

PHYLOGENY AND GENERIC CLASSIFICATION OF THE SUBFAMILY LYCOPERDININAE WITH A RE-ANALYSIS OF THE FAMILY ENDOMYCHIDAE (COLEOPTERA: CUCUJOIDEA)

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Abstract.— A cladistic analysis of the family Endomychidae based on adult and larval characters to resolve the relationships between its subfamilies is presented. Monophyly of the Endomychidae and all subfamilies was tested, and the family and all currently recognized subfamilies including the largest subfamily, Lycoperdininae are hypothesized to be monophyletic groups. Cladistic analysis was performed separately on adult and on the combined character sets. The adult data matrix was coded for 69 characters for 65 ingroup taxa (38 genera of Lycoperdininae and 27 genera from all remaining endomychid subfamilies, representing Eupsilobiinae, Danascelinae, Mycetaeinae, Leiestinae, Merophysiinae, Anamorphinae, Pleganophorinae, Xenomycetinae, Endomychinae, Stenotarsinae and Epipocinae), and 4 outgroup taxa representing 3 families of Cucujoidea: Coccinellidae (*Sticholotis* and *Rhyzobius*), Corylophidae (*Holopsis*) and Cerylonidae (*Hypodacnella*). Combined matrix was prepared in two variants; first included all 69 taxa and 96 morphological, adult plus larval characters, and the second variant included 33 taxa (only those with known larvae) coded for 96 morphological, adult and larval characters. The shortest, most parsimonious solutions were investigated using NONA-WinClada and Hennig86. The monophyly of the largest subfamily Lycoperdininae was supported and based on the results of the analyses five generic groups may be recognized: *Daulis*-group, *Amphix*-group, *Amphisternus*-group, *Eumorphus*-group – monophyletic and *Lycoperdina*-group not supported by apomorphic characters. All 38 genera of Lycoperdininae are described, diagnosed and included in an identification key; the larvae of 10 genera are also described. The first larval descriptions are given for: *Amphisternus verrucosus* Gorham, *Acinaces* sp., *Amphix vestitus cinctus* (Fabricius), *Encymon immaculatus* (Montruzier). *Gerstaeckerus* nom. nov. is proposed here for *Engonius* Gerstaecker, 1857 (nec *Engonius* Perty, 1833). Type species are designated for the following genera: *Dioedes* Gerstaecker, 1857 (*Dioedes columbinus* Gerstaecker, 1857), *Eumorphoides* Guérin, 1858 (*Eumorphus tetraspilotus* Hope, 1832), *Enaisimus* Guérin, 1858 (*Eumorphus quadrinotatus* Gerstaecker, 1857), *Haplomorphus* Guérin, 1858 (*Eumorphus bipunctatus* Perty, 1831), *Heterandrus* Guérin, 1858 (*Eumorphus confusus* Guérin, 1857), *Rhachidophorus* Guérin, 1857 (*Cacodaemon hopei* Thomson, 1857 (= *Eumorphus hopei* Guérin, 1857)), *Olenus* Thomson, 1857 (*Trycherus senegalensis* Gerstaecker, 1857). *Daulis* Erichson and *Daulotypus* Lea, treated in the recent classification of Endomychidae (Tomaszewska 2000) as genera *incertae sedis*, are confirmed here to belong in Lycoperdininae. The following new synonym is proposed: *Evolocera championi* Sharp, 1891 (= *Adamia mexicana* Tomaszewska, 2000), consequently *Evolocera* Sharp, previously classified in Merophysiinae, is moved here to Eupsilobiinae. The lectotype of *Evolocera championi* is designated here. The history of classification and the known aspects of the biology of the subfamily are provided.

The genus *Polymus* Mulsant, 1846 is treated here as *incertae sedis*, due to the unavailability of material for study.



Key words.— Coleoptera, Cucujoidea, Endomychidae, Lycoperdininae, genera, adults, larvae, morphology, phylogeny.

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INTRODUCTION

Main subject of study

Lycoperdininae constitute the largest subfamily of Endomychidae, containing 38 genera and over 635 described species (of the 120 genera and about 1300 species of the family). They are distributed mostly in the Oriental Region. Some genera are known from Afrotropical and Palaearctic Regions, while only three genera are distributed in the Nearctic, four genera in Neotropic, and two genera are known from Australia.

It is difficult not to agree with Gerstaecker (1858), that Lycoperdininae are the largest and most beautiful beetles among Endomychidae. They are mostly black, brown or red, almost always with contrasting markings on the elytra (spots, stripes, transverse bands etc.). Sometimes the taxa also bear amazing ornaments, in the form of long spines or high tubercles on their elytra. Such coloration suggests that Lycoperdininae, like most Coccinellidae having aposematic colour patterns, are distasteful or even poisonous to predators. The impressive ornaments, like spines may also serve as a defence against predators. The strongly developed sexual characters result in the presence of different teeth, spines, thickenings or fringes of hairs on the legs (mainly tibiae and femora).

Historical view

The nomenclatural history of the subfamily Lycoperdininae began in the middle of the 19th century, when Redtenbacher (1844, 1845) established the subfamily Lycoperdinae to accommodate the genera *Endomychus* Panzer, *Lycoperdina* Latreille and *Dapsa* Germar.

The status of the subfamily Lycoperdininae (=Eumorphinae) (Pakaluk, Ślipiński and Lawrence 1994, Lawrence and Newton 1995, Tomaszewska 2000) has changed several times in the course of the century. The classification of this taxon has changed many times, moving from the subfamily Lycoperdinae (Redtenbacher 1844), to the family Eumorphidae (Gistel 1856), division Eumorphini (Gerstaecker 1858), subfamily Eumorphinae (Bates 1861), again to the family Eumorphidae (Gorham 1873), and once again to the division Eumorphini (Arrow 1925) and to the subfamily Eumorphinae (Strohecker 1953).

Gerstaecker (1858) in his monograph of the Endomychidae Leach, 1815, the first general survey of the family, erected the division levels for the first time within the family. All genera known at the time, classified presently within Lycoperdininae, were placed in two divisions: Eumorphini and Dapsini. Within Eumorphini, Gerstaecker accommodated *Eumorphus* Weber, *Amphisternus* Germar, *Corynomalus* Dejean and his seven newly described genera: *Spathomeles*,

Engonius, *Trycherus*, *Pedanus*, *Dioedes*, *Encymon* and *Cymbachus*. Although Eumorphini was based on the overall appearance of adults, including their size, beauty, and structures of the mouthparts and antennae, all those genera belong presently to the subfamily Lycoperdininae. Gerstaecker's Dapsini, however, next to presently recognized Lycoperdininae (*Acinaces*, *Phalantha*, *Ceramis* – described by Gerstaecker (1858) – and *Indalmus* Latreille, *Ancylopus* Costa, *Dapsa* Latreille, *Daulis* Erichson, *Lycoperdina* Latreille, *Mycetina* Mulsant), included also the members of the present Epipocinae, Stenotarsinae and even Anamorphinae.

Gorham (1873) elevated Eumorphini to the family level and classified within it the genera from Gerstaecker's division excluding *Corynomalus*. He established the family Corynomalidae for *Corynomalus* and included *Acinaces*, which was placed previously in Gerstaecker's Dapsini. Gorham placed the remaining genera of Dapsini, in his families Lycoperdinidae, Epipocidae and Palaeomorphidae. All these families, however, were subsequently downgraded to the subfamily level (Gorham 1890) within the family Endomychidae.

Arrow (1925) in his Fauna of British India returned to the concept of divisions. He discovered and described the stridulatory organs on the head and pronotum present in the members of Eumorphini and indicated them as characteristic features for this division. He also paid attention to the development of sexually dimorphic features within the division. In Arrow's Eumorphini, there were 14 genera, including his *Pseudindalmus* (Arrow 1920a) and *Brachytrycherus* (Arrow 1920b). Arrow also established Beccariini for *Beccaria* Gorham, 1885 (= *Beccariola* Arrow, 1943), where he observed neither the stridulatory organs nor sexually dimorphic characters.

Strohecker (1953) in his generic review and world catalogue – the largest work on the Endomychidae of the 20th century – proposed a revised classification of endomychid suprageneric taxa. Based on the presence of the stridulatory organs, he placed Gerstaecker's Eumorphini and part of Dapsini (*Acinaces*, *Hylaia* Guérin (= *Ceramis*), *Indalmus*, *Ancylopus*, *Dapsa*, *Lycoperdina* and *Mycetina*) in the subfamily Eumorphinae. *Archipines* (= *Phalantha*) and *Daulis* were placed, however, in the very diverse subfamily Stenotarsinae based on the following diagnosis: "rarely glabrous, mostly smaller species, the pronotum often very broadly margined, the head without occipital file". In 1964 Strohecker reviewed the genera of his division Amphisternini and in the following papers he reviewed the genera *Eumorphus* (Strohecker 1968), *Beccariola*, *Dryadites* and *Cymbachus* (Strohecker 1970), *Engonius* and *Parindalmus* (Strohecker 1971a), *Encymon* (Strohecker 1971b), *Pseudindalmus* (Strohecker 1977) and *Amphix* (Strohecker 1980). He also described five genera and many species of Lycoperdininae (=Eumorphinae).

Present position and current research

The present author (Tomaszewska 2000) undertook the first phylogenetic study of the family Endomychidae, based on the detailed morphology of selected genera. That study was aimed at the resolution of three major taxonomic problems: the relationships between Endomychidae and Coccinellidae, the limits of Endomychidae as a monophyletic taxon, and the limits and relationships of the endomychid suprageneric taxa in order to provide a soundly based subfamily or tribal classification. The cladistic analysis confirmed the sister-relationships between Endomychidae and Coccinellidae and yielded 12 clearly defined evolutionary lineages (subfamilies of Endomychidae), each based on apomorphic features. Despite the confirmation of the monophyly of all subfamilies, limitations of the data matrix did not provide a solid hypothesis of relationships between them. In most of the trees, the subfamily Lycoperdininae formed a large group with Endomychinae, Epipocinae, Stenotarsinae and Xenomycetinae that was not supported by a unique apomorphy, because the pseudotrimerous tarsi uniting these taxa are shared with most Coccinellidae. In spite of the monophyly of these subfamilies within this group, their relationships have remained unclear. There is some evidence for sister relationships between Lycoperdininae and Epipocinae, based on structures of the male genitalia and terminalia. Regarding the monophyly of Lycoperdininae, the analysis in 2000 (using species of five selected genera of Lycoperdininae) confirmed that the stridulatory organs on the head and the pronotum are unique for the subfamily, although these vary in their development on the pronotum (e.g. variably reduced among the species of *Trycherus* and obsolete in *Beccariola*). The occipital file on the head is, however, always well developed. The ovipositor with coxites fused medially was postulated as one more synapomorphy of Lycoperdininae.

The results of the most recent studies on the Lycoperdininae were presented in a series of papers, on *Pseudindalmus* Arrow, *Amphistethus* Strohecker, *Beccariola* Arrow, *Archipines* Strohecker, *Dapsa* Latreille, *Acinaces* Gerstaecker, *Avencymon* Strohecker, *Dryadites* Frivaldszky (Tomaszewska 2001a, 2001b, 2002a, 2002b, 2003a, 2003b, 2003c, 2003d, Tomaszewska and Pal 2003) and *Achuarmychus* (Tomaszewska and Leschen 2004), containing descriptions of new species and revisions of a few genera, including support for their placement within Lycoperdininae and identification keys to their species. Immature stages were described for *Archipines* (Tomaszewska 2002b) and *Achuarmychus* (Tomaszewska and Leschen 2004).

The objectives of current study are:

- to test the monophyly of Lycoperdininae,
- to reconstruct the phylogenetic relationships of genera included in Lycoperdininae,

- to revise the recognized genera of Lycoperdininae,
- to hypothesize the sister taxa of Lycoperdininae and the placement of the subfamily in Endomychidae.

In present analyses every possible attempt has been made to include available larvae of Endomychidae with a hope that this additional data set will help to resolve the relationships within the family. Despite the limited larval data the analysis was performed for a combination of adult and larval characters and its results seem to largely support the relationships based on the adult characters as proposed by Tomaszewska (2000).

Immature stages and biology

The knowledge of the immature stages of the family is still very poor. Of 120 currently recognized genera of Endomychidae, larvae of only 30 genera have been described so far (three genera in the present paper). Of the 12 subfamilies, the larvae remain unknown for Danascelinae Tomaszewska, 2000. The first larva of Eupsilobiinae (Pakaluk and Ślipiński 1990) is treated for the first time in this paper.

The larvae of Endomychidae are highly diverse in form, sculpture and vestiture (Lawrence 1991), and this diversity results in similarities to other cucujoidea. Lycoperdininae seem to be especially morphologically diverse. Burakowski (1997) and Burakowski and Ślipiński (2000) grouped all known Lycoperdininae larvae into four morphological groups. The larva of *Mycetina cruciata* (Schaller) (Burakowski 1997, Beutel et al. 2000), appears to be most similar to *Aphorista vittata* (Fabricius) with their short thoracic and abdominal lateral, tergal lobes, vestiture of specialized fan-shaped setae, tergal plates with weak protuberances and tergum 9 emarginate. *Amphix* with its odd, onisciform shape without apparent dorsal vestiture and with dorsal spiracles, and *Lycoperdina* with its paired, acute processes on abdominal terga, form separate monogeneric groups. *Eumorphus*, on the other hand seems to be most similar to *Ancylopus* in having narrow dehiscent processes along thoracic and abdominal edges and the presence of repugnatorial gland openings on abdominal tergum 1.

Characters of the recently described *Archipines* larva (Tomaszewska 2002b) have brought more confusion to this informal division. *Archipines* is most similar to a group including *Eumorphus*, *Encymon* and *Ancylopus*, which have dehiscent body processes, but *Archipines* has a distinctly emarginate tergum 9 like that found within the group including *Aphorista* and *Mycetina*, and a 1-segmented labial palp, like that of *Eumorphus* and *Achuarmychus* (Tomaszewska and Leschen 2004). The larva of *Achuarmychus* is similar to *Archipines*, *Aphorista* and *Mycetina*. The body lacking tergal sclerotisations and verrucae distinguishes *Achuarmychus* from *Aphorista* and *Mycetina*, while the absence of deciduous tergal lobes separates it from *Archipines*.

To date, no larval synapomorphies have been proposed for Lycoperdininae. As more endomychid larvae are described (e.g., Tomaszewska 2002b, Tomaszewska and Leschen 2004), it appears that many characters are not in congruence with the monophyly of some endomychid subfamilies. Some of them, in particular Epipocinae, Stenotarsinae, and Lycoperdininae, share many larval similarities (McHugh and Pakaluk 1997, Burakowski and Ślipiński 2000), but without any recognizable synapomorphies.

Endomychidae are mostly mycophagous, feeding on a wide variety of fungal types, and Lycoperdininae larvae are also fungus feeders, almost without exception. Their most frequent habitats are rotten wood and fungus-infested bark. The larvae may occur under bark, in rotting wood or more often, on wood or bark surfaces. Some of them, including *Mycetina perpulchra* (Newman), *Lycoperdina* spp., and *Aphorista vittata* (Fabr.) have obligate host relationships to Basidiomycetes. Species of *Lycoperdina* have internally feeding larvae, which occur in puffballs of the genus *Lycoperdon* (Lawrence 1991), although the specimens of *L. ferruginea* LeConte were also collected from forest litter or debris (Pakaluk 1984). The internally feeding larvae have mouthparts highly adapted for sporophagy. Lawrence (1977) referred to the mandibular morphology of puffball beetles as a "spore mill", which is "powerful enough to crush any spores before they are swallowed", with the enlarged mola provided with numerous tubercles, and the top of the mandible reduced and truncated.

Sometimes the specific food source is difficult to verify. For example, *Aphorista morosa* LeConte was found in association with a yellow plasmodium of a slime mould (Myxomycetes). There is, however, no evidence that none of the Endomychidae genus utilizes plasmodia as a food source (Lawrence 1988, 1991). A species of *Amphix* was found feeding on spore capsules of an ascomycete fungus, while the larva of *Trycherus* was reported to feed on lichens (Strohecker 1953).

Leschen (1994) discussed very interesting correlations between fungal ecology and larval behaviour of mycophagous Coleoptera, and hypothesized that many larval behaviours have evolved in a defensive context. The antipredator adaptations include: egg protection, aposematism, larval gregariousness, pupal locations, parental care and other behaviours. Reports of larvae that pupate within sporocarps involve the taxa feeding on tough and persistent, lignicolous fungi, like *Amphix* spp. *Amphix* may pupate in clusters, but the significance of this is uncertain.

MATERIAL AND METHODS

This study is based on approximately 6000 adult specimens of nearly 400 species and most of the known larvae

of Endomychidae, examined during the past four years. Species representing all the Lycoperdininae genera and many genera of the remaining endomychid subfamilies were examined, including all available types.

The studied material came from the following institutions:

- ANIC – Australian National Insect Collection, Division of Entomology, CSIRO, Canberra, Australia;
- BMNH – The Natural History Museum, London, England;
- BPBM – Bernice P. Bishop, Museum, Honolulu, USA;
- CASC – California Academy of Sciences, San Francisco, USA;
- EMLU – Entomological Museum, Lund University, Lund, Sweden;
- FMNH – Field Museum of Natural History, Chicago, Illinois, USA;
- FSCA – Florida State Collection of Arthropods, Gainesville, FL, USA;
- HNHM – Hungarian Natural History Museum, Budapest, Hungary;
- LSAM – Louisiana State Arthropod Museum, Baton Rouge, LA, USA;
- MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA;
- MHNG – Muséum d'Histoire Naturelle, Genève, Switzerland;
- MIZ – Muzeum i Instytut Zoologii PAN, Warszawa, Poland;
- MNHN – Muséum National d'Histoire Naturelle, Paris, France;
- NCI – National Collection of Insects, Pretoria, South Africa;
- NHMB – Naturhistorisches Museum, Basel, Switzerland;
- NHMV – Naturhistorisches Museum, Vienna, Austria;
- NMB – Naturhistorisches Museum für Naturkunde der Humboldt Universität, Berlin, Germany;
- NME – Naturkundemuseum Erfurt, Germany;
- NMNH – National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA;
- NMP – National Museum, Prague, Czech Republic;
- NZAC – New Zealand Arthropod Collection, Auckland, New Zealand;
- QMB – Queensland Museum, Brisbane, Australia;
- SMNS – Staatliches Museum für Naturkunde, Stuttgart, Germany;
- SMT – Staatliches Museum für Tierkunde, Dresden, Germany;
- TMNH – Transvaal Museum of Natural History, Pretoria, South Africa.

