; 141. *Macreurops longicollis* (Horn) ; 142. *Renuka rita* n. sp. ; 143. *Europs* sp. ; 144. *Europs* sp. ; 145. *Monotoma* sp. ; 146. *Malabica tatai* n. sp. ; 147. *Bactridium convexulum* Casey ; 148. *Monotomopsis monotomoides* Grouvelle.



Figs. 149-157. Ventrite. 149. *Malinica ranjana* n. sp. ; 150. *Monotopion ferrugineum* Reitter ; 151. *Pycnotomina covicollis* (Horn) ; 153. *Hesperobaenus abbreviatus* (Motschulsky) ; 154. *Phyconomus marinus* (LeConte) ; 155. *Shoguna* sp. ; 156. *Thione* sp. ; 157. *Lenax mirandus* Sharp.

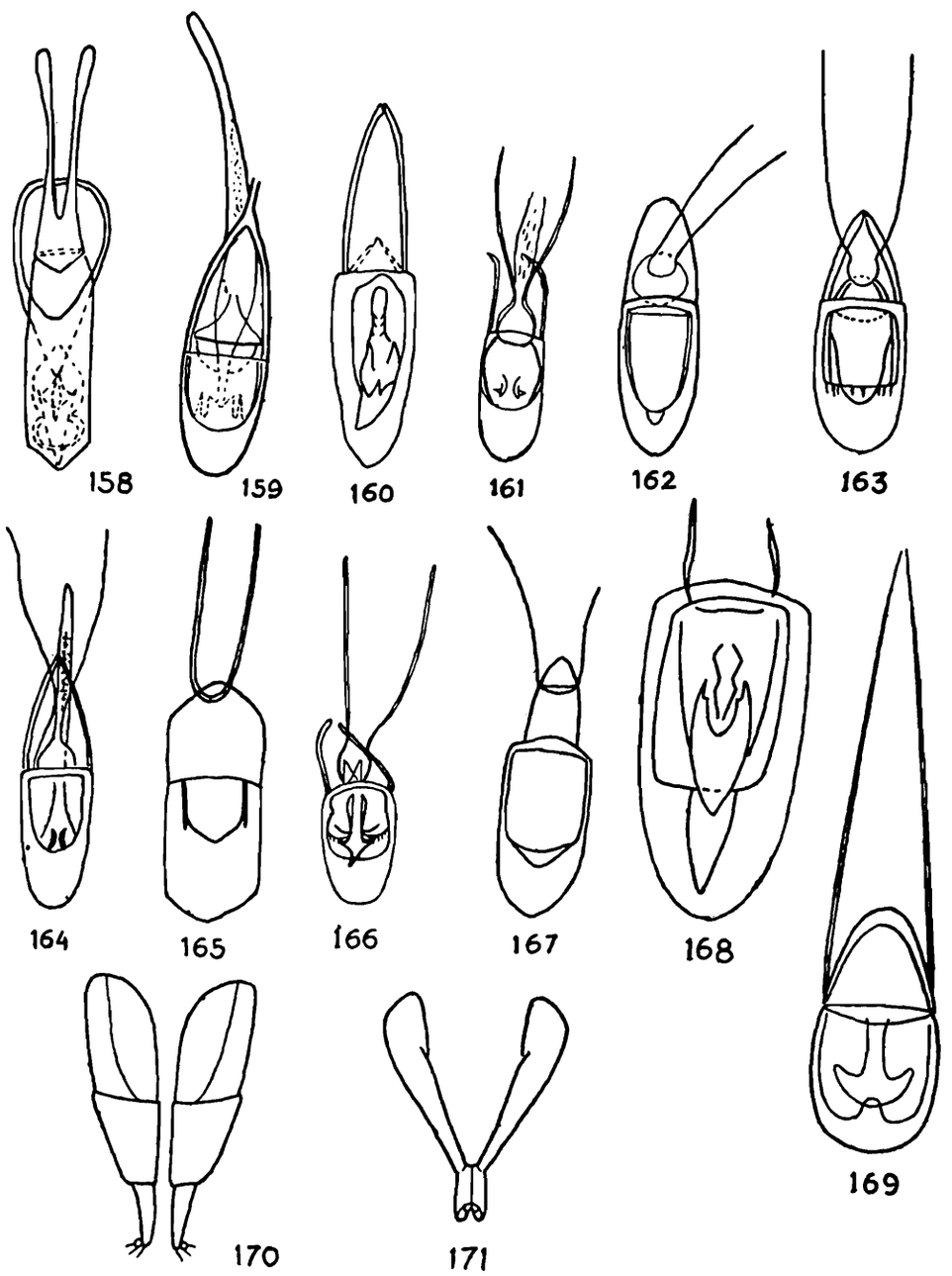
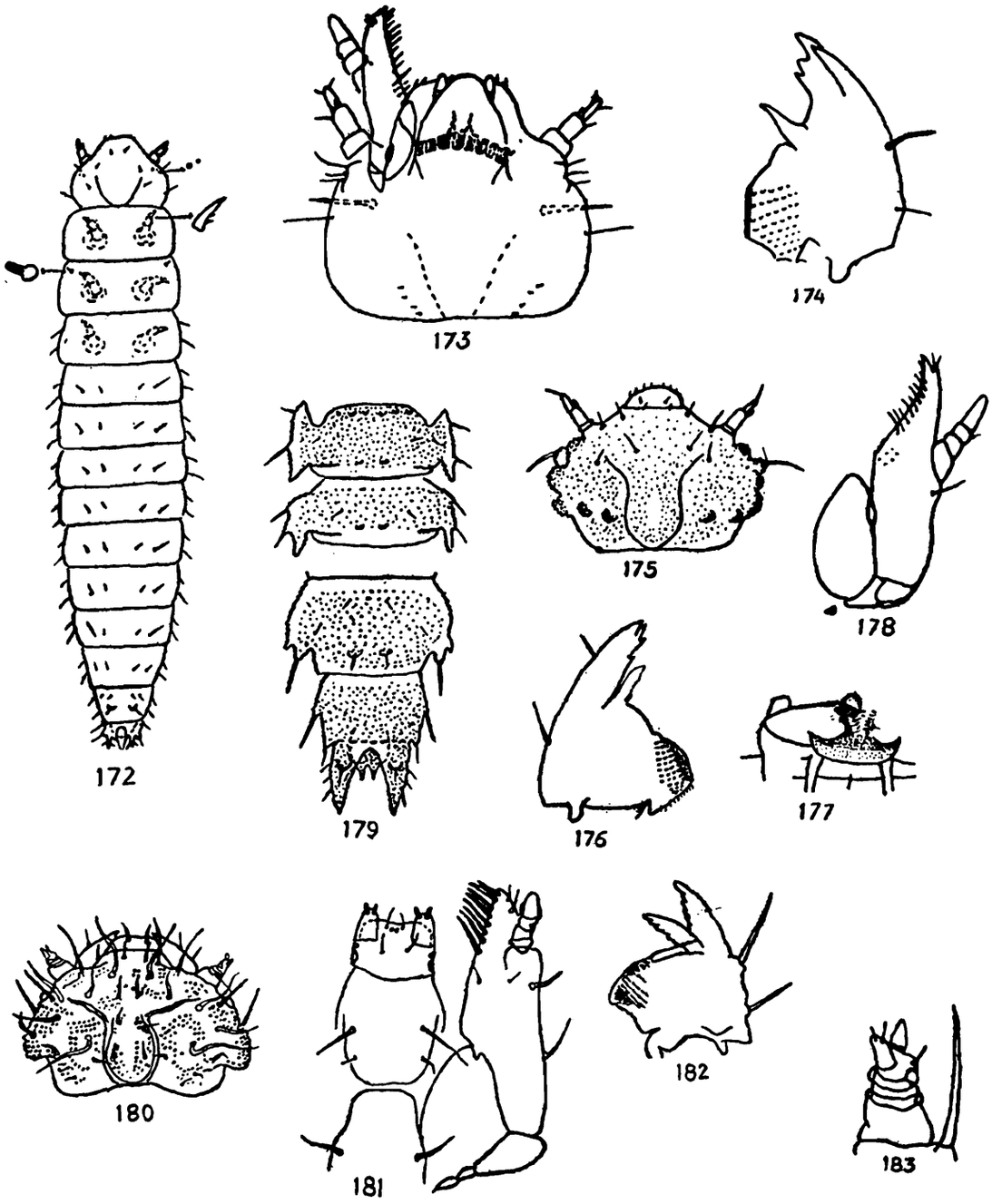


Fig. 158-171. Aedeagus. 158. *Rhizophagus* **sp.; 159.** *Macreurops longicollis* **(Horn); 160.** *Monotopion ferrugineum* **Reitter; 161.** *Pycnotomina cavicollis* **(Horn); 162.** *Phyconomus marinus* **(LeConte); 163.** *Europs* **sp.; 164.** *Bactridium convexulum* **Casey; 165.** *Mimemodes kimbhutus*; **166.** *Leptipsius striatus* **(LeConte); 167.** *Hesperobaenus abbreviatus* **(Motschulsky); 168.** *Malabica tatai* **n. sp.; 169.** *Monotoma* **sp.; Ovipositor: 170.** *Monotomopsis monotomoides* **Grouvelle; 171.** *Lenax mirandus* **Sharp.**



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