For detailed examination of characters that might be used for cladistic analysis, at least one male and one female of one or more species of the studied genus were completely cleared in 10% cold potassium hydroxide and

disarticulated and placed in glycerine on slides for further study. The structural illustrations were made from these preparations using a camera lucida attached to an Olympus dissecting microscope SZH 10 or to a Zeiss Amplitiv microscope (smaller structures). Measurements of the following were made using a filar micrometer: body length, from apical margin of clypeus to apex of elytra; body width, across both elytra (maximum); pronotal length, from the middle of anterior margin to margin of basal foramen; pronotal width, across widest part; elytral length, along suture including scutellum.

Terminology used for adult morphology follows Lawrence and Britton (1991, 1994) and that of wing venation terminology, Kukulova-Peck and Lawrence (1993, 2004).

In taxonomy section, the "species examined" are cited below each generic description, and the type species of the genus is marked with asteriks (*).

TAXONOMY

Lycoperdininae Redtenbacher

Lycoperdinae Redtenbacher, 1844: 118. Type genus: *Lycoperdina* Latreille, 1807.

Eumorphidae Gistel, 1856: 382. Type genus: *Eumorphus* Weber, 1801.

Eumorphini Gerstaecker, 1857: 214. Type genus: *Eumorphus* Weber, 1801.

Dapsini Gerstaecker, 1858: 170. Type genus: *Dapsa* Latreille, 1829.

Corynomalidae Gorham, 1873: 14. Type genus: *Corynomalus* Gerstaecker, 1857.

Amphicini Csiki, 1910: 25. Type genus: *Amphix* Laporte, 1840.

Beccariini Arrow 1925: 278. Type genus: *Beccaria* Gorham, 1885 (nec Trinchese, 1870). Unavailable name, based on preoccupied type genus.

Amphisternini Strohecker, 1964: 320. Type genus: *Amphisternus* Germar, 1843.

Characteristics of the subfamily

Adults. Head (Figs 1–6) partially retracted in prothorax. Frontoclypeal suture distinct, straight. Antennal grooves absent; antennal sockets visible from above. Occiput covered with fine, reticulate microsculpture and provided with median, transversely ridged cephalic stridulatory area (occipital file). Gular sutures rarely well developed and widely separated (Fig. 6), most often gular sutures are confluent medially (Figs 2, 4, 5) or indistinct to absent. Antenna 11-segmented, almost always with 3-segmented club. Clypeus transverse, flat, widest at base. Mandible (Figs 96–176) broad, strongly concave ventrally, convex dorsally; mola large, well developed, strongly sclerotized, transversely ridged; prosthema rather narrow, membranous, setose; submola small, densely setose, membranous. Maxilla (Figs 177–241) with 4-segmented palp; lacinia with mesal

and dorsal surfaces provided with more or less regularly arranged hairs and/or spines. Labium (Figs 242–279) with 3-segmented palp; palpomere 1 very small, rarely fused with palpomere 2; ligula short, membranous or submembranous, more or less distinctly lobed at sides. Tentorium with anterior arms fused medially, and widely divergent anteriorly; corpotentorium straight or weakly curved, without median process.

Prothorax (Figs 280–355) transverse. Pronotum almost always bordered laterally and often anteriorly; anterior edge with stridulatory membrane; basal and lateral sulci almost always present, well developed. Anterior angles most often produced forwards, acute, blunt or rounded; posterior angles right-angled or weakly acute; pronotal disc at least weakly convex. Prosternum most often with a pair of pits at the front of procoxal cavities; prosternal process very differently developed (Figs 281, 285, 291, 295, 311, 343); front coxae prominent, circular in outline; their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax (Figs 356–393). Mesonotum sclerotized with small scutellum. Mesoventrite carinate, most often with a pair of pits near anterior margin; intercoxal process of different sizes and shapes, separating mesocoxae; extending to about half of length of coxae. Mesocoxa circular in outline, its cavity outwardly open with trochantin at least partially exposed. Meso-metaventral junction almost always with internal knobs. Elytra most often widest at about basal third or near mid length, elongate, convex, most often irregularly punctured; epipleuron often moderately wide, complete or almost so. Metaventrite large, transverse, weakly convex, narrowing towards its anterior margin, provided with postcoxal pits, sometimes also with characters of sexual dimorphism, with intercoxal process often widely bordered and raised; discripen most often longer than half length of metaventrite. Metacoxae transverse, widely separated; femoral lines almost always absent. Metendosternite most often with short stalk and widely separated anterior arms and tendons. Hind wing with anal lobe; anal veins single (Figs 16, 18, 19) or double (Figs 15, 17); anal cells one (Figs 18, 19) or two (Figs 15–17) (if CuA2 well developed then forms closed cell with AA+CuA); Mp-CuA cross vein vestigial; medial bridge present; medial fleck small or moderately large, oval or elongate, undivided (Figs 15, 19), partially divided (Fig. 18) or fully divided (Figs 16, 17) by (AA+CuA)+CuA2 connecting just before medial fleck and as a single, slender vein dividing medial fleck; radial cell reduced.

Legs (Figs 394–618). Trochanterofemoral attachment most often subheteromeroid or heteromeroid, sometimes oblique. Femora usually moderately densely setose, and at least ventral surfaces of fore and mid femora provided with additional more or less distinct, regular or somewhat irregular rows of obliquely directed spinulae. Tibia and tarsus more densely setose than femur; tibia widening

towards tarsus, without apical spurs. Tarsal formula 4-4-4 in both sexes; tarsi pseudotrimerous with tarsomeres 1 and 2 flattened and ventrally lobed; tarsomere 3 much shorter than terminal tarsomere. Claws simple or rarely modified (Figs 449, 487). Male legs almost always provided with characters of sexual dimorphism (Figs 405, 410, 421, 423, 425, 437-440, 447).

Abdomen with five pairs of functional spiracles on abdominal segments 1-5, situated dorsally on pleurites; ventrites 2-5 with internal, anterolateral apodemes. Five or sometimes six freely articulated ventrites; ventrite 1 longest. Ventrite 5 often with characters of sexual dimorphism (sometimes modified in both sexes). Male abdominal segment 8 (Figs 619-656) with sternite narrow and most often emarginate medially at apex. Male genital segment with sternite almost always at least weakly modified apically (Figs 657-732).

Aedeagus (Figs 733-807) usually stout, strongly sclerotized, at least weakly curved, resting on its side when retracted. Median lobe often with apical branches. Tegmen usually placed at base and reduced.

Female genitalia (Figs 808-846). Ovipositor with coxites almost always at least partially fused, rarely separated or strongly reduced; abdominal segment 8 or at least sternite 8 most often fused (or compactly connected) with genital segments. Spermatheca membranous, accessory gland usually present.

Larvae. Body (Figs 901, 911, 926, 942, 959, 977, 994, 1010, 1028, 1042) short-oval to long-oval, flattened dorsoventrally to moderately convex often with lateral, pleural and tergal processes (sometimes deciduous - easily breaking off, leaving scars); urogomphi present or absent. Dorsum usually light brown, well sclerotized; venter slightly lighter, moderately sclerotized; mola almost always dark brown. Dorsal vestiture consists of simple or frayed setae arising from small tubercles; ventral surfaces usually sparsely covered with simple, short setae.

Head protracted or retracted, at least partially visible from above, almost always hypognathous with mouthparts directed ventrally; moderately flattened dorsoventrally. Epicranial stem usually absent (Figs 927, 943, 995, 1029, 1043), sometimes present but short (Figs 901, 912, 960, 978, 1011), frontal arms long, U- or V-shaped. Median endocarina absent. Hypostomal rods present, usually single subparallel or rarely double - long and short (Figs 1012, 1030). Stemmata 4 per side, hemispherical. Frontoclypeal suture usually distinct and straight. Clypeus transverse, submembranous. Labrum free, sclerotized often with membranous, moderately large anterior part (Figs 920, 936, 951, 1007, 1020, 1037); anterior margin truncate or very shallowly emarginate, rarely multidentulate (Figs 974, 1053) or sinuate (Figs 920, 951). Antenna (Figs 902, 914, 929, 945, 964, 979, 998, 1013, 1034, 1045) 3-segmented, usually long and slender; situated in large, circular membrane, sometimes partially retracted into anten-

nal insertions, almost always distant from mandibular articulations. Antennomere 1 short; antennomere 2 longest, almost always at least 3 × longer than antennomere 1; sensory appendage, usually at least as long as antennomere 3. Mandible broad, usually triangular with apex differently developed; prostheca moderately large, membranous, sometimes with additional submembranous or weakly sclerotized process (Figs 918, 919, 1001, 1002, 1015, 1016), or divided in two separated parts (Figs 907, 981); mola usually large, and usually finely ridged transversely with additional asperities. Maxillolabial complex retracted. Maxilla with well-developed articulating area; cardo usually somewhat triangular and stipes elongate; mala longer than wide, usually densely setose, sometimes with specialized setae (Figs 905, 917, 986) and/or characteristically arranged curved setae (Figs 1004, 1023). Maxillary palp 3-segmented based on large, membranous palpifer; palpomere 1 usually shortest and transverse; terminal palpomere always bearing a group of apical sensilla. Labium usually with mentum and submentum fused; labial palpi usually 2-segmented (sometimes 1-segmented), situated in membranous palpifers distant from each other.

Thorax widest across meso- or metathorax; prothorax almost as long as meso- and metathorax combined; each tergum strongly transverse, usually well sclerotized, with lighter or darker notal plates, and usually divided by pale longitudinal line. At least small tergal processes usually present on each segment. Obvious glands absent.

Legs usually long and rather slender; all pairs of subequal length with coxae usually widely separated; coxae sometimes bear frayed setae along with simple pubescence. Trochanter somewhat triangular; femur subcylindrical, often slender at base, densely setose; tibiotarsus sometimes distinctly longer than coxa and femur (Figs 1009, 1026); claw most often slender with single, comparatively long seta.

Abdomen widest most often across segment 2 or 3, bearing usually tergal and pleural or only tergal (sometimes dehiscent) processes. A1 sometimes with dorso-lateral gland openings (Figs 926, 994, 1000, 1010, 1017) and modified tergal processes (very small, covered with modified setae). A9 short sometimes with distinct urogomphi; A10 postero-ventral or ventral, rarely situated posteriorly (Figs 977, 1028). Spiracles annular, not raised on tubes, usually located in folds between tergal and pleural lobes; rarely situated dorsally - small, annular, accompanying with slightly smaller rounded tubercle, both surrounded with sclerotized ring (Figs 942, 949).

Key to the adults

1. Body vestiture double, consisting of suberect setae originating from punctures and very long, erect spines placed on small tubercles (Figs 12, 37, 38, 869,

- 870); pronotum with lateral margins coarsely crenulate (Figs 314, 316)..... 2
- Body glabrous or covered with one kind of vestiture (Figs 866, 867); pronotum with lateral margins smooth or at most finely crenulate/ denticulate (Figs 300, 308, 312, 322)..... 3
2. Elytra irregularly punctured, covered with scattered black spots (Fig. 869); labium with terminal palpomere oval (Fig. 254); maxillary galea widely rounded at apex (Fig. 208); hind wing without medial fleck *Daulis* Erichson
- Elytra with regular rows of punctures, without contrasting spots (Fig 870); labium with terminal palpomere transverse (Fig. 255); maxillary galea broadly triangular (Fig. 209); hind wing with medial fleck *Daulotypus* Lea
3. Mesovetrite almost flat (Figs 356, 363); terminal antennomere with apical tubercles/ sensilla (Figs 20, 27); [coxites separated (Figs 810, 815)] 4
- Mesoventrite carinate (Figs 358, 368, 377, 378); terminal antennomere without apical tubercles; [coxites almost always fused] 5
4. Pronotum with lateral margins widened into small, sharp tooth or at least weakly angulate near anterior third (Fig. 294), prosternal process vestigial (Fig. 295); mesosternal process very narrow with mesocoxae almost contiguous (Fig. 363); sternite of male genital segment visible in deep excision of ventrite 6; coxites vestigial (Fig. 815); mandible shallowly excised at apex (Figs 113, 114)..... *Archipines* Strohecker
- Pronotum without lateral widening into small, sharp tooth and without distinct angulation near anterior third (Fig. 280), prosternal process long and moderately wide (Fig. 281); mesosternal process distinctly separating mesocoxae (Fig. 356); sternite of male genital segment invisible, coxites well developed (Fig. 810); mandible with long, sharp apical tooth (Figs 97, 98) *Achuarmychus* Tomaszewska et Leschen
5. Mesoventrite with intercoxal process longer than wide, provided with elongate median ridge at least along anterior half (Figs 362, 371, 380, 386); median lobe most often without apical branches (Figs 745, 746, 781, 782, 785, 786); [gular sutures well developed, widely separated]..... 6
- Mesoventrite with intercoxal process as long as wide or transverse, rarely elongate – without elongate median ridge (Figs 357, 366, 368); median lobe more or less distinctly branching out at apex (Figs 737, 738, 743, 744, 761, 762)..... 9
6. Antennal club distinctly 3-segmented, without differences between sexes..... 7
- Antennal club 2-segmented (Fig. 46) or 3-segmented, with antennomere 9 in male larger than antennomere 10 (Fig. 44) 8
7. Body minutely setose, more flattened; elytra unicoloured – blackish, or reddish-brown with elongate, black stripes, or dark brown to almost black with pale bases and apices (Fig. 853); pronotum with lateral margins smooth (Fig. 298); median lobe without apical branches (Figs 745, 746) *Aphorista* Gorham
- Body distinctly setose, more convex (Figs 867, 868). elytra light brown decorated with black maculae of irregular shapes or rarely elytra uniformly light brown, or black with pale oval markings; pronotum with lateral margins weakly denticulate (Fig. 312); median lobe more or less distinctly branching out at apex (Figs 767, 768) *Dapsa* Latreille
8. Antennal club 2-segmented (Fig. 46); body at most finely pubescent; female genitalia with proctiger acutely produced backwards (Fig. 835) *Lycoperdina* Latreille
- Antennal club 3-segmented with antennomere 9 in male, larger than antennomere 10 (Fig. 44); body rather densely pubescent; female genitalia with proctiger simple at apex (Fig. 833) *Hylaia* Guérin
9. Elytra (at least in males) with distinct tubercles and/or long spines (Figs 9 11, 13, 14); base of spermatheca at least with small, weakly sclerotized ring (Figs 809, 812, 819, 844, 845)..... 10
- Elytra without tubercles or spines; spermatheca lacking basal ring..... 14
10. Prosternal process widely separating fore coxae, extending distinctly beyond them and deeply excised at apex (Figs 285, 287, 297) 11
- Prosternal process not as above..... 13
11. Pronotum with anterior angles widely thickened and raised (Fig. 286); mandibular apices symmetrical (Figs 105, 106); spermatheca with small, weakly sclerotized ring (Fig. 812)..... *Amphistethus* Strohecker
- Pronotum with anterior angles lacking wide, raised thickening (Figs 284, 296); mandibular apices asymmetrical (Figs 101–104, 121–124); spermatheca with large, nodulus-like structure (Figs 809, 819) 12
12. Elytra covered with tubercles (Figs 9, 849); maxillary lacinia with tuft of S-like setae at apex (Figs 179, 180); metaventrite with intercoxal process widening at apex and covering part of coxae (Fig. 358) *Amphisternus* Germar
- Elytra covered almost always with long spines (Figs 10, 11, 859, 860) (rarely with tubercles – Fig. 861); maxillary lacinia without S-like setae at apex (Figs 197, 198); metaventrite with lateral margins of intercoxal process subparallel (Fig. 367) *Cacodaemon* Thomson
13. Body less elongate (Fig. 898); pronotum with anterior angles lacking raised thickening (Fig. 352) *Stictomela* Gorham
- Body more elongate (Figs 896, 897); pronotum with anterior angles widely thickened and raised (Fig. 350) *Spathomeles* Gerstaecker

14. Mesoventrite with intercoxal process widening towards apex and overlapping part of coxae (Figs 358, 359, 378, 384, 389, 391) 15
- . Mesoventrite with intercoxal process not widening towards apex (Figs 356, 357, 365, 376)..... 16
15. Body more elongate, subparallel with pronotum almost as wide as elytra (Fig. 890); maxillary lacinia with tuft of S-like setae at apex (Figs 228, 229) *Ohtaius* Chùjô
- . Body less elongate, with elytra weakly rounded laterally, and pronotum narrower than base of elytra (Fig. 878); maxillary lacinia without S-like setae at apex (Figs 213, 214)..... *Gerstaeckerus* nom. nov.
16. Posternal process moderately widely separates fore coxae, deeply excised apically (forked), extending at most to hind margin of coxae (Figs 309, 311, 319,349); [body usually broadly-oval] 17
- . Prosternal process not as above (at most weakly excised/ emarginate apically)..... 20
17. Pronotum without basal sulcus and with extremely reduced stridulatory membrane (visible only on cleared specimens) (Fig. 8); legs and abdominal ventrites lacking characters of sexual dimorphism *Beccariola* Arrow
- . Pronotum with well developed basal sulcus and stridulatory membrane (Figs 310, 318, 348); legs (and/or abdominal ventrites) with characters of sexual dimorphism (Figs 506, 595, 596) 18
18. Metaventrte with intercoxal process widely bordered and raised (Fig. 375); mandible with sharp apical tooth (Figs 138, 139); abdominal tergite 8 simply setose *Dryadites* Frivaldszky
- . Metaventrte with intercoxal process moderately widely bordered and weakly raised (Figs 374, 390); mandible with apex widely chisel-shaped (Figs 130, 170); abdominal tergite 8 with tuft of long setae at apex (Figs 630, 646)..... 19
19. Body more oval (Fig. 865); mesoventrite with intercoxal process wider, distinctly pentagonal, almost flat (Fig. 374); aedeagus more elongate (Figs 671, 672) *Cymbachus* Gerstaecker
- . Body more elongate (Figs 894, 895); mesoventrite with intercoxal process narrower and at least weakly ridged or tuberculate (Fig. 390); aedeagus short and stout (Fig. 803)..... *Sinocymbachus* Strohecker et Chùjô
20. Head with gular sutures well developed and widely separated (Fig. 6); maxillary lacinia with tuft of S-like setae at apex (Figs 195, 196); [body broadly oval, dark brown or black with yellow or red markings on elytra (Fig. 858)] *Brachytrycherus* Arrow
- . Head with gular sutures indistinct or confluent in middle line (Figs 2, 4, 5); maxillary lacinia without S-like setae at apex (Figs 230, 235) 21
21. Mesoventrite with intercoxal process trapezoidal in shape (Figs 383, 393); prosternal process distinctly bordered with bordering margins extending (at least shortly) anteriorly as parallel or divergent ridges (Figs 343, 347) 22
- . Mesoventrite with intercoxal process not trapezoidal in shape (Figs 361, 387); prosternal process if bordered then bordering ridges not extending anteriorly (Figs 341, 351)..... 23
22. Mesoventrite with femoral lines (Fig. 393); male antennomere 9 with tendency to bulbous enlargement (Fig. 53); female genitalia with coxites fused (Fig. 840)..... *Pseudindalmus* Arrow
- . Mesoventrite without femoral lines (Fig. 383); male antennomere 9 simple (Fig. 49); female genitalia with coxites separated (Fig. 838)..... *Mycetina* Mulsant
23. Elytra with basal edge thickened and raised (Figs 10, 13); [body long-oval] 24
- . Elytra with basal edge simple (Fig. 12)..... 27
24. Pronotum of female with lateral sulci connected medially by arcuate ridge (Fig. 292); mandible with long and sharp apical tooth (Figs 109, 110); labrum with sides subparallel (Fig. 63); male mid femora with fringe of long hairs almost throughout inner edge (Fig. 421) while hind femora simply pubescent *Ancylopus* Costa
- . Pronotum of both sexes with lateral sulci separated (Figs 334, 340) (not connected medially by arcuate ridge); mandible with apex minutely excised or blunt (Figs 154, 155, 162, 163); labrum with sides produced antero-laterally into rounded lobes (Figs 85, 88); male mid and hind femora with fringe of long hairs almost throughout inner edge (Figs 575, 576) or mid and hind femora simply pubescent 25
25. Body black or brownish-black with elytra decorated with yellow transverse bands (Fig. 891); mandibular apex without teeth (Figs 162, 163); labial palp 2-segmented (Fig. 273) *Parindalmus* Achard
- . Prevailing body colour brown or deeply red and elytra without pale transverse bands (Figs 855, 885); mandibular apex minutely excised (Figs 115, 116, 154, 155); labial palp 3-segmented 26
26. Colour of dorsal surface of body deeply red, with elytra surrounded by black area (Fig. 885); pronotum with lateral edges not crenulate and anterior angles rounded and not produced anteriorly (Fig. 334); lateral sulci very short and shallow (Fig. 334)..... *Malindus* Viliers
- . Colour of dorsal surface of body light brown to dark brown (Fig. 855) or elytra entirely black; pronotum with lateral edges weakly crenulate and anterior angles blunt or weakly acute, distinctly produced anteriorly (Fig. 290); lateral sulci deep and long (Fig. 290)..... *Avencymon* Strohecker
27. Labium with palpomere 2 strongly transverse, semilunar in shape while terminal palpomere distinctly elongate (Fig. 249); legs without sexually dimorphic features; [body brown, often with black markings

- on elytra, pronotum without basal sulcus (Fig. 848)]
 *Acinaces* Gerstaecker
- Labial palpi not as above (Figs 257, 265); legs almost always with characters of sexual dimorphism (Figs 467, 469, 530)..... 28
28. Body covered with dense reticulate microsculpture with punctures extremely fine or sometimes dense reticulation present along with distinct punctures; elytra most often without markings, sometimes with black, elongate stripes, or only apices lighter 29
- Body distinctly punctured sometimes with fine reticulation on pronotum or elytra; elytra most often with contrasting markings 31
29. Antennal club rather narrow and weakly flattened (Fig. 32); body puncturation most often very distinct, mesoventrite with intercoxal process longer than wide (Fig. 368) *Callimodapsa* Strohecker
- Antennal club wide and flattened (Figs 35, 43); body puncturation very fine to obsolete; mesoventrite with intercoxal process at most as long as wide, or transverse. 30
30. Mandible with apical tooth widely chisel-shaped (Figs 146, 147); fore femur with apical part of dorsal surface deeply excised (Fig. 529); body more stout; body almost always deeply black (Fig. 879) *Haploscelis* Blanchard
- Mandible with apical tooth comparatively sharp, not chisel-shaped (Figs 131, 132); fore femur without apical excision; body more slender; rarely entirely black (Fig. 866) *Cymones* Gorham
31. Prosternal process narrowly separating fore coxae (Figs 321, 331); mandible with very small apical and subapical teeth, subequal in size (Figs 140, 141, 150, 151); female abdominal segment 8 fused with genital segments, while sternite 7 free (Figs 829, 834) . . . 32
- Prosternal process moderately to rather widely separating fore coxae (Figs 305, 337, 355); mandible with apex not as above (Figs 127, 128, 156, 157, 175, 176); female abdominal segment 8 and sternite 7 fused with genital segments (Fig. 839), or only sternite 8 fused with coxites (Figs 821, 837, 846) 33
32. Body colour green, blue-green, dark blue or black, with prothorax red or black and femora black or bicoloured, and elytra sometimes with pale, rounded spots; body more oval with elytra strongly convex (in most cases) (Figs 872, 873); base of pronotum weakly to distinctly narrower than base of elytra (Fig. 320); elytra widest near basal third or near mid length; antennal club wide and flattened (Fig. 40); labium with terminal palpomere very strongly transverse (much wider than palpomere 2) (Fig. 262) *Encymon* Gerstaecker
- Body colour black or sometimes brown, always with contrasting (yellow or red) markings on the elytra (Figs 881, 882); body more elongate with elytra moderately convex; base of pronotum almost as wide as base of elytra; elytra widest beyond mid length; antennal club narrow and weakly flattened (Fig. 45); labium with terminal palpomere transverse but not much wider than palpomere 2 (Fig. 267) *Indalmus* Gerstaecker
33. Elytra dark brown to black, almost always with irregular in shape, contrasting markings (pale or pale and/or black, stripes and bands) (Figs 864, 886, 899, 900); at least male abdominal tergite 8 truncate to somewhat emarginate at apex (Figs 637, 642, 654, 821, 837); female genitalia with spermatheca lacking accessory gland (Figs 821, 837, 846); median lobe without long apical branches (Figs 759, 760, 797, 798) 34
- Elytra black with more regular yellow spots, or sometimes brown or yellow with black spots, or without distinct spots or bands (Figs 851, 874 877, 892); abdominal tergite 8 of both sexes more or less rounded apically (Figs 622, 648, 639); spermatheca with distinct accessory gland (Figs 811, 830, 839); median lobe branching out at apex (Figs 739, 740, 775, 776, 789, 790) 36
34. Antenna stout (Fig. 33); labrum with basal margin straight (Fig. 77); pronotum with sides widely bordered and this bordering coarsely punctured (Fig. 304); spermatheca very large (Fig. 821) *Chetryrus* Viliers
- Antenna more slender (Figs 48, 57); basal margin of labrum with median, triangular, raised ridge produced anteriorly (Figs 86, 90); pronotum with lateral margins narrowly bordered and without distinct puncturation (Fig. 336, 354); spermatheca small (Fig. 837, 846) 35
35. Base of pronotum much narrower than base of elytra (Fig. 886); maxillary galea of equal width throughout, rounded at apex (Fig. 226); terminal maxillary palpomere about as long as wide (Fig. 226) *Microtrycherus* Pic
- Base of pronotum at most slightly narrower than base of elytra (Fig. 899, 900); maxillary galea enlarged and triangularly produced towards apex (Fig. 241); terminal maxillary palpomere elongate (Fig. 241) *Trycherus* Gerstaecker
36. Pronotum with stridulatory membrane reduced, very small (Fig. 288); prosternal process not extending beyond fore coxae, truncate or weakly emarginate at apex (Fig. 289); elytra uniformly coloured, sometimes surrounded with black area (Fig. 851) or rarely with rounded or subquadrate black maculae; mandible with apical tooth widely chisel-shaped and with moderately large, blunt subapical tooth (Figs 107, 108); only abdominal sternite 8 compactly connected with female genitalia *Amphix* Laporte
- Pronotum with stridulatory membrane well developed, conspicuous (Figs 324, 344); prosternal process extending at least shortly beyond fore coxae, rounded

- at apex (Figs 323, 345); elytra almost always black with four yellow spots (Figs 874, 875, 877); mandible not as above (Figs 142, 143); abdominal segment 8 and sternite 7 fused with genital segments 37
37. Lateral margin of pronotum simple (Fig. 344); intercoxal process of mesoventrite almost flat (Fig. 388); bordered anterior margin of intercoxal process of metaventrite comparatively raised (Fig. 388); male abdominal ventrites each with setose tubercles; male mid and hind femora provided with fringes of long hairs on inner edges (Fig. 582) *Platindalmus* Strohecker
- . Lateral margin of pronotum with tendency to form irregularly broken lines, inconstant and often asymmetrical (Fig. 322); intercoxal process of mesoventrite with ridges and concavities (Fig. 377); intercoxal process of metaventrite narrowly bordered and weakly raised (Fig. 377); male abdominal ventrites without setose tubercles; male femora simply pubescent (without fringes of long hairs on inner edges) *Eumorphus* Weber
- single (Fig. 944); antennomere 2 over 10.0 × longer than antennomere 1 (Fig. 945); abdominal tergites without any processes *Amphix* Laporte
- . Body long-oval, covered with short, suberect hairs (Fig. 1028); abdominal spiracles placed laterally (not visible from above); hypostomal rods paired (Fig. 1030); antennomere 2 at most 2.5 × longer than antennomere 1 (Fig. 1034); abdominal tergites with dorsal, acute, paired processes (Figs 1028, 1032) *Lycoperdina* Latreille
7. Body short-oval, lacking lateral processes or dorsal verrucae (Fig. 911); mandibular prosthema provided with stout, finger-like processes in apical half (Figs 918, 919) *Acinaces* Gerstaecker
- . Body elongate-oval with dorsal verrucae and/or lateral processes (Figs 901, 959, 977, 1042); mandibular prosthema without finger-like processes 8
8. Thoracic and abdominal terga with lateral large or moderately large processes, and without dorsal verrucae (Figs 901, 977); labial palp 1-segmented (Figs 908, 989); mandibular prosthema divided in two separated parts (Figs 907, 981); labrum with apical margin smooth (without denticles) 9
- . Thoracic and abdominal terga with lateral small processes and dorsal verrucae (Figs 959, 1042); labial palp 2-segmented (Figs 971, 1055); mandibular prosthema not divided (Figs 969, 970, 1047, 1048); labrum with apical margin multidentulate (Figs 974, 1054) 10
9. Body processes deciduous (Figs 977, 991); claw provided with stout seta rounded at apex (Fig. 993) *Archipines* Strohecker
- . Body processes not deciduous (Fig. 901); claw with seta slender and pointed apically (Fig. 910) *Achuarmyachus* Tomaszewska et Leschen
10. Thoracic segments 2 and 3 with 1 pair of dorsal, tergal protuberances (Fig. 959); antennal insertions placed in about mid length of head (Fig. 960); caudal notch on abdominal tergite 9 weakly emarginate (Fig. 959) *Aphorista* Gorham
- . Thoracic segments 2 and 3 with 2 pairs of dorsal, tergal protuberances (Fig. 1042); antennal insertions placed beyond mid length of head (Fig. 1043); caudal notch on abdominal tergite 9 deeply emarginate (Fig. 1042) *Mycetina* Mulsant

Key to the larvae

1. Head with frontal arms U-shaped (Figs 927, 943, 995, 1011, 1029) 2
- . Head with frontal arms V-shaped (Figs 912, 960, 977, 1043) 7
2. Tergite of abdominal segment 1 with repugnatorial gland openings (Figs 926, 994, 1000, 1010, 1017); body with lateral large processes 3
- . Tergite of abdominal segment 1 without repugnatorial gland openings; lateral body processes absent or very small 6
3. Body more oval (Fig. 926); each tergum provided with a pair of lateral processes on each side; body processes not deciduous *Amphisternus* Germar
- . Body more elongate (Figs 994, 1010); each tergum provided with one lateral process on each side; tergal processes deciduous 4
4. Body processes blunt apically; head broadened behind antennal insertions *Ancylopus* Costa
- . Body processes at least subacute apically (Figs 997, 1019); head without distinct widening behind antennal insertions (Figs 995, 1011) 5
5. Epicranial stem present, although very short (Fig. 1011); hypostomal rods paired (Fig. 1012); labial palp 1-segmented (Fig. 1024); body processes with setae arising from small tubercles (Figs 1018, 1019) *Eumorphus* Weber
- . Epicranial stem absent (Fig. 995); hypostomal rods single (Fig. 996); labial palp 2-segmented (Fig. 1005); body processes with setae arising from large tubercles (Fig. 997) *Encymon* Gerstaecker
6. Body short-oval, apparently glabrous, abdominal spiracles placed dorsally (Fig. 942); hypostomal rods

Adult morphology

Achuarmyachus Tomaszewska et Leschen

(Figs 20, 61, 97, 98, 192, 250, 280, 281, 356, 394–398, 619, 657, 658, 749, 750, 810, 847)

Achuarmyachus Tomaszewska et Leschen, 2004: 207. Type species, by original designation: *Achuarmyachus carltoni* Tomaszewska et Leschen, 2004.

Diagnosis. *Achuarmychnus* is most similar to the genus *Archipines* in having the body densely setose, the terminal antennomere bearing small, setose tubercles/ sensilla on apical margin, the abdominal ventrite 6 partially visible, the ovipositor with separated coxites and the tegmen with strut comparatively long. *Achuarmychnus*, however, differs from *Archipines* in having mandible with one, large apical tooth and without subapical teeth, the elytra at most $2.1 \times$ longer than the pronotum, the prosternal process comparatively widely separating front coxae and extending beyond them, the intercoxal process of mesoventrite, pentagonal, about twice as long as wide, the ovipositor with well developed coxites and the male tibiae without sexually dimorphic characters. The overall body appearance of *Achuarmychnus* resembles setose species of *Lycoperdina*, however the antennal club distinctly 3-segmented, the mandible without subapical teeth, the prosternal process widely separating front coxae and extending beyond them, the intercoxal process of mesoventrite elongate, pentagonal and flat, ovipositor with separated coxites and apex of tergite 10 (proctiger) simple, the tegmen with basal piece encircling penis in its half length and with tegminal strut long, and the male tibiae simple present in *Achuarmychnus*, separate it easily from *Lycoperdina*.

Redescription. Length 3.65–3.70 mm. Body (Fig. 847) elongate-oval, comparatively convex, shiny, densely setose; moderately densely and coarsely but rather shallowly, confusedly punctured; ventral surfaces with interspaces covered with distinct, reticulate microsculpture. Colour dark reddish-brown with sterna slightly darker and antenna somewhat lighter.

Head partially retracted in prothorax, weakly transverse. Eyes large, oval in outline, prominent, coarsely faceted. Occiput covered with reticulate microsculpture and with long-oval, finely ridged, central stridulatory area. Postoccipital sutures present. Gular sutures short, widely separated, strongly convergent anteriorly. Antenna (Fig. 20) slightly shorter than half length of body, rather stout, with 3-segmented, scarcely flattened and rather narrow club; with antennomere 3 elongate (about $1.6 \times$ longer than wide); antennomeres 4–6 scarcely longer than wide and antennomeres 7–8 slightly wider than long; terminal antennomere (Fig. 20) distinctly elongate with apical margin bearing small tubercles/ sensilla. Clypeus transverse, flat, with anterior margin weakly rounded, widest at base, narrowing from base towards about half length, thence parallel. Labrum (Fig. 61) moderately sclerotized with very narrow, membranous apex, strongly transverse, coarsely punctured, covered with long setae and with tufts of long and very long setae on sides; anterior edge weakly emarginate, tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 97, 98) with strong and sharp apical tooth and without subapical teeth; mola large, well-developed, finely ridged; prosthema narrow, membranous, covered with short and

fine setae, submola very small, setose, membranous. Maxilla (Fig. 192) with terminal palpomere conical, rounded at apex; galea large, broadly triangular, densely setose; lacinia short and very narrow apically, fringed with stiff, slightly curved setae on inner edge, with a few straight setae along dorsal surface and three long spines below them; digitus absent. Labium (Fig. 250) with palpi comparatively close together; palpomere 2 transverse; terminal palpomere elongate, narrowing from half length towards apex, weakly rounded apically. Mentum transverse, covered with rather sparse setae and with reticulate microsculpture at base, widest near basal third with scarcely arcuate, weakly raised ridge transversely. Prementum short, moderately sclerotized with ligula produced into distinct, lateral lobes.

Prothorax transverse, widest near half length, parallel from base toward basal third, thence weakly rounded toward anterior margin. Pronotum (Fig. 280) narrowly bordered laterally and basally; anterior edge with very small, produced anteriorly stridulatory membrane; basal sulcus moderately deep, lateral sulci somewhat triangular, scarcely curved inwardly, deep and long with small pits at base; anterior angles shortly produced, blunt, posterior angles almost right-angled; pronotal disc comparatively convex. Prosternum (Fig. 281) with small pit at the front of each procoxal cavity; prosternal process moderately wide, extending distinctly beyond front coxae, somewhat bordered laterally and apically, weakly rounded at apex; front coxae prominent, circular in outline (Fig. 394); their cavities externally open, internally widely closed; trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum small, strongly transverse, rather sparsely punctured, angulate near base and widely rounded at apex. Mesoventrite (Fig. 356) without pits near anterior margin; intercoxal process almost flat, elongate, pentagonal, straight posteriorly; moderately widely separating mesocoxae, extending to about half of their length. Mesocoxa (Fig. 396) circular in outline, with cavity outwardly open and trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near half length, thence abruptly narrowing towards apices; blunt apically; comparatively strongly convex with punctures dense and moderately coarse; humeri almost flat; lateral margins very narrowly flattened and scarcely visible from above; sutural stria absent; epipleuron comparatively wide, narrowing towards apex, reaching abdominal ventrite 5. Metaventrite (Fig. 356) strongly transverse, shorter than mesoventrite and abdominal ventrite 1, weakly convex, narrowing towards its anterior margin, which is rather narrowly bordered and scarcely raised, provided with a pair of small postcoxal pits; discrimen extending along $\frac{1}{3}$ length of metaventrite. Metacoxae transverse widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Wingless.

Legs moderately long and rather stout; trochanterofemoral attachment heteromeroid (Figs 394–398). Femur widest near half length, densely setose; ventral and dorsal surfaces of fore and mid femora bear many obliquely directed, suberect, moderately long spines (Figs 394, 396); dorsal surfaces of mid and hind femora bear a few similar spines; tibia and tarsus very densely setose; tibia weakly widening towards tarsus (Fig. 397); tarsi (Figs 395, 398) with tarsomeres 1 and 2 moderately widely flattened and ventrally lobed; terminal tarsomere about 5 times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium distinct, bisetose.

Abdomen with intercoxal process moderately wide; with five freely articulated ventrites and ventrite 6 partially visible. Ventrite 1 as long as 3.5 following ventrites combined; ventrites 2–4 gradually, weakly shorter. Ventrite 5 in male with weak, median excision at apex. Male abdominal segment 8 (Fig. 619) with sternite narrow and scarcely emarginate medially at apex; tergite large with very small membranous lateral lobes at base; female segment 8 with sternite and tergite simple apically. Male genital segment (Figs 657, 658) with sternite weakly emarginate and paired apophyses fused along at least $\frac{2}{3}$ of their length; dorsal plate divided into two, lateral parts.

Aedeagus (Figs 749, 750) rather short and slender; tegmen comparatively large, placed near mid length of median lobe, with parameres fused and tegminal strut long. Median lobe strongly curved apically (curvature about 90°) and pointed at apex. Ejaculatory duct long, stout and partially coiled.

Female genitalia (Fig. 810). Ovipositor moderately sclerotized, with coxites well developed, separated; styli absent. Spermatheca small, strongly elongate, membranous; accessory gland minute, rounded, membranous; sperm duct short, slender; bursa copulatrix elongate with lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *A. carltoni** Tomaszewska et Leschen – monotypic genus.

Distribution. South America: Ecuador.

Acinaces Gerstaecker

(Figs 21, 58, 99, 100, 177, 178, 249, 282, 283, 357, 399–403, 620, 659, 660, 733, 734, 808, 848)

Acinaces Gerstaecker, 1858: 178. Type species, by subsequent designation of Strohecker (1953: 85): *Acinaces lebasii* Gerstaecker, 1858.

Diagnosis. The general body appearance of *Acinaces* resembles those of *Amphix* and *Beccariola*. The unique form of the labial palp with palpomere 2 semilunar in shape while the terminal palpomere distinctly elongate, separates easily *Acinaces* from both genera (and all other genera of Lycoperdininae). Moreover *Acinaces* differs from *Amphix* by having mandible with apical and subapical,

sharp teeth, the pronotum without basal sulcus and the legs devoid of sexually dimorphic features, while the body more elongate, the prosternal process truncate or at most very weakly emarginate at apex, the abdominal ventrite 5 bearing at least weak dimorphic characters and differently shaped antennal club, separate *Acinaces* from *Beccariola*.

Redescription. Length 4.05–6.27 mm. Body (Fig. 848) long-oval to short-oval in outline, convex; strongly shiny; confusedly punctured, elytra moderately densely and coarsely punctured while the rest of the body very finely punctured with additional reticulate microsculpture covering interspaces. Colour yellowish-brown to dark reddish-brown, often with black maculae on the elytra.

Head transverse, narrowing from eyes towards labrum. Gular sutures poorly marked, strongly convergent, confluent medially, and in form of weak mid line reaching almost submentum. Eyes very large, transversely oval in outline, prominent, very coarsely faceted. Antenna (Fig. 21) about as long as half of body length, 11-segmented with 3-segmented, narrow or moderately wide, scarcely flattened, loose club; at least antennomeres 3–7 distinctly longer than wide; terminal antennomere somewhat variable in size and shape (weakly transverse to distinctly elongate, oval to somewhat rectangular with truncate or weakly excised apical margin. Clypeus transverse, narrowing from base towards basal third thence parallel, flat. Labrum (Fig. 58) densely punctured, covered with moderately dense and short setae and with lateral, weak brushes of long setae; apical edge narrowly truncate at apex; tormae elongate with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 99, 100) moderately wide, convex dorsally, weakly concave ventrally, with stout apical tooth and one subapical tooth (equal in size with apical one); mola heavily sclerotized, moderately large, finely ridged; prostheca narrow, submembranous, shortly setose; submola very small, membranous, setose. Maxilla (Fig. 177) with palpomere 2–3 distinctly widening towards their apices; terminal palpomere strongly elongate, weakly tapering toward apex, blunt or truncate apically. Galea large, strongly widening and setose apically. Lacinia (Fig. 178) short and narrow, tapering, with long, stout setae on its inner edge and two long spines below them. Labium (Fig. 249) with palpomere 2 large, transverse and somewhat semilunar in shape; terminal palpomere elongate, subcylindrical, weakly rounded at apex. Mentum transverse, widest near basal third, sparsely punctured and densely reticulate, covered with sparse, long setae. Prementum short, with ligula submembranous, strongly widening laterally, covered with short setae.

Prothorax strongly transverse, widest at base or near anterior third. Pronotum (Fig. 282) with anterior edge with distinct stridulatory membrane; lateral margins most often moderately widely bordered; basal sulcus absent, lateral sulci well developed, long and linear; anterior angles produced anteriorly, acute, blunt or weakly

rounded; posterior angles most often weakly acute. Pronotal disc weakly convex, most often finely punctured. Prosternal process (Fig. 283) moderately wide, bordered laterally. Procoxae distinctly separated, prominent, circular in outline (Fig. 399); their cavities externally open, internally widely closed, trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum moderately large, distinctly transverse, somewhat heart-shaped, weakly angulated near base. Mesoventrite (Fig. 357) without distinct pits near anterior margin; with transverse, declivent area in front of each coxa; intercoxal process flat or weakly convex, pentagonal, about as long as wide or weakly transverse, bordered anteriorly by more or less arcuate, raised ridge and almost straight posteriorly, lateral edges weakly raised; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa (Fig. 400) circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with small internal knobs. Elytra oval, most often weakly rounded from base toward apical third, then narrowing towards apex; strongly convex with lateral margins rather narrowly flattened; moderately densely and coarsely, irregularly punctured; epipleuron moderately wide, incomplete. Metaventricle (Fig. 357) transverse, weakly convex with anterior margin weakly raised between coxae; with three pairs of postcoxal pits; discrimen extending at least to half length of metaventricle. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck rather small, oval, divided.

Legs (Figs 399–403) long and moderately stout; trochanterofemoral attachment subheteromeroid. Femur widest near middle length, about twice as wide as tibia, hardly setose but ventral surfaces of fore and mid femora bear rows of obliquely directed short spines; tibia and tarsus moderately densely setose; tibia weakly widening towards tarsus; tarsi with terminal tarsomere very long and slender, about 7 times longer than tarsomere 3. Claws simple, hollowed along inner edge (Fig. 403); empodium very small with two short setae.

Abdomen with intercoxal process weakly emarginate medially; with five freely articulated ventrites. Ventrite 1 as long as three following ventrites combined with narrow, postcoxal concavities; ventrites 2–4 subequal in length. Ventrite 5 bears weak characters of sexual dimorphism (more or less arcuate and/or weakly truncate at apex). Male abdominal segment 8 (Fig. 620) with sternite very narrow, most often at least weakly emarginate at apex; tergite arcuate apically with two lateral, membranous plates at base. Male genital segment with sternite rounded, truncate or emarginate apically and paired apophyses fused along most of their length; dorsal plate divided into two lateral parts connected medially by membrane (Figs 659, 660).

Aedeagus (Figs 733, 734) stout, moderately long, heavily sclerotized, moderately to strongly curved near base. Median lobe with one, apical branch. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 808) fused with abdominal sternite 8, which is membranous medially. Ovipositor moderately sclerotized, with coxites entirely fused; styli absent. Spermatheca large, oval submembranous with accessory gland rounded or oval, membranous, as large as spermatheca or larger. Bursa copulatrix moderately large, narrow with apical outlet of common oviduct and dorso-lateral outlet of sperm duct.

Species examined. *A. collaris* Gerstaecker, *A. gerstaeckeri* Tomaszewska, *A. laceratus* Gerstaecker, *A. lebasii lebasii** Gerstaecker, *A. lebasii stroheckeri* Tomaszewska, *A. nigricollis* Gerstaecker, *A. ovatus* Tomaszewska, *A. pakaluki* Tomaszewska, *A. unicolor* Tomaszewska – all known species.

Distribution. Central and South America: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, French Guiana, Honduras, Panama, Paraguay, Peru, Surinam, Uruguay, Venezuela.

Amphisternus Germar

(Figs 9, 22, 59, 101–104, 179, 180, 243, 284, 285, 358, 404–408, 621, 661, 662, 735, 736, 809, 849)

Amphisternus Germar, 1843a: 85. Type species, by subsequent designation of Arrow (1925: 282): *Amphisternus tuberculatus* Germar, 1843a.

Diagnosis. The species of *Amphisternus* are most similar to those of *Cacodaemon*, *Amphistethus*, *Spathomeles* and *Stictomela* in having the elytra provided with high tubercles and/or spines. Among them, having the ovipositor with base of spermatheca provided with large, at least weakly sclerotized, nodulus-like structure, and the mandible with apices strongly asymmetrical, *Amphisternus* appears to be closely related to *Cacodaemon*. Both features common with *Cacodaemon* separate *Amphisternus* from *Amphistethus*, *Spathomeles* and *Stictomela*. The maxillary lacinia long and stout throughout, provided with tuft of S-like setae at apex and a row of subequal in length dorsal spines, the intercoxal process of mesoventrite widening apically and covering part of coxae and the intercoxal process of metaventricle widely bordered and raised (with deep concavity behind) can distinguished *Amphisternus* from *Cacodaemon*.

Redescription. Length 6.3–10.0 mm. Body (Fig. 849) elongate-oval to short-oval, strongly convex, shiny or opaque, glabrous; coarsely and variably densely, confusedly punctured with interspaces reticulate. Colour brownish-black or most often black; elytra verrucose to

spinose, humeri carinate sometimes with spines; elytral tubercles black or orange-yellow.

Head rather deeply retracted in prothorax, weakly transverse, with two, elongate, shallow concavities between eyes. Eyes comparatively small, narrow and transverse, prominent, coarsely faceted. Occipital file moderately large. Gular sutures poorly marked, confluent medially (Fig. 5). Antenna long and stout (Fig. 22) with 3-segmented, narrow, moderately flattened and rather loose club; scape about twice as long as pedicel and as long as antennomere 3; antennomere 3 about $1.6 \times$ as long as antennomere 4 or 5; antennomeres 6–8 subequal in length, slightly shorter than preceding antennomeres. Clypeus strongly transverse, flat, widest at base, weakly narrowing towards basal third, thence parallel with apical margin straight. Labrum (Fig. 59) sclerotized with membranous apex; strongly transverse, sparsely punctured, covered with long setae and with tufts of long setae on sides of anterior margin; anterior edge of membranous part simple or truncate and of sclerotized part simple or emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods very slender, long, widely divergent anteriorly. Mandible (Figs 101–104) with asymmetrical apex – right mandible seems to have two large, apical teeth (one of them chisel-shaped) and one, minute subapical tooth; left mandible seems to have strong, chisel-shaped apical tooth and two subapical teeth, first as large as apical one and the second distinctly smaller, but much larger than this on left mandible; mola large, well-developed, finely ridged; protheca large, membranous, moderately densely setose; submola comparatively large, setose, membranous. Maxilla (Fig. 179) with terminal palpomere elongate, subcylindrical, weakly rounded at apex, about $2.0 \times$ as long as palpomere 3; galea moderately large, long-oval, bluntly rounded and densely setose apically; lacinia (Fig. 180) almost as large as galea (long and wide) not tapering, bluntly rounded at apex, with tuft of somewhat S-shaped, apical spines, with row of rather fine setae on its inner-ventral edge and row of long spines on inner-dorsal edge; digitus absent. Labium (Fig. 243) with palpi moderately close together; palpomeres 2 and 3 strongly transverse; terminal palpomere truncate at apex. Mentum transverse, flat, widest near basal third, covered with short, sparse, suberect setae. Prementum rather short, moderately sclerotized with ligula weakly lobed at sides.

Prothorax strongly transverse, widest near anterior third. Pronotum (Fig. 284) rather narrowly bordered laterally and anteriorly; anterior edge with conspicuous and weakly prominent stridulatory membrane; basal sulcus distinct, weakly sinuate to almost straight, lateral sulci linear, subparallel, moderately deep and long; anterior angles produced, blunt or acute, posterior angles weakly acute or right-angled; pronotal disc convex but of uneven

surface; sides with elongate concavities; puncturation very fine with interspaces reticulate or almost only reticulated. Prosternum with a pair of small pits at the front of procoxal cavities; prosternal process (Fig. 285) rather widely separates front coxae, deeply cleft apically, and extending beyond coxae; front coxae prominent, circular in outline (Fig. 404); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, strongly transverse, moderately densely punctured, widely rounded apically or somewhat heart-shaped. Mesoventrite (Fig. 358) with a pair of distinct, rather deep pits near anterior margin and with transverse, declivent area in front of each coxa; intercoxal process strongly transverse, with apex widening laterally, covering part of coxae; bordered anteriorly by weakly arcuate ridge and sinuate posteriorly, lateral edges weakly raised; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra with basal margins moderately widely bordered and raised; convex, covered almost always with tubercles (Fig. 9); humeri most often strongly carinate; puncturation coarse and rather dense with interspaces reticulate; lateral margin narrowly flattened, visible from above, from humeri to about apical fourth; most often blunt at apices; epipleuron comparatively wide, complete. Metaventrite (Fig. 358) more than twice as wide as long, weakly convex, narrowing anteriorly; anterior margin especially of intercoxal process comparatively widely bordered and raised; provided with three pairs of postcoxal pits; discrimen complete or almost so. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with different degree of reduction or well developed – then one anal vein and one anal cell present; medial fleck elongate, partially divided.

Legs (Figs 404–408) long and moderately stout; trochanterofemoral attachment heteromeroid. Femur clubbed, slender at base, hardly setose but ventral surfaces of fore femur bear rows of obliquely directed short spines, sometimes also mid femora have a few short spines; tibia and tarsus moderately densely setose; tibia weakly widening towards tarsus; terminal tarsomere very long and comparatively stout, about 9 times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium rather small with two short setae. Male tibiae with very distinctly marked sexual characters (Figs 405, 407) – fore tibia with distinct tooth in apical third and mid tibia may be more or less curved near apex.

Abdomen with intercoxal process scarcely emarginate at apex; five freely articulated ventrites. Ventricle 1 as long as three following ventrites combined with nar-

row, postcoxal concavities and sometimes also with pits; ventrites 2–4 gradually, slightly shorter. Male ventrite 5 arcuate to weakly truncate with tuft of short apical hairs. Male abdominal segment 8 with sternite very narrow, simple (Fig. 621), truncate or weakly emarginate at apex; tergite arcuate apically with two small, lateral, membranous plates at base. Male genital segment (Figs 661, 662) with sternite most often emarginate apically (sometimes arcuate) and paired apophyses fused along $\frac{1}{3}$ of their length; dorsal plate divided into two lateral parts connected medially by membrane, additional internal sclerite present.

Aedeagus (Figs 735, 736) stout, moderately long, heavily sclerotized, weakly curved near base. Median lobe branched out at apex. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 809) fused with abdominal sternite 8. Ovipositor sclerotized, with coxites entirely fused; styli present, rather small, terminal or subterminal. Spermatheca large, rounded, membranous with weakly sclerotized, large, basal ring; sperm duct short, slender; accessory gland strongly elongate, membranous. Bursa copulatrix moderately large, narrow with lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *A. corallifer* Gerstaecker, *A. malaccanus* Pic, *A. mucronatus* Gerstaecker, *A. nanus* Strohecker, *A. tuberculatus*^{*} Germar, *A. vomeratus* Gorham – 6 of 14 known species.

Distribution. Widely distributed in the Oriental Region.

Amphistethus Strohecker

(Figs 16, 23, 62, 96, 105, 106, 181, 182, 244, 286, 287, 359, 409–415, 624, 663, 664, 737, 738, 812, 850)

Amphistethus Strohecker, 1964: 337. Type species, by original designation: *Amphistethus superbus* Strohecker, 1964.

Diagnosis. *Amphistethus* is most similar to *Spathomeles*, *Stictomela*, *Amphisternus* and *Cacodaemon* in having the elytra provided with tubercles and/or spines, and the base of spermatheca at least weakly sclerotized, but can be separated in having the terminal maxillary palpomere transverse or at most as long as wide. Moreover *Amphistethus* differs from *Amphisternus* and *Cacodaemon* by absence of many spines and/or high tubercles on the elytra, and by having the pronotum with anterior angles produced anteriorly, thickened and bluntly rounded. The prosternal process very wide, deeply excised apically can easily separate *Amphistethus* from *Spathomeles* and *Stictomela*.

Redescription. Length 7.5–11.0 mm. Body (Fig. 850) long-oval, highly convex, shiny, glabrous; confusedly punctured with interspaces reticulate. Colour black to brownish-black; elytra with yellow or orange maculae often placed on raised areas, humeri inflated or rarely produced into long spines.

Head rather deeply retracted in prothorax, almost as long as wide, with weak, elongate, concavity between eyes. Eyes moderately large, transversely oval, rather prominent, moderately coarsely faceted. Occipital file large, long-oval. Gular sutures, strongly convergent, confluent medially near base and extending anteriorly as short median line. Antenna (Fig. 23) at least as long as half length of body, slender with 3-segmented, moderately wide to very wide, flattened and compact club; antennomeres 1–8 longer than wide; scape about twice as long as pedicel; antennomere 3 about 1.5 × longer than scape or antennomere 4; antennomeres 4 and 5 subequal in length, slightly longer than 6 or 7; antennomere 8 slightly shorter than preceding antennomeres; antennomere 9 more or less triangular; 9 and 10 transverse. Clypeus strongly transverse, flat, widest at base, narrowing towards basal third, thence parallel with apical margin straight. Labrum (Fig. 62) sclerotized with membranous apex; strongly transverse, moderately coarsely punctured, covered with rather short setae and with tufts of long setae on sides of anterior margin; anterior edge of membranous part simple or truncate, and of sclerotized part weakly emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 96, 105, 106) with apex chisel-shaped and tip minutely incised, with moderately large subapical tooth; mola large, finely ridged; prostheca large, membranous, densely setose; submola comparatively large, setose, membranous. Maxilla (Fig. 181) with palp stout; terminal palpomere at least subquadrate, often transverse and axe-shaped, truncate at apex; galea moderately large, long-oval to somewhat triangular, bluntly rounded and densely setose apically with tuft of spine-like setae at tip; lacinia (Fig. 182) almost as large as galea, tapering, bluntly rounded at apex, with tuft of somewhat S-shaped, apical spines, row of rather fine setae on its inner-ventral edge and row of long spines on inner-dorsal edge. Labium (Fig. 244) with palpi rather close together; palpomeres 2 and 3 strongly transverse; terminal palpomere truncate at apex. Mentum transverse, widest near basal third, covered with short, sparse setae, with weak, arcuate and raised transverse ridge. Prementum rather short, moderately sclerotized with membranous ligula expanded at sides.

Prothorax strongly transverse, widest anteriorly or near anterior third. Pronotum (Fig. 286) with moderately widely bordered lateral margins and very widely bordered, thickened, raised and strongly produced anterior angles; anterior margin with comparatively small and not prominent stridulatory membrane; basal sulcus distinct, moderately deep, weakly sinuate or almost straight; lateral sulci linear, subparallel, moderately deep and short; hind angles weakly acute or right-angled; pronotal disc moderately convex, but of uneven surface; puncturation fine and shallow with interspaces densely reticulate. Prosternum without pits in front of procoxal cavities;

prosternal process (Fig. 287) widely separates front coxae, broadly excised at apex, extending beyond coxae, somewhat concave medially; front coxae prominent, circular in outline (Fig. 409); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, comparatively convex, strongly transverse, sparsely punctured, widely rounded apically or somewhat heart-shaped with pointed apex. Mesoventrite (Fig. 359) of uneven surface with a pair of distinct, deep pits near anterior margin, with median, convex tubercle near anterior margin and with transverse, declivent area in front of each coxa; intercoxal process strongly transverse, with apex widening laterally, covering part of coxae; bordered anteriorly by more or less sinuate and raised ridge and strongly sinuate posteriorly, lateral edges raised and middle part depressed; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 414), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra with basal edges moderately widely bordered and raised; convex, covered with weak tubercles (raised areas); humeri inflated (with spines in one known species); puncturation rather coarse and moderately dense with interspaces finely reticulate, lateral margins narrowly flattened, visible almost throughout, blunt at apices; epipleuron comparatively wide, complete or almost so. Metaventricle (Fig. 359) more than twice as wide as long, narrowing anteriorly; anterior edge especially of intercoxal process widely bordered and raised; provided with three pairs of large, postcoxal pits, convex on sides of discrimen; discrimen almost complete. Metacoxae transverse, widely separated. Metendosternite with moderately long stalk and widely separated anterior arms and tendons.

Hind wing (Fig. 16) with one anal vein and two anal cells, medial fleck comparatively large, long-oval, divided.

Legs (Figs 409–415) long and slender with trochanterofemoral attachment heteromeroid. Femur clubbed, slender at base and swollen before apex, almost glabrous; tibia and tarsus rather densely setose; tibia slender and scarcely widening towards tarsus, sometimes weakly curved in both sexes (more distinctly in males); tarsi with terminal tarsomere very long and comparatively stout, about 10 times longer than tarsomere 3. Claws simple, hollowed along inner edge (Fig. 412); empodium rather small with two short setae. Male fore tibiae most often with distinctly marked sexual characters (Figs 410, 411, 415).

Abdomen with intercoxal process weakly emarginate at apex; with five freely articulated ventrites. Ventrite 1 as long as 2.5 following ventrites combined, with narrow, deep postcoxal grooves; ventrites 2–4 subequal in length. Male ventrite 5 most often widely emarginate and impressed medially at apex. Male abdominal seg-

ment 8 with sternite very narrow, somewhat W-shaped (Fig. 624); tergite scarcely rounded apically with two large, lateral, membranous plates at base. Male genital segment (Figs 663, 664) with sternite narrow, with asymmetrical apical margin, and paired apophyses fused apically; dorsal plate undivided; additional internal sclerite present.

Aedeagus (Figs 737, 738) short and stout, heavily sclerotized, straight. Median lobe branched out apically. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 812) fused with abdominal segment 8. Ovipositor sclerotized, with coxites entirely fused, and their apex more or less crenulate; styli present, small, terminal. Spermatheca small, rounded, membranous with weakly sclerotized, small basal ring; sperm duct short, slender; accessory gland minute, membranous. Bursa copulatrix moderately large, with lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *A. astrate* Strohecker, *A. phyllocerous* (Arrow), *A. pustulifer* (Gorham), *A. stroheckeri* Tomaszewska, *A. superbus** Strohecker (externally) – all known species.

Distribution. Oriental Region.

Amphix Laporte

(Figs 24, 60, 107, 108, 183, 184, 242, 288, 289, 360, 416–420, 622, 665, 666, 739, 740, 811, 851)

Amphix Laporte, 1840: 522. Type species, by monotypy: *Eumorphus binotatus* Laporte, 1840 (= *Erotylus marginatus* Fabricius, 1798). *Corynomalus* Erichson, 1847: 181. Type species, by monotypy: *Corynomalus tarsatus* Erichson, 1847.

Diagnosis. *Amphix* is most similar to *Acinaces* by the general body appearance, but differs in having the mandible with apex widely chisel-shaped, the labial palp with palpomere 2 transverse while the terminal palpomere elongate, subquadrate or transverse, the pronotum with well developed basal sulcus and the legs provided with at least weak characters of sexual dimorphism.

Redescription. Length 6.5–10.0 mm. Body (Fig. 851) oval in outline, convex; strongly shiny; confusedly punctured with additional reticulate microsculpture covering interspaces. Colour variable, yellowish-brown to dark reddish-brown, violet to black sometimes with black spots on the elytra and sometimes on pronotum; often only lateral margins of elytra (sometimes also along suture) lighter; legs and antenna often bicoloured.

Head about as long as wide. Gular sutures absent. Occipital file rather narrow, long-oval. Eyes rather small, narrowly oval in outline, moderately prominent, finely to moderately coarsely faceted. Antenna (Fig. 24) about as long as half length of body, with 3-segmented, narrow or moderately wide, comparatively flattened, rather compact club; antennomeres 1, 3–7 and often antennomere 8 distinctly longer than wide, scape about

2 × as long as pedicel; antennomere 3 about 3 × longer than pedicel and at least 1.5 × longer than antennomere 4; terminal antennomere as long as wide or transverse, with truncate apical margin. Clypeus transverse, narrowing from base towards basal third thence parallel, flat with somewhat arcuate apical margin. Labrum (Fig. 60) sclerotized with comparatively wide, membranous apex; sparsely punctured, covered with fine, short setae and with moderately long setae on anterior sclerotized margin; apical edge of sclerotized part emarginate medially and of membranous part simple (somewhat truncate) or weakly emarginate; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 107, 108) moderately wide, convex dorsally with sharp, elongate ridge near lateral margin and concave ventrally; chisel-shaped at apex with moderately large, blunt subapical tooth; mola large, heavily sclerotized, finely ridged; prostheca moderately large, membranous or submembranous, finely setose; submola small, membranous, setose. Maxilla (Fig. 183) with palpomeres 2–4 elongate; palpomeres 2–3 distinctly widening towards their apices; terminal palpomere about as long as 3, tapering towards apex and rounded. Galea large, strongly widening and setose apically. Lacinia (Fig. 184) moderately long, narrow, tapering, with long, stout setae on apex and inner-ventral edge, with row of moderately long spines on dorsal surface and two longest spines below them. Labium (Fig. 242) with palpi moderately close together; palpomere 2 transverse; terminal palpomere subcylindrical in shape, elongate, subquadrate or transverse, blunt at apex. Mentum strongly transverse, widest near basal third, sparsely punctured, covered with sparse, long setae anteriorly. Prementum short, with ligula submembranous, strongly widening laterally, shortly setose, with apical edge weakly emarginate, truncate or weakly rounded.

Prothorax strongly transverse, widest at base or near anterior third. Pronotum (Fig. 288) with anterior edge provided with very small to moderately large stridulatory membrane; lateral and anterior margins narrowly to moderately widely bordered; basal edge margined; basal sulcus distinct, lateral sulci weakly marked to moderately deep, long and linear, subparallel; anterior angles produced anteriorly, blunt or rounded; posterior angles weakly acute or right-angled. Pronotal disc weakly convex, most often finely punctured. Prosternal process (Fig. 289) moderately wide, narrowly bordered laterally, not extending beyond coxae, truncate or weakly emarginate at apex. Procoxae distinctly separated, prominent, circular in outline (Fig. 416); their cavities externally open, internally widely closed; trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum moderately large, transverse, somewhat heart-shaped, and weakly angulate near base, narrowly rounded or somewhat pointed at apex. Mesoventrite (Fig. 360) with small and shallow pits near anterior margin; with

transverse, weakly declivent area in front of each coxa; intercoxal process pentagonal, about as long as wide or transverse, bordered anteriorly and laterally, flat or weakly concave, with straight posterior margin; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 418), its cavity outwardly open; trochantin exposed. Mesometaventral junction with small internal knobs. Elytra oval, widest near basal third, thence narrowing towards apex, blunt or weakly acute at apices; strongly convex with lateral margins rather narrowly flattened and visible from above almost throughout; densely and coarsely punctured; epipleuron moderately wide, incomplete at apex. Metaventricle (Fig. 360) strongly transverse, weakly convex with anterior margin moderately widely bordered and weakly raised; with extremely shallow postcoxal pits (one or three pairs), or rarely without pits; discrimen extending at least to mid length of metaventricle. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell. Mp-CuA cross vein absent; medial fleck small, oval, undivided.

Legs (Figs 416–420) long and moderately stout with trochanterofemoral attachment oblique or subheteromeroid. Femur clubbed or widest near middle length, less than twice as wide as tibia, hardly setose but with short row of obliquely directed short spines on ventral surfaces of fore and mid femora; tibia and tarsus comparatively densely setose; terminal tarsomere very long and rather slender, 8–9 times longer than tarsomere 3. Claws simple, hollowed along inner edge (Fig. 420); empodium moderately large with two short setae; male fore tibiae may bear at least weak dimorphic features (Fig. 417).

Abdomen with intercoxal process at least weakly emarginate medially; with five freely articulated ventrites. Ventrite 1 about as long as three following ventrites combined with narrow, postcoxal concavities; ventrites 2–4 subequal in length or gradually slightly shorter. Ventrite 5 sometimes with weak characters of sexual dimorphism in both sexes (more or less arcuate and/or weakly truncate at apex); male ventrites 1–4 sometimes with median tubercles or elongate ridges. Male abdominal segment 8 (Fig. 622) with sternite very narrow, most often at least weakly emarginate at apex; tergite arcuate apically with two lateral, submembranous lobes at base. Male genital segment with sternite submembranous medially, emarginate at apex; paired apophyses fused at least along half of their length; dorsal plate divided in two lateral parts connected medially by membrane (Figs 665, 666).

Aedeagus (Figs 739, 740) stout, moderately long, sclerotized, weakly curved near base to almost straight. Median lobe most often with one, apical branch. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 811) fused with abdominal sternite 8, which is membranous medially or formed by lateral, sclerotized plates without median connection. Ovipositor sclerotized, with coxites entirely fused, emarginate or somewhat truncate apically; styli absent. Spermatheca moderately large or large, oval, membranous with accessory gland long-oval, membranous, as large as spermatheca or much smaller. Bursa copulatrix moderately large, with apical outlet of sperm duct and medio-ventral outlet of common oviduct.

Species examined. *A. dentatus* (Fabricius), *A. femoralis* (Gerstaecker), *A. marginatus** (Fabricius), *A. subcordatus* (Gerstaecker), *A. tarsatus* (Erichson), *A. vestitus cinctus* (Fabricius) – 6 of 49 known species.

Distribution. Neotropical Region.

Ancylopus Costa

(Figs 25, 63, 109, 110, 185, 186, 245, 292, 293, 361, 421–427, 627, 667, 668, 741, 742, 813, 852)

Ancylopus Costa, 1854: 13. Type species, by monotypy: *Endomychus melanocephalus* Olivier, 1808.

Diagnosis. The body of the *Ancylopus* species being long-oval and of moderate size resembles closely those of *Avenymon* and *Malindus*. *Ancylopus* however differs from both genera in having the female pronotum with lateral sulci connected medially by arcuate ridge, the elytra almost always decorated with black maculae and the labrum with sides subparallel.

Redescription. Length 4.0–6.0 mm. Body (Fig. 852) elongate, somewhat parallel-sided, moderately convex, shiny and glabrous; moderately densely and rather finely, confusedly punctured. Colour yellowish-brown to dark brown, almost always with black maculae on the elytra.

Head partially retracted in prothorax, weakly transverse. Gular sutures slender, confluent medially, and extending anteriorly as slender and moderately long median line. Eyes moderately large, oval in outline, prominent, coarsely faceted. Occipital file somewhat triangular in shape. Antenna moderately long (slightly shorter than half of body length) and rather slender (Fig. 25) with 3-segmented, very narrow and loosely articulated, not flattened club; scape about 1.5 × as long as pedicel; antennomere 3 at least as long as antennomeres 4 and 5 combined; antennomere 4 scarcely longer than 5; antennomeres 5–6 equal in size; antennomere 7 slightly dilated, distinctly broader than those preceding and succeeding it. Clypeus transverse, flat, widest at base, slightly convergent along basal third, thence parallel. Labrum (Fig. 63) with anterior edge weakly emarginate medially; strongly transverse, sclerotized with membranous apex and with more or less distinct small, triangular, raised edge at base; densely and moderately coarsely punctured, covered with rather short setae and with tufts

of moderately long setae on sides; tormae elongate, with mesal arms recurved posteriorly; labral rods very slender and short, almost parallel. Mandible (Figs 109, 110) moderately broad, concave ventrally and convex dorsally; sharply pointed at tip, narrowly chisel-shaped with small subapical tooth; mola rather large, well-developed, finely ridged; prostheca narrow, membranous, covered densely with fine setae; submola small, densely setose, membranous. Maxilla (Fig. 185) with 4-segmented palp; terminal palpomere elongate, slightly longer than palpomere 3, cylindrical, blunt at apex; galea broadly triangular, pointed at apex, densely setose; lacinia (Fig. 186) short and narrow, tapering, fringed with stiff setae on its inner edge and with two long spines below them; digitus absent. Labium (Fig. 245) with palpi close together, palpomere 2 distinctly transverse and terminal palpomere transversely rectangular. Mentum strongly transverse, widest in mid length, with raised, curved ridge transversely; sparsely covered with short setae. Prementum very short, moderately sclerotized with ligula formed by moderately large lobes at sides.

Prothorax transverse, widest near apical third. Pronotum (Fig. 292) very narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; basal sulcus deep; lateral sulci linear, subparallel, deep and long, extending beyond mid length; in female, anterior end of lateral sulci connected with deep median sulcus, by deep, curved channel (Fig. 292); anterior angles distinctly produced forwards, blunt; posterior angles right-angled or scarcely acute; pronotal disc slightly convex. Prosternum without pits; prosternal process (Fig. 293) very narrow, hardly separating front coxae, extending almost to their hind margin; coxae prominent, circular in outline (Fig. 422); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, more or less broadly rounded apically. Mesoventrite (Fig. 361) with a pair of pits near anterior margin; intercoxal process elongate, rather narrowly separating mesocoxae, with weak raised, arcuate ridge anteriorly, almost truncate posteriorly; extending slightly beyond half length of coxae. Mesocoxa circular in outline (Fig. 421), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knob. Elytra elongate, subparallel, convex, rounded at apices, with very narrow lateral margins, with punctures rather fine, moderately dense and irregular; epipleuron narrow, incomplete at apex. Metaventrite (Fig. 361) transverse, weakly convex, scarcely narrowing towards its anterior margin; intercoxal process moderately widely or widely bordered and raised, provided with three pairs of postcoxal pits; in males sometimes with small tubercles near hind coxae; discrimen very long but incomplete. Metacoxae transverse, widely separated; femoral lines absent.

Metendosternite with short stalk and widely separated anterior arms and long tendons. Hind wing with two anal veins and two anal cells; medial fleck comparatively large, elongate-oval, divided; radial cell absent.

Legs (Figs 421–427). Trochanterofemoral attachment heteromeroid. Femur long, somewhat clavate, slender at base, hardly setose; dorsal and ventral surfaces of fore femur and ventral surfaces of mid femur bear rows of obliquely directed short spines; tibia and tarsus moderately densely setose; tibia widening towards tarsus. Tarsi with terminal tarsomere about six times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium distinct, bisetose. In males sexual characters may be present in all tibiae (Figs 423–425) and mid trochanters (Fig. 421); male mid femora bear fringe of long hairs along almost throughout inner edge (Fig. 421).

Abdomen with five freely articulated ventrites. Ventrite 1 longer than three following ventrites combined, with intercoxal process truncate at apex; ventrites 2–4 subequal in length. In male ventrite 5 weakly excised at apex. Male abdominal segment 8 (Fig. 627) with sternite very narrow and deeply emarginate at apex; tergite provided with large, lateral, submembranous plates at base. Male genital segment with apical edge of sternite somewhat crenulate; paired apophyses fused along $\frac{1}{3}$ of their length; dorsal plate narrow, undivided (Figs 667, 668).

Aedeagus (Figs 741, 742) stout, moderately long, heavily sclerotized, weakly curved. Median lobe branched out apically. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut indistinct.

Female genitalia (Fig. 813) fused with abdominal segment 8. Ovipositor sclerotized, with coxites at most partially fused by membranous connection; sternite 8 divided in two lateral, sclerotized plates and fused with coxites; styli small, terminal. Spermatheca very small, oval, membranous; sperm duct short, slender, connected directly with spermatheca; accessory gland minute, elongate, membranous. Bursa copulatrix large with apical outlet of sperm duct and latero-apical outlet of common oviduct.

Species examined. *A. ferrugineus* Weise, *Ancylopus melanocephalus** (Olivier), *A. pictus indianus* Strohecker, *A. pictus papuanus* Strohecker, *A. phungi* Pic – 4 of 13 known species.

Distribution. South Palaearctic, Orient and Africa.

Aphorista Gorham

(Figs 26, 64, 111, 112, 187, 188, 247, 298, 299, 362, 428–433, 623, 669, 670, 745, 746, 814, 853)

Aphorista Gorham, 1873: 45. Type species, by original designation: *Epipocus laetus* LeConte, 1853 (cited by Gorham as *Mycetina laeta*).

Diagnosis. The species of *Aphorista* can resemble those of *Lycoperdina* and *Mycetina*. *Aphorista* however

can be easily distinguished from *Lycoperdina* in having the body less convex, the antennal club distinctly 3-segmented and the ovipositor with apex of proctiger simple, while from *Mycetina* it can be separated by having the prosternal process narrowly separating fore coxae, the intercoxal process of mesoventrite at least weakly longer than wide, provided with elongate ridge along anterior half, and the ovipositor with fused coxites.

Redescription. Length 5.5–8.0 mm. Body (Fig. 853) elongate to elongate-oval, moderately convex, shiny, and minutely setose; confusedly punctured with additional fine reticulation. Colour brown or reddish-brown with elongate, black stripes on elytra and sometimes with black spots on pronotum, or body entirely black.

Head partially retracted in prothorax, almost as long as wide. Eyes moderately large, oval in outline, prominent, moderately coarsely faceted. Occipital file long-oval. Postoccipital suture distinct. Gular sutures well developed, widely separated, convergent anteriorly. Antenna (Fig. 26) slightly shorter than half length of body and rather slender, with 3-segmented, narrow and scarcely flattened, loose club; scape slightly longer than pedicel; antennomere 3 at least $1.5 \times$ as long as pedicel or antennomere 4; antennomeres 4–5 and 7 subequal in length; 6 and 8 slightly shorter; terminal antennomere longer than wide, somewhat truncate at apex. Clypeus transverse, flat, widest at base, convergent from base toward basal third, thence parallel, weakly rounded at apex. Labrum (Fig. 64) strongly transverse, sclerotized with membranous apex, moderately coarsely punctured, covered with short setae and with tufts of sparse, long setae on sides of anterior margin; apical margin of sclerotized part simple and of membranous part with median, small emargination; tormae elongate, with mesal arms recurved posteriorly, labral rods short, very weakly divergent anteriorly. Mandible (Figs 111, 112) moderately broad, strongly concave ventrally, convex dorsally with sharp, elongate ridge laterally and weak tubercle near prostheca; sharply cleft at tip forming apical and subapical teeth of equal size and with additional, very small subapical tooth; mola large, finely ridged; prostheca rather small and narrow, membranous, sparsely setose; submola small, membranous, covered with dense, short setae. Maxilla (Fig. 187) with terminal palpomere elongate, tapering from mid length to apex, blunt or rounded apically, scarcely longer than palpomere 3; galea rather narrow, weakly enlarged toward apex, moderately densely setose; lacinia (Fig. 188) short and narrow, strongly tapering, fringed with rather stiff, long setae on apex and inner-ventral edge, with row of short spines on dorsal surface and two very long and stout spines below them. Labium (Fig. 247) with palpi close together; palpomere 2 transverse and terminal palpomere subquadrate, truncate at apex. Mentum transverse, flat, widest near mid length; moderately coarsely punctured and shortly setose on sides. Prementum very

short, moderately sclerotized with ligula lobed at sides, weakly emarginate medially.

Prothorax strongly transverse, widest near mid length, or at base. Pronotum (Fig. 298) moderately coarsely and not very densely punctured; rather narrowly bordered laterally and anteriorly; base margined; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, lateral sulci linear, subparallel, deep and moderately long with deep pits at base; anterior angles distinctly produced forwards, blunt or subacute; posterior angles right-angled or weakly acute; pronotal disc weakly convex. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 299) very narrow, truncate apically, not extending beyond fore coxae, which are almost contiguous, prominent and circular in outline (Fig. 428); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, somewhat heart-shaped, angulate near base, somewhat pointed apically, sparsely punctured. Mesoventrite (Fig. 362) with a pair of pits near anterior margin; intercoxal process weakly elongate, comparatively widely separating mesocoxae, extending to about half of their length, almost flat, with weak elongate, median ridge along anterior half and lateral edges weakly bordered and raised (especially posteriorly); apical margin weakly sinuate. Mesocoxa circular in outline (Fig. 429), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near mid length, elongate or oval, weakly to moderately convex, blunt at apices with punctures dense and rather fine; epipleuron rather narrow, incomplete at apex; lateral margins moderately widely flattened, visible from above throughout; humeri weakly prominent; sometimes with weak tubercles near scutellum. Metaventrite (Fig. 362) large, transverse, comparatively convex (especially in males) and weakly concave along disc; narrowing towards anterior margin which is moderately widely bordered and weakly raised; provided with three pairs of postcoxal pits; disc long but incomplete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck moderately large, oval, at least partially divided.

Legs (Figs 428–433) with trochanterofemoral attachment heteromeroid. Femur clubbed, widest near apex, slender at base, hardly to moderately densely setose with ventral surface of fore and often mid femora provided with obliquely directed, suberect spines; tibia and tarsus more densely setose than femur; tibia widening towards tarsus. Tarsomere 3 about seven times shorter than tarsomere 4. Claws simple, hollowed along inner edge. Empodium bisetose. Male fore and mid tibiae bear characters of sexual dimorphism (Figs 430, 431).

Abdomen with five freely articulated ventrites. Ventrite 1 as long as three following ventrites combined, with anterior margin of intercoxal process straight or weakly emarginate medially; ventrites 2–4 equal in length. Male ventrite 5 narrowly truncate or scarcely emarginate at apex. Male abdominal segment 8 (Fig. 623) with sternite very narrow and weakly emarginate at apex and tergite widely rounded. Male genital segment with sternite emarginate apically and paired apophyses fused along about half of their length; dorsal plate divided in two lateral parts meeting medially (Figs 669, 670).

Aedeagus (Figs 745, 746) long and moderately stout, sclerotized, weakly curved at base. Median lobe without apical branches. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 814) fused with sternite 8. Ovipositor sclerotized, with coxites entirely fused, weakly emarginate at apex; styli absent. Spermatheca small, oval, membranous; sperm duct short, slender; accessory gland minute, elongate, membranous. Bursa copulatrix very long with apical outlet of sperm duct and lateral outlet of common oviduct.

Species examined. *A. laeta** (LeConte), *A. morosa* (LeConte), *A. vittata* (Fabricius) – all known species.

Distribution. Nearctic Region.

Archipines Strohecker

(Figs 27, 65, 113, 114, 189, 190, 246, 294, 295, 363, 434–441, 626, 673, 674, 743, 744, 815, 854)

Phalanthia Gerstaecker, 1858: 202 (nec *Phalanthia* Gistel, 1839). Type species, by monotypy: *Phalanthia exsanguis* Gerstaecker, 1858.

Archipines Strohecker, 1953: 57. Replacement name for *Phalanthia* Gerstaecker, 1858.

Diagnosis. *Archipines* appears to be closely related to Australian genera *Daulis* and *Daulotypus* sharing similar body appearance, the terminal labial palpomere large and somewhat flattened dorso-ventrally, the labrum produced laterally into rounded lobes, the trochanterofemoral attachment being oblique, the apex of the sternite of the male genital segment visible in a deep excision of the ventrite 6 and the female genitalia with strongly reduced coxites. However the body vestiture simple, the lateral margins of the pronotum finely denticulate, widened into small, sharp tooth or at least weakly angulate near apical third, the prosternal process vestigial, and the mandible with small apical teeth can distinguished *Archipines* from both genera.

Redescription. Length 3.90–6.06 mm. Body (Fig. 854) long-oval in outline, flattened above; shiny; very densely and coarsely, confusedly punctured. Colour light brown to dark brown or dark reddish-brown, with black or rarely bright spots on the elytra.

Head almost as long as wide, weakly narrowing from eyes towards labrum; occiput with transverse stridulatory area; gular sutures absent. Eyes very large, oval in outline, prominent, very coarsely faceted. Antenna as long as half of body length, with more or less distinct 3-segmented, narrow, scarcely flattened, loose club; apical margin of terminal antennomere with elongate, membranous sensilla (Fig. 27). Clypeus rectangular, flat. Labrum (Fig. 65) punctured, covered with sparse and short setae; apical edge deeply emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods short, subparallel. Mandible (Figs 113, 114) almost round, convex dorsally, weakly concave ventrally; with small apical tooth and one very small subapical tooth; mola heavily sclerotized; prostheca narrow, submembranous with brush of short setae near mola; submola very small, membranous. Maxilla (Fig. 189) with palpomere 2–4 distinctly widening towards their apices; terminal palpomere obliquely truncate at apex. Galea large, widening and densely setose apically. Lacinia (Fig. 190) short and narrow, narrowing towards its apex, with long, stout setae on its inner edge and one long spine below them. Labium (Fig. 246) with palpi close together; palpomere 2 small, transverse; terminal palpomere large, transverse, truncate at apex. Mentum somewhat pentagonal with arcuate anterior edge, punctured, covered with several long setae. Prementum strongly widened near apex, punctured, covered with moderately long setae; ligula small, submembranous.

Prothorax transverse, widest near apical third. Pronotum (Fig. 294) narrowly bordered laterally and anteriorly; anterior margin with small but distinct stridulatory membrane; lateral margins most often distinctly reflexed; basal sulcus more or less distinct, lateral sulci most often short and poorly marked, sometimes long and deep or rarely absent; anterior angles weakly rounded or produced outwards into small sharp tooth; posterior angles right-angled, acute or provided with small tooth; lateral margins widened into small, sharp tooth or at least slightly angulate near apical third. Pronotal disc scarcely convex, very coarsely and densely punctured. Prosternal process (Fig. 295) reduced. Procoxae (Fig. 435) contiguous, prominent, circular in outline; their cavities externally open, internally widely closed; trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum moderately large, wider than long. Mesoventrite (Fig. 363) with intercoxal process very narrow, extending to about half length of coxae and most often meeting very narrow intercoxal process of metaventrite or sometimes both processes separated; mesocoxae very narrowly separated. Mesocoxa circular in outline, its cavity laterally narrowly open; trochantin partially exposed. Meso-metaventral junction of straight-line type. Elytra most often heart-shaped, widest near basal third thence abruptly narrowing towards apex, sometimes long-oval,

widest in mid length; in males most often a little more elongate than in females; weakly convex with lateral margins narrowly to widely flattened, very densely and coarsely, irregularly punctured; epipleuron narrow to broad, incomplete. Metaventrite (Fig. 363) transverse, flat, without postcoxal pits; discrimen long; anterior edge rather narrowly bordered and very weakly raised. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck small, oval, undivided.

Legs (Figs 434–441) with trochanterofemoral attachment oblique. Femur widest near mid length, about twice as wide as tibia, covered with long and dense setae; tibia and tarsus very densely pubescent; tibia weakly widening towards tarsus. In males fore tibiae with more or less distinct tooth at about apical third or near mid length, often additionally finely denticulate on inner edge; middle and hind tibiae most often distinctly denticulate on inner edge, at least from apical third to apex, sometimes curved outwardly. Tarsomere 3 at least 5 times shorter than tarsomere 4. Claws simple. Empodium very small with one seta.

Abdomen. In female five freely articulated ventrites, in male ventrite sixth at least partially visible; anterior margin of intercoxal process very weakly emarginate. Ventrite 1 usually longer than metasternum and almost as long as two following ventrites combined. Ventrite 5 and/or 6 usually with characters of sexual dimorphism in both sexes. Male abdominal segment 8 with sternite at least weakly emarginate (Fig. 626). Male genital segment (Figs 673, 674) with sternite usually with asymmetrical (sinuate) apical edge and paired apophyses fused apically or in mid length; dorsal plate divided in two parts connected by narrow membrane.

Aedeagus (Figs 743, 744) usually long, stout and heavily sclerotized. Tegmen comparatively large with basal piece encircling median lobe near base; parameres fused; tegminal strut distinct, submembranous. Median lobe almost straight to strongly curved, with membranous or submembranous gonopore at apex.

Female genitalia (Fig. 815). Ovipositor almost membranous with coxites vestigial. Spermatheca small, round, membranous; accessory gland minute, weakly oval, membranous; sperm duct moderately long and slender.

Species examined. *A. apicicornis apicicornis* (Pic), *A. apicicornis fairmairei* Tomaszewska, *A. championi* (Gorham), *A. elongata* (Pic), *A. exsanguis exsanguis** (Gerstaecker), *A. exsanguis sanestebani* Tomaszewska, *A. flavida* (Pic), *A. intricata* (Gorham), *A. macromaculata* Tomaszewska, *A. macrospilota* Strohecker, *A. oberthuri* Tomaszewska, *A. peruviansis* Tomaszewska, *A. pictipennis* (Gorham), *A. unicolor* Tomaszewska, *A. variegata* (Gorham) – all known species.

Distribution. Neotropical Region.

Avencymon Strohecker

(Figs 28, 66, 115, 116, 191, 248, 290, 291, 364, 442–449, 625, 671, 672, 747, 748, 816, 855)

Avencymon Strohecker, 1971b: 38. Type species, by original designation: *Ancylopus concolor* Strohecker, 1951 (= *Encymon ruficephalus* Ohta, 1931).

Diagnosis. *Avencymon* is most similar to *Malindus* and *Ancylopus* in having the body long-oval and of moderate size. The labrum with median part of basal margin raised and triangularly produced anteriorly is also shared by these genera. The female pronotum with lateral sulci not being connected medially by arcuate ridge, the elytra without maculae, the labrum with sides produced antero-laterally into rounded lobes, and the intercoxal process of metaventrite more widely bordered and raised distinguish *Avencymon* from *Ancylopus* while the body colouration, and the pronotum with lateral edges weakly sinuate, anterior angles distinctly produced anteriorly, and lateral sulci long and deep separate it from *Malindus*.

Redescription. Length 5.10–6.40 mm. Body (Fig. 855) elongate, parallel, flattened, shiny, glabrous; densely and coarsely, confusedly punctured. Colour light brown to dark brown or dark reddish-brown with sides of meso- and metaventrite and sometimes sides of abdomen infuscate; head at least dorsally, antennae, legs in part infuscate or black; elytra sometimes black.

Head partially retracted in prothorax, weakly transverse, with weak, long concavities between eyes. Eyes large, transversely oval in outline, prominent, coarsely faceted. Occipital file finely ridged, somewhat trapezoidal in shape. Gular sutures weak, confluent medially and extending anteriorly as complete median line (reaching submentum). Antenna about as long as half of body length and rather slender (Fig. 28) with, narrow, weakly flattened club; scape about 3 × as long as pedicel and distinctly longer than antennomere 3; antennomere 3 as long as antennomeres 4 and 5 combined; antennomeres 4–5 subequal in length; antennomeres 6–7 equal in length, slightly shorter than preceding ones; antennomere 8 shorter than 7. Clypeus transverse, flat, widest at base, slightly convergent basally, thence parallel with apical margin somewhat pointed medially. Labrum (Fig. 66) sclerotized with membranous sides; strongly transverse, coarsely punctured, covered with moderately long setae and with tufts of long setae on sides; anterior edge emarginate medially; base with distinct triangular, raised edge medially; tormae elongate, with mesal arms recurved posteriorly; labral rods very slender, widely divergent anteriorly. Mandible (Figs 115, 116) with apex little produced and feebly notched; mola rather large, finely ridged; prostheca narrow, membranous, covered with moderately dense and fine setae; submola small, densely setose, membranous. Maxilla (Fig. 191) with terminal palpomere elongate (about 1.5 × as long as palpomere 3),

cylindrical, truncate apically; galea large, broadly triangular, densely setose at apex; lacinia moderately short and narrow, tapering, fringed with stiff setae on its inner edge and with two long spines below them; digitus absent. Labium (Fig. 248) with palpi close together; palpomere 2 and 3 strongly transverse. Mentum transverse, widest in middle of its length, with raised, curved ridge transversely; covered with short, sparse setae. Prementum short, moderately sclerotized, emarginate at apex; ligula produced into short, lateral lobes.

Prothorax transverse, widest near middle length. Pronotum (Fig. 290) rather finely punctured; narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, lateral sulci linear, subparallel, moderately deep and long; anterior angles produced, blunt; posterior angles almost right-angled; lateral margins feebly sinuate; pronotal disc weakly convex. Prosternum with small pit in front of each procoxal cavity; prosternal process (Fig. 291) very narrow, not extending beyond front coxae; coxae prominent, circular in outline (Fig. 442), almost contiguous; their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, sparsely punctured at base, somewhat truncate at apex. Mesoventrite (Fig. 364) with pair of rather deep pits near anterior margin; intercoxal process elongate and narrow, sinuate posteriorly, with weakly raised, arcuate ridge anteriorly; rather narrowly separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 443), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra parallel-sided from humeri toward apical fourth, thence narrowing abruptly towards apex; blunt or weakly acute at apices; moderately convex with punctures dense, coarse and irregular; humeri weakly prominent; female elytra generally more elongate at apex; lateral margins visible throughout; epipleuron rather narrow, incomplete. Metaventrite (Fig. 364) large, transverse, weakly convex, scarcely narrowing towards its anterior margin; intercoxal process moderately widely bordered and raised, provided with three pairs of postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with single anal vein and one anal cell; medial fleck moderately large, oval, at least partially divided.

Legs (Figs 442–449) long and comparatively slender; trochanterofemoral attachment heteromeroid. Femur widest near half length, hardly setose but ventral surfaces of fore and middle tibiae bear rows of obliquely directed short spines; tibia and tarsus rather densely setose; tibia weakly widening towards tarsus; tarsi with terminal tarsomere very long, 5–6 times longer than tarsomere 3. Claws with a few distinct teeth (Fig. 449).

Empodium bisetose. In males sexual characters present in all legs – fore and middle tibiae weakly enlarged apically, incurved and finely toothed along apical half (Figs 444, 446); hind tibiae (Fig. 448) somewhat enlarged at apex and produced into flattened laterally lobe; fore and middle trochanters with small tubercles (Figs 442, 443); hind femora with fringe of very long, erect setae on inner edge (Fig. 447).

Abdomen with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined, with anterior margin of intercoxal process at least weakly emarginate; ventrites 2–4 subequal in length or 2 slightly longer than 3 or 4. Ventrite 5 modified at apex in both sexes – excised in males, truncate or weakly emarginate in female. Male abdominal segment 8 (Fig. 625) with sternite narrow, somewhat W-shaped; tergite widely rounded apically with large, membranous, basal plate, emarginate medially. Male genital segment (Figs 671, 672) with sternite emarginate at apex and paired apophyses fused along at least $\frac{2}{3}$ of their length; dorsal plate not divided, but with membranous median part.

Aedeagus (Figs 747, 748) stout, moderately long, heavily sclerotized, weakly curved. Median lobe with single, apical branch. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Figs 816) fused with abdominal segment 8. Ovipositor sclerotized, with coxites entirely fused; styli absent. Spermatheca small, oval, membranous; sperm duct long, slender; accessory gland minute, elongate-oval, membranous, with ventro-apical outlet of common oviduct, and dorso-apical outlet of sperm duct.

Species examined. *A. bicolor* Tomaszewska, *A. ruficephalus** (Ohta) – all known species.

Distribution. Widely distributed in the Oriental Region: China, Taiwan, Philippines, Indonesia (Celebes Is., Sumba Is., Java and Sumatra, Seram Is.).

Beccariola Arrow

(Figs 8, 29, 67, 117, 118, 193, 194, 251, 308, 309, 365, 450–454, 628, 675, 676, 751, 752, 817, 856, 857)

Beccaria Gorham, 1885: 521 (nec *Beccaria* Trinchese, 1870). Type species, by monotypy: *Beccaria papuensis* Gorham, 1885.

Beccariola Arrow, 1943: 129. Replacement name for *Beccaria* Gorham, 1885.

Diagnosis. The general body appearance of *Beccariola* resembles *Cymbachus* and *Acinaces*. The body almost rounded in outline (in most species) and the pronotum with extremely reduced stridulatory membrane (visible only on cleared specimens) (Fig. 8) can separate *Beccariola* from both these genera. Moreover the terminal labial palpomere about as long as wide, the prosternal process excised apically with subacute lateral lobes (forked) and the intercoxal process of mesoventrite strongly transverse, separates easily *Beccariola* from

Acinaces, and the antennal club narrower and less flattened, the mandible with apical and subapical teeth, the pronotum without basal sulcus, the legs devoid of sexually dimorphic features, the abdominal tergite 8 simple at apex and differently shaped antennal club, separate *Beccariola* from *Cymbachus*.

Redescription. Length 4.4–6.0 mm. Body (Figs 856, 857) short-oval, or almost circular in outline, strongly convex, subhemispherical; surface smooth and shiny; finely and confusedly punctured; colour black, with yellow or orange maculae on the elytra or yellow, or yellowish-brown with black maculae or at least black elytral margins.

Head deeply retracted in prothorax, almost circular in outline. Gular sutures poorly marked, confluent medially; median line indistinct or sometimes slender and long. Eyes large, narrowly transverse, prominent, and coarsely faceted. Occipital file comparatively large, wide basally and strongly narrowing anteriorly. Antenna slightly shorter than a half of body length, (Fig. 29) with 3-segmented, narrow, loose, flattened club; antennomeres 9 and 10 with disto-medial angle acutely produced, especially in males; scape less than twice as long as pedicel; antennomere 3 almost as long as pedicel, or sometimes distinctly longer; antennomeres 4–8 subequal in length. Fronto-clypeal suture straight. Clypeus transverse, flat, weakly narrower at apex than at base. Labrum (Fig. 67) strongly transverse, covered with short setae, anterior edge truncate medially; tormae elongate, with mesal arms straight or recurved posteriorly; labral rods absent. Mandible (Figs 117, 118) strongly concave ventrally, convex dorsally; with one apical tooth and small subapical tooth; mola transversely ridged; prosthema large, covered with short setae; submola small, setose, membranous. Maxilla (Fig. 193) with terminal palpomere elongate, cylindrical, tapering, truncate at apex. Galea strongly enlarged toward its apex, densely setose apically, weakly recurved towards lacinia. Lacinia (Fig. 194) short and narrow, with long, apical and subapical stiff setae on inner edge and three long spines below them. Labium (Fig. 251) with palpi placed close together at base; palpomere 1 very small; palpomere 2 large, strongly transverse; terminal palpomere ovate. Mentum transverse; punctured, covered with long setae. Prementum transverse, sclerotized, punctured at apex; ligula densely setose at apex, strongly lobed at sides.

Prothorax strongly transverse, widest at base. Pronotum (Fig. 308) hardly bordered laterally and anteriorly; anterior margin with reduced, extremely small stridulatory membrane (Fig. 8) (visible on cleared specimens, on high magnification); basal sulcus absent, lateral sulci shallow and short; basal margin weakly 3-sinuate. Anterior angles weakly produced, blunt; posterior angles acute. Pronotal disc weakly convex. Prosternal process (Fig. 309) short and comparatively broad, excised apically (to receive anterior part of pentagonal intercoxal process of mesov-

entrite), not produced beyond coxae. Procoxa circular in outline (Fig. 450); its cavity externally open, internally widely closed, trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum rather small, transverse, widely rounded apically. Mesoventrite (Fig. 365) sometimes with pair of very shallow pits near anterior margin; with intercoxal process transversely pentagonal, broadly separating mesocoxae, not extending beyond them. Mesocoxa circular in outline (Fig. 451), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with two small, lateral internal knobs. Elytron oval, strongly convex, with punctures fine and irregular, (sometimes with rows of micropunctures); lateral margins moderately widely flattened; epipleuron broad apically, gradually narrowing towards elytral apex, complete or sometimes incomplete short distance before apex. Metaventrite (Fig. 365) transverse, weakly narrowing towards its anterior margin, with long discrimen and with two pairs of postcoxal pits; intercoxal process weakly bordered, almost flat. Metacoxae transverse, widely separated. Metendosternite with long stalk and widely separated anterior arms. Hind wing with one anal vein and two anal cells; Mp-CuA cross vein incomplete near MP; medial fleck moderately large, elongate, divided.

Legs (Figs 450–454) simple in both sexes. Trochanterofemoral attachment subheteromeroid. Femur widest near middle of its length, more than twice as wide as tibia, hardly setose; tibia and tarsus more densely setose than femur; tibia weakly widening towards tarsus. Tarsi with tarsomere 3 about four times shorter than tarsomere 4. Claws simple. Empodium distinct, bisetose.

Abdomen with five freely articulated ventrites; anterior margin of intercoxal process very weakly emarginate; ventrite 5 simple in both sexes, ventrite 1 as long as three following combined; often with femoral lines and sometimes with small postcoxal pits; ventrites 3–5 subequal in length. Male segment 8 (Fig. 628) with sternite narrow, gently, widely rounded at apex and tergite without basal lobes. Male genital segment (Figs 675, 676) with sternite weakly emarginate apically and single, long apophysis; dorsal plate divided and connected widely by membrane.

Aedeagus (Figs 751, 752) stout, moderately long, strongly sclerotized, curved. Tegmen placed at base of median lobe, small, ring-shaped; parameres fused; tegminal strut absent.

Female genitalia (Fig. 817). Ovipositor moderately sclerotized, with sternite 8 reduced to two lateral plates connected by membrane and at least medially fused with coxites; styli absent. Spermatheca large, long-oval, membranous; sperm duct comparatively long, slender; accessory gland small, oval, membranous. Bursa copulatrix moderately large with apical outlet of sperm duct and ventro-apical outlet of common oviduct.

Species examined. *B. celebensis* Tomaszewska, *B. elongata* Tomaszewska, *B. orca* Heller, *B. pallida* (Arrow), *B.*

*papuensis** (Gorham), *B. selene* Strohecker, *B. sikkimensis* Tomaszewska, *B. wallacei* (Gorham) – 8 of 31 known species.

Distribution. Widely distributed in the Oriental Region and one species is known from Madagascar.

Brachytrycherus Arrow

(Figs 6, 30, 68, 119, 120, 195, 196, 261, 300, 301, 366, 455–461, 629, 677, 678, 753, 754, 818, 858)

Brachytrycherus Arrow, 1920b: 12. Type species, by original designation: *Brachytrycherus perotteti* Arrow, 1920b.

Diagnosis. The species of *Brachytrycherus* resemble those of *Ohtaius* and *Gerstaeckerus* in having the body black or blackish-brown with elytra decorated most often with orange or yellow, transverse bands. These genera share also the mandible with chisel-shaped apex. The body less elongate, the head with well developed gular sutures and the intercoxal process of mesoventrite parallel sided, separate easily *Brachytrycherus* from both these genera. Moreover the maxillary lacinia provided with tuft of S-like setae at apex and a row of long, stout spines, subequal in length on inner-dorsal edge can distinguish *Brachytrycherus* from *Gerstaeckerus* while the femora lacking fringe of long hairs on inner surface distinguish it from *Ohtaius*.

Redescription. Length 6.0–7.5 mm. Body (Fig. 858) short-oval, moderately convex, shiny, glabrous or minutely pubescent; finely or moderately coarsely, confusedly punctured with interspaces finely reticulate. Colour dark brown to black with orange or yellow markings on elytra.

Head (Fig. 6) rather deeply retracted in prothorax, weakly transverse, with two, weakly elongate, shallow concavities between eyes. Eyes moderately large, narrowly transverse, weakly prominent, moderately coarsely and rather loosely faceted. Occipital file narrow, finely ridged. Gular sutures well developed, widely separated, convergent anteriorly (Fig. 6). Antenna long and rather slender (Fig. 30) with 3-segmented, narrow, loose, moderately flattened club; scape about twice as long as pedicel and slightly longer than antennomere 3; antennomere 3 about 1.3 × as long as antennomere 4 or 5; antennomeres 6–8 subequal in length, slightly shorter than preceding antennomeres. Clypeus strongly transverse, flat, widest at base, weakly narrowing towards basal third, thence parallel with apical margin straight. Labrum (Fig. 68) sclerotized without membranous apex; strongly transverse, moderately densely punctured posteriorly and almost without punctures anteriorly, covered with rather short setae; anterior margin weakly truncate; tormae elongate, with mesal arms recurved posteriorly; labral rods slender, long, divergent anteriorly. Mandible (Figs 119, 120) comparatively weakly concave ventrally; with large, chisel-shaped apical tooth and moderately

large subapical tooth; mola large, well-developed, finely ridged; prostheca large, membranous, moderately densely and shortly setose; submola very small, membranous, setose. Maxilla (Fig. 195) with terminal palpomere elongate, tapering anteriorly, rounded at apex, about $2.0 \times$ as long as palpomere 3; galea moderately large, long-oval, bluntly rounded and densely setose apically; lacinia (Fig. 196) almost as large as galea (long and wide) not tapering, bluntly rounded at apex, with tuft of S-shaped, apical spines, row of moderately long setae on its inner-ventral edge and row of long spines on inner-dorsal edge; digitus absent. Labium (Fig. 261) with palpi moderately close together; palpomeres 2 and 3 transverse with terminal palpomere truncate apically. Mentum transverse, with weak arcuate ridge transversely, widest near basal third, covered with short, sparse, suberect setae. Prementum rather short, moderately sclerotized with ligula submembranous, weakly expanded at sides.

Prothorax strongly transverse, widest near anterior third. Pronotum (Fig. 300) rather narrowly bordered laterally and anteriorly; anterior edge with moderately large and weakly prominent stridulatory membrane; base distinctly margined; basal sulcus distinct, straight, lateral sulci linear, subparallel, moderately deep and rather short; anterior angles produced, blunt or weakly acute, posterior angles weakly acute; pronotal disc comparatively convex, sometimes longitudinally channelled posteriorly. Prosternum without pits in front of procoxal cavities; prosternal process moderately widely separates front coxae, minutely cleft apically and bituberculate or forming rounded knob with longitudinal tubercle (Fig. 301), extending shortly beyond coxae; front coxae prominent, circular in outline (Fig. 455); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, strongly transverse, rather sparsely punctured, widely rounded apically, weakly angulate near basal third. Mesoventrite (Fig. 366) with a pair of distinct, rather deep pits near anterior margin and with transverse, declivent area in front of each coxa; intercoxal process strongly transverse, bordered anteriorly by weakly arcuate ridge, sinuate posteriorly, with lateral edges weakly raised; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 456), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra with anterior edge thickened and raised; convex with humeri weakly prominent; blunt or rounded at apices; lateral margins narrowly flattened, visible from base to about apical fourth; epipleuron comparatively wide, complete or incomplete at apex. Metaventrite (Fig. 366) about $3 \times$ as wide as long, weakly convex and concave along discrimen, narrowing anteriorly; anterior margin (especially of intercoxal process) comparatively widely bordered and raised between coxae; provided with three pairs of

postcoxal pits; discrimen extending along $\frac{2}{3}$ length of metaventrite. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing strongly reduced – very narrow and shorter than elytra.

Legs (Figs 455–461) long and comparatively slender; trochanterofemoral attachment heteromeroid. Femur somewhat clavate, moderately densely setose apically and with rows of obliquely directed short spines on ventral surfaces of fore and mid femora; tibia and tarsus rather densely setose; tibia weakly widening towards tarsus; terminal tarsomere about 8–9 times longer than tarsomere 3, comparatively stout. Claws simple, hollowed along inner edge; empodium small with two short setae. Male tibiae with very distinctly marked sexual characters – small teeth and/or different degrees of curvature (Figs 457–459); male trochanters may bear small tubercles (Figs 455, 456).

Abdomen with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined, sometimes with shallow, elongate postcoxal pits, with anterior margin of intercoxal process weakly emarginate; ventrites 2–4 gradually, slightly shorter. Male ventrite 5 widely rounded apically. Male abdominal segment 8 (Fig. 629) with sternite very narrow, with apical edge truncate or weakly emarginate medially; tergite widely rounded at apex with two moderately large, membranous, lateral plates at base. Male genital segment (Figs 677, 678) with sternite sinuate apically and paired apophyses fused at least along $\frac{1}{3}$ of their length; dorsal plate undivided; additional, internal, arcuate sclerite present.

Aedeagus (Figs 753, 754) stout, moderately long, heavily sclerotized, without basal curvature. Median lobe branched out apically. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut very short.

Female genitalia (Fig. 818) fused with abdominal sternite 8, which is divided in two lateral, sclerotized parts, connected medially by membrane. Ovipositor moderately sclerotized, with coxites entirely fused, sinuate at apex; styli present, small, terminal. Spermatheca and accessory gland very large, membranous; sperm duct moderately long, slender. Bursa copulatrix comparatively large with lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *B. madurensis* Arrow, *B. perotteti** Arrow – 2 of 6 known species.

Distribution. Oriental Region (India, Laos, Thailand).

Cacodaemon Thomson

(Figs 10, 11, 31, 69, 121–124, 197, 198, 256, 296, 297, 367, 462–465, 632, 679, 680, 755, 756, 819, 859–861)

Cacodaemon Thomson, 1857: 153. Type species, by subsequent designation of Strohecker (1964: 345): *Eumorphus satanas* Thomson, 1856.

Diagnosis. The species of *Cacodaemon* are most similar to those of *Amphisternus*, *Amphistethus*, *Spathomeles* and *Stictomela* in having the elytra provided with high tubercles and/or spines. Among them, *Cacodaemon* appears to be closely related to *Amphisternus* in having the ovipositor with base of spermatheca provided with large, at least weakly sclerotized, nodulus-like structure, and the mandibles with apices strongly asymmetrical. Both features shared with *Amphisternus* separate *Cacodaemon* from *Amphistethus*, *Spathomeles* and *Stictomela*. Moreover the intercoxal process of mesoventrite with sides subparallel and the intercoxal process of metaventrite not margined anteriorly but convex, the different structures of maxillary lacinia, lacking S-like, apical setae and the elytra provided almost always with long and sharp spines can distinguish *Cacodaemon* from all mentioned genera.

Redescription. Length 7.0–11.0 mm. Body (Figs 859–861) elongate-oval to short-oval, strongly convex, shiny or opaque, glabrous; coarsely, sparsely to densely, confusedly punctured with interspaces reticulate. Colour brownish-black or most often black; elytra with long spines and/or tubercles, humeri carinate often with spines, elytral tubercles black or red.

Head rather deeply retracted in prothorax, almost as long as wide, with two, long, shallow concavities between eyes. Eyes comparatively small, narrow and transverse, moderately prominent, coarsely faceted. Occipital file moderately large, finely ridged, triangular in shape. Gular sutures poorly marked, strongly convergent anteriorly, fused medially at base; median line absent. Antenna long and comparatively slender (Fig. 31) with 3-segmented, narrow, weakly flattened and loose club; antennomere 3–8 longer than wide; scape almost 3 × as long as pedicel and as long as antennomere 3; antennomere 3 about 4 × longer than scape and 1.5–2.0 × as long as antennomere 4; antennomeres 4–8 gradually scarcely shorter or sometimes antennomere 4 may be longer than 5. Clypeus strongly transverse, flat, widest at base, weakly narrowing towards basal third, thence parallel with apical margin weakly arcuate. Labrum (Fig. 69) sclerotized with membranous apex; strongly transverse, moderately densely punctured, covered with short, sparse setae and with tufts of long setae on sides of anterior margin; anterior edge of membranous part sinuate or emarginate and of sclerotized part emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 121–124) with asymmetrical apex – right mandible bifid at apex (with two large, apical teeth); left mandible with strong, narrowly chisel-shaped apical tooth and one, moderately large subapical tooth; mola large, well-developed, finely ridged; prostheca large, membranous, moderately densely setose; submola rather small, setose, membranous. Maxilla (Fig. 197) with terminal palpomere elongate, subcylindrical, flattened laterally from half length towards apex, blunt apically, less than 1.5 × longer than

palpomere 3; galea large, widely triangular, densely setose apically; lacinia (Fig. 198) much shorter than galea, narrow, tapering, bluntly rounded at apex, with a few, apical spines, row of moderately fine setae on its inner-ventral edge, row of long spines on inner-dorsal edge and 2 or 3 longest, mesal spines below; digitus absent. Labium (Fig. 256) with palpi close together; palpomeres 2 and 3 strongly transverse with terminal palpomere truncate apically. Mentum transverse, flat, widest near basal third, covered with few, short setae. Prementum short, moderately sclerotized with ligula produced at sides.

Prothorax transverse, widest anteriorly. Pronotum (Fig. 296) narrowly bordered laterally; anterior edge with small or moderately large stridulatory membrane; basal sulcus moderately deep, most often at least weakly sinuate in mid length; lateral sulci short, subparallel, weakly arcuate; anterior angles produced into long acute spines, posterior angles weakly acute or right-angled; pronotal disc moderately convex but of uneven surface; punctures extremely fine with interspaces reticulate. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 297) widely separates front coxae, deeply cleft apically, extending distinctly beyond coxae; front coxae prominent, circular in outline (Fig. 462); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, strongly transverse, rather sparsely punctured, somewhat heart-shaped and pointed at apex. Mesoventrite (Fig. 367) with a pair of small and shallow pits near anterior margin and with transverse, declivent area in front of each coxa; intercoxal process transverse, bordered anteriorly by weakly arcuate ridge and weakly sinuate posteriorly, lateral edges raised; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra (Figs 10, 11) with basal margins moderately widely thickened and raised; convex, covered with tubercles and/or spines; humeri carinate, most often with spines; punctures coarse or very coarse and deep, moderately dense with interspaces reticulate; lateral margins narrowly flattened; most often produced into tubercle or spine at apices; epipleuron comparatively wide, complete. Metaventrite (Fig. 367) more than twice as wide as long, provided with three pairs of postcoxal pits; weakly convex, scarcely narrowing anteriorly; anterior margin moderately wide and raised, but intercoxal process not bordered, but in form of convex, triangular or oval area, defined posteriorly by shallow concavities; discrimen complete or almost so. Metacoxae transverse, widely separated. Metendosternite with short stalk and very widely separated anterior arms and tendons. Hind wing with different degree of reduction or well developed

– then with one anal vein and two anal cells; medial fleck moderately large, elongate, partially undivided.

Legs (Figs 462–465) long and rather slender, hardly setose; trochanterofemoral attachment heteromeroid. Femur clubbed, very slender at base; sometimes glabrous, if setose then at least fore femora provided with rows of obliquely directed short spines on ventral surface; tibia very weakly widening towards tarsus; terminal tarsomere very long and comparatively stout, about 10 times longer than tarsomere 3. Claws simple, hollowed along inner edge (Fig. 465); empodium distinct with two short setae. In males fore tibiae often with distinct tooth near apex (Fig. 463), and fore trochanters sometimes rectangular.

Abdomen with five freely articulated ventrites. Ventrite 1 as long as 2.5 following ventrites combined, with anterior margin of intercoxal process comparatively wide and weakly emarginate; ventrites 2–3 subequal in length. Male ventrite 5 simple or modified – truncate or excised at apex. Male abdominal segment 8 (Fig. 632) with sternite very narrow, emarginate or somewhat truncate at apex; tergite arcuate apically with two small, lateral, submembranous plates at base. Male genital segment (Figs 679, 680) with sternite more or less emarginate at apex and paired apophyses fused along at least $\frac{1}{3}$ of their length; dorsal plate not divided; additional internal, arcuate sclerite present.

Aedeagus (Figs 755, 756) stout, moderately long, heavily sclerotized, strongly curved near apex. Median lobe branched out apically. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut short but distinct.

Female genitalia (Fig. 819) fused with abdominal sternite 8. Ovipositor sclerotized, with coxites entirely fused, sometimes with sinuate apex; styli present, rather small, terminal. Sternite 8 divided in two lateral, sclerotized plates and fused with coxites. Spermatheca large, elongate-oval, membranous with weakly sclerotized, large, nodulus-like structure between sperm duct and spermatheca; sperm duct short, slender; accessory gland elongate, membranous. Bursa copulatrix moderately large, narrow with lateral outlet of common oviduct and apical outlet of sperm duct, which is provided with small sclerite.

Species examined. *C. aculeatus* (Gerstaecker), *C. bellicosus* (Gerstaecker), *C. borneensis* (Fridvaldszky), *C. inaequalis* (Germar), *C. proavus* Strohecker, *C. satanas** (Thomson), *C. spinicollis* (Gerstaecker) – 7 of 24 known species.

Distribution. Widely distributed in the Oriental Region.

Callimodapsa Strohecker

(Figs 15, 32, 70, 125, 126, 199, 200, 257, 302, 303, 368, 466–471, 636, 681, 682, 757, 758, 820, 862, 863)

Callimodapsa Strohecker, 1974: 535. Type species, by original designation: *Endomychus bivittatus* Percheron, 1837.

Diagnosis. *Callimodapsa* is most similar to *Indalmus* in many aspects including body size and shape, colouration, the structures of mouthparts and sterna. *Callimodapsa* however differs from *Indalmus* in having the body less convex, covered with coarse reticulate microsculpture along with distinct puncturation, or sometimes punctures are very fine, and by the antennae and legs shorter and stouter.

Redescription. Length 4.9–7.0 mm. Body (Figs 862, 863) elongate, weakly convex, shiny, minutely pubescent to almost glabrous; confusedly punctured with interspaces densely reticulate. Colour light brown to dark brown or black; brown forms often have black, elongate stripes on the elytra.

Head moderately deeply retracted in prothorax, weakly transverse. Eyes large, oval in outline, prominent, coarsely faceted. Occipital file large, weakly trapezoidal in shape. Gular sutures poorly marked, confluent medially at base and extending as short median line. Antenna (Fig. 32) slightly shorter than half of body length, rather stout, with 3-segmented, narrow and weakly flattened, loose club; scape about twice as long as pedicel; antennomere 3 at least 1.5 × as long as antennomere 4; antennomeres 4–8 subequal in length, quadrate or transverse; terminal antennomere longer than wide. Clypeus transverse, flat, widest at base, slightly convergent basally, thence parallel. Labrum (Fig. 70) sclerotized with membranous apex; strongly transverse, moderately densely punctured, covered with short, sparse setae and with tufts of moderately long setae on sides of anterior margin; anterior edge of membranous part truncate and of sclerotized part weakly emarginate medially; base with distinct triangular, raised edge medially; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 125, 126) moderately broad, concave ventrally, convex dorsally; with sharp apical tooth and small, blunt subapical tooth; mola moderately large, finely ridged; prostheca narrow, membranous, minutely setose; submola small, setose, membranous. Maxilla (Fig. 199) with terminal palpomere elongate (about 1.5 × as long as palpomere 3), subcylindrical, blunt at apex; galea elongate and moderately broad, obliquely truncate at apex, densely setose; lacinia (Fig. 200) short and narrow, tapering, fringed with stiff setae on its inner edge and two long spines below them; digitus very small. Labium (Fig. 257) with palpi close together; palpomeres 2 and 3 strongly transverse with terminal palpomere truncate apically. Mentum transverse, widest near middle length, with raised, strongly curved ridge transversely; covered with sparse, rather long setae. Prementum very short, moderately sclerotized with ligula expanded laterally.

Prothorax strongly transverse, widest near anterior third or at base. Pronotum (Fig. 302) coarsely and moderately densely punctured; moderately widely bordered laterally and anteriorly; lateral edges simple or scarcely sinuate; anterior edge with conspicuous stridulatory

membrane; basal sulcus deep, lateral sulci linear, subparallel, deep and long; anterior angles distinctly produced forwards, blunt or weakly acute; posterior angles right-angled; pronotal disc slightly convex. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 303) narrow, rounded apically, extending almost to hind margin of procoxae and separating them distinctly; coxae prominent, circular in outline (Fig. 466); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, with sides weakly angulate near base, rounded at apex. Mesoventrite (Fig. 368) with raised ridges; provided with a pair of pits near anterior margin; intercoxal process elongate and moderately widely separating mesocoxae; extending to about half length of coxae; weakly arcuate anteriorly and emarginate posteriorly, with weakly raised borders. Mesocoxa circular in outline (Fig. 468), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knob. Elytra subparallel, widest near apical third, elongate, moderately convex, blunt at apices with humeri scarcely prominent; punctures rather dense, moderately coarse and shallow, sometimes very fine; reticulate microsculpture very distinct and dense, epipleuron moderately wide, complete or almost so; lateral margins rather widely flattened, visible from above almost throughout. Metaventrite (Fig. 368) large, transverse, weakly concave along discrimen and convex on sides of discrimen; narrowing towards anterior margin; intercoxal process widely bordered and raised, provided with three pairs of postcoxal pits, in males sometimes also with small tubercles near hind coxae; discrimen almost complete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing (Fig. 15) with two anal veins and two anal cells; medial fleck moderately large, long-oval, undivided.

Legs (Figs 466–471) with trochanterofemoral attachment heteromeroid. Femur widest near half length, less than twice as wide as tibia, moderately densely setose; with rows of more or less distinct, obliquely directed short spines on ventral surfaces of fore and mid femora; tibia and tarsus more densely setose than femur; tibia widening towards tarsus. Tarsi with tarsomere 3 about five times shorter than tarsomere 4. Claws simple; empodium with two short setae. In males sexual characters may be found in all tibiae (Figs 467, 469).

Abdomen with five freely articulated ventrites. Ventrite 1 as long as three following ventrites combined, with anterior margin of intercoxal process simple; ventrites 2–4 equal in length. In male, ventrite 5 truncate or excised at apex. Male abdominal segment 8 (Fig. 636) with sternite very narrow, somewhat W-shaped, emarginate at apex; tergite rounded apically with submem-

branous, lateral lobes at base. Male genital segment (Figs 681, 682) with sternite sinuate or emarginate at apex; paired apophyses fused along $\frac{1}{2}$ of their length; dorsal plate undivided.

Aedeagus (Figs 757, 758) stout, moderately long, strongly sclerotized, very weakly curved. Median lobe branched out apically. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 820) fused with abdominal segment 8. Ovipositor sclerotized, with coxites entirely fused; sternite 8 sclerotized laterally and membranous in middle, fused with coxites; styli present, small, terminal. Spermatheca small, long-oval, membranous; sperm duct rather long, slender; accessory gland very small, elongate, membranous. Bursa copulatrix moderately large, narrow with outlet of common oviduct on lateral left side of body and outlet of sperm duct at apex.

Species examined. *C. afra* Strohecker, *C. nigrofusca* (Gorham), *C. obscura* Strohecker, *C. rufocincta* Strohecker – 4 of 16 known species.

Distribution. Africa.

Chetryrus Viliers

(Figs 1, 2, 33, 77, 127, 128, 201, 202, 258, 304, 305, 369, 472–476, 637, 683, 684, 759, 760, 821, 864)

Chetryrus Viliers, 1953: 1465. Type species, by original designation: *Trycherus raffrayi* Gorham, 1885.

Diagnosis. *Chetryrus* is most similar to *Trycherus* and *Microtrycherus* by general body appearance and the colouration. These genera appear to be closely related by having the spermatheca lacking the accessory gland. *Chetryrus* however can be distinguished from *Microtrycherus* and *Trycherus* by having the lateral margins of the pronotum widely bordered and coarsely punctured, and the antenna comparatively stout.

Redescription. Length 5.9–8.5 mm. Body (Fig. 864) long-oval, moderately convex, shiny, glabrous or minutely setose; confusedly punctured. Colour dark brown to black always with contrasting (yellow or orange) markings on the elytra; pronotum often bicoloured with disc dark and sides lighter.

Head (Figs 1, 2) partially retracted in prothorax, weakly transverse. Eyes large, oval in outline, prominent, coarsely faceted. Gular sutures poorly marked, strongly convergent and fused medially at base, extending shortly as median line (Fig. 2). Occipital file small, oval, comparatively coarsely ridged. Antenna moderately long (slightly shorter than a half of body length) and rather stout (Fig. 33), with 3-segmented, narrow and scarcely flattened, loose club; antennomeres 2 and 4–8 at least slightly wider than long; scape almost as long as pedicel and antennomere 3 combined, antennomere 3 about 1.5

× longer than antennomere 4; antennomeres 4–7 gradually slightly shorter; terminal antennomere elongate-oval. Clypeus transverse, flat, widest at base, slightly convergent from base toward half length, thence parallel. Labrum (Fig. 77) strongly transverse, sclerotized with membranous apex, densely and rather coarsely punctured, covered with moderately long setae and with tufts of long setae on sides; anterior edge of membranous part somewhat truncate and of sclerotized part weakly sinuate; tormae elongate, with mesal arms recurved posteriorly; labral rods slender, divergent anteriorly. Mandible (Figs 127, 128) moderately broad, strongly concave ventrally, convex dorsally with sharp, elongate ridge; with two sharp apical teeth and one blunt, subapical tooth; mola moderately large, finely ridged; prosthema rather narrow, membranous, finely setose; submola rather small, setose, membranous. Maxilla (Fig. 201) with terminal palpomere elongate (about 1.5 × longer than palpomere 3), cylindrical, blunt at apex; galea broadly triangular, moderately densely setose; lacinia (Fig. 202) short and narrow, weakly tapering, fringed with stiff, long setae on its inner-ventral edge, with row of spines on inner-dorsal edge and two very long spines below them; digitus absent. Labium (Fig. 258) with palpi close together; palpomere 2 strongly transverse and terminal palpomere transversely rectangular. Mentum transverse, widest near middle of its length, with raised, curved ridge transversely; covered with short setae in anterior part and densely reticulate posteriorly. Prementum very short, moderately sclerotized with ligula in form of large, lateral lobes.

Prothorax strongly transverse, widest at base, almost as wide basally as base of elytra. Pronotum (Fig. 304) coarsely and densely punctured; widely bordered laterally with margins raised and punctured; anterior edge narrowly bordered with minute stridulatory membrane; basal sulcus deep, lateral sulci linear, subparallel, moderately long and deep; anterior angles produced forwards, blunt; posterior angles right-angled or weakly acute; pronotal disc moderately convex. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 305) moderately wide, parallel-sided with edges weakly bordered, rounded apically, extending distinctly beyond procoxae and separating them distinctly; front coxae prominent, circular in outline (Fig. 472); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, with sides angulate near base, widely rounded or somewhat truncate at apex. Mesoventrite (Fig. 369) with a pair of pits near anterior margin; intercoxal process pentagonal, elongate, widely separating mesocoxae, angulate anteriorly and almost truncate posteriorly, with raised borders and weakly concave median area; extending to about half length of coxae. Mesocoxa circular in outline, its cavity

outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra elongate-oval, almost parallel-sided, convex, blunt at apices with punctures moderately coarse and dense; humeri weakly prominent; lateral margins narrowly flattened, visible from above almost throughout; epipleuron moderately wide, incomplete at apex. Metaventrite (Fig. 369) large, transverse, moderately convex, narrowing towards its anterior margin which is moderately widely bordered and raised, provided with three pairs of postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with two anal veins and one anal cell; medial fleck moderately large, oval, partially divided.

Legs (Figs 472–476) with trochanterofemoral attachment heteromeroid. Femur widest near half length, less than twice as wide as tibia, hardly to moderately densely setose, with rows of more or less distinct, obliquely directed short spines on ventral surfaces of fore and mid femora; tibia and tarsus densely setose; tibia widening towards tarsus; tarsi with tarsomere 3 about eight times shorter than tarsomere 4. Claws simple, hollowed along inner edge. Empodium distinct, bisetose. Sexual differences absent.

Abdomen with anterior margin of intercoxal process truncate or weakly emarginate; with five freely articulated ventrites. Ventrite 1 as long as three following ventrites combined; ventrites 2–3 equal in length, ventrite 4 slightly shorter. Ventrite 5 in both sexes weakly raised at apex looking like truncate. Male abdominal segment 8 with sternite moderately narrow, divided in two sclerotized, lateral parts connecting medially by very narrow membranous belt (Fig. 637), and tergite widely truncate at apex with small, lateral, submembranous plates at base. Male genital segment (Figs 683, 684) with sternite comparatively large, emarginate at apex; paired apophyses fused along ½ of their length; dorsal plate undivided.

Aedeagus (Figs 759, 760) moderately long and rather slender, sclerotized, strongly curved near base. Median lobe with membranous gonopore at apex, without apical branches. Tegmen placed basally, large, ring-shaped with parameres fused and tegminal strut comparatively long.

Female genitalia (Fig. 821) fused with abdominal sternite 8. Ovipositor elongate, sclerotized, with coxites entirely fused, somewhat truncate apically; styli absent. Spermatheca very large, membranous; sperm duct moderately long, slender; accessory gland absent. Bursa copulatrix moderately large, long and narrow with lateral outlet of common oviduct and apical outlet of sperm duct, provided with small sclerite.

Species examined. *Ch. diversifasciatus* (Pic), *Ch. raffrayi** (Gorham), *Ch. tricolor* (Gerstaecker) – 3 of 8 known species.

Distribution. Africa.

Cymbachus Gerstaecker

(Figs 34, 72, 129, 130, 293, 204, 252, 310, 311, 374, 477–481, 630, 685, 686, 761, 762, 822, 865)

Cymbachus Gerstaecker, 1857: 233. Type species, by monotypy: *Cymbachus pulchellus* Gerstaecker, 1857.

Diagnosis. This genus appears to be closely related to *Sinocymbachus* sharing numerous characters including labial and maxillary structures, the mandible with apex widely chisel-shaped, tergite 8 of both sexes with tuft of long setae at apex, and the aedeagus short with apical branches often as long as half length of median lobe. The body more oval, and the intercoxal process of mesoventrite distinctly pentagonal, almost flat, can separate *Cymbachus* from *Sinocymbachus*.

Redescription. Length 6.0–7.0 mm. Body (Fig. 865) broadly oval, highly convex, shiny, glabrous; punctures fine, moderately dense, confused. Prevailing body colour black with elytra decorated with yellow spots; sometimes elytra yellow with black markings.

Head partially retracted in prothorax, almost as long as wide, somewhat circular in outline, weakly concave between antennae. Gular sutures poorly marked, strongly convergent anteriorly, fused medially near base and extending anteriorly as long median line. Eyes strongly transverse, moderately large, prominent, and moderately coarsely faceted. Occipital file finely ridged, produced anteriorly, long-oval. Antenna about as long as half of body length, slender (Fig. 34) with 3-segmented, rather wide, flattened club; scape twice as long as pedicel; antennomere 3 less than twice as long as pedicel and about 1.2 × as long as antennomere 4; antennomere 4 distinctly longer than 5; antennomeres 5–8 subequal. Clypeus transverse, flat, widest at base, convergent along basal third, thence parallel, subtruncate at apex. Labrum (Fig. 72) large, transverse, sclerotized with membranous apex and sides; coarsely punctured and covered with long setae; anterior margin straight medially and rounded on sides (anterior margin of sclerotized part emarginate medially); tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 129, 130) broad, concave ventrally, convex dorsally; with apex produced into long, chisel-shaped tooth and with moderately large, subapical tooth; mola strongly sclerotized, with inner surface finely ridged; prostheca large, moderately narrow, membranous, covered densely with short setae; submola small, densely setose, membranous. Maxilla (Fig. 293) with 4-segmented palp; terminal palpomere elongate (almost twice as long as palpomere 3 and about 1.5 × as long as 2), weakly tapering towards apex, minutely truncate; galea elongate, weakly widening towards apex and blunt, densely setose; lacinia (Fig. 204) moderately long and narrow, tapering, fringed with stiff setae on its inner edge, with two or three long spines below them; short digitus or long apical spine present. Labium (Fig. 252) with palpi moderately widely

separated; palpomere 2 transverse; terminal palpomere long-oval, somewhat subcylindrical in shape, truncate apically. Mentum rectangularly transverse with angles rounded; covered with long setae. Prementum rather short, moderately sclerotized with ligula membranous, transverse, weakly produced laterally into short lobes at sides, scarcely rounded at apex.

Prothorax strongly transverse, widest at base and narrowing anteriorly. Pronotum (Fig. 310) very narrowly bordered laterally and anteriorly; base weakly trisinate; anterior edge with large stridulatory membrane; basal sulcus deep, lateral sulci moderately deep and rather short, weakly arcuate, anterior angles weakly produced forwards, acute; posterior angles weakly acute; pronotal disc moderately convex. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 311) moderately wide, not produced beyond coxae, v-excised at apex receiving front angle of pentagonal mesosternum; front coxae prominent, circular in outline (Fig. 477); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum moderately large, almost as long as wide, somewhat heart-shaped. Mesoventrite (Fig. 374) without pits; intercoxal process rather flat, pentagonal, about as long as wide; moderately widely separating mesocoxae; extending at least to half of their length. Mesocoxa circular in outline (Fig. 478), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near mid length or at basal third, short, highly convex, strongly rounded at sides, blunt apically with punctures dense, moderately coarse and irregular; epipleuron rather wide basally, narrowing towards apex, reaching apical fifth; humeri moderately prominent; lateral margins visible from above at least in apical half. Metaventrite (Fig. 374) large, transverse, weakly convex, narrowing towards its anterior margin which is rather narrowly bordered and weakly elevated, provided with a pair of small postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck moderately large, round-oval, undivided.

Legs (Figs 477–481) with trochanterofemoral attachment subheteromeroid. Femur slender and almost parallel-sided, hardly setose; with rows of obliquely directed short spines on ventral surfaces of fore and mid femora; tibia and tarsus densely setose; tibia slender, weakly widening towards tarsus. Tarsi with tarsomere 3 about six times shorter than tarsomere 4. Claws simple, hollowed along inner edge (Fig. 481). Empodium distinct bisetose. Male fore trochanters with characters of sexual dimorphism (e.g. distinct tubercles) (Fig. 477).

Abdomen with five freely articulated ventrites. Ventrite 1 with anterior margin of intercoxal process straight or

emarginate medially, longer than three following ventrites combined, in male sometimes weakly impressed medially and with a pair of median tubercles near hind margin; ventrites 2–4 subequal in length. Ventrite 5 in male truncate at apex, in female weakly pointed. Abdominal segment 8 (Fig. 630) similar in both sexes, with sternite very narrow but well sclerotized (in male scarcely emarginate at apex); tergite weakly pointed at apex with tuft of long setae medially (in male with additional, small, lateral membranous plates at base) (Fig. 630). Male genital segment (Figs 685, 686) with additional narrow, internal, arched sclerite; sternite weakly emarginate medially at apex and paired apophyses fused at least along their apical third; dorsal plate divided in two, lateral, sclerotized plates, connected medially by membrane.

Aedeagus (Figs 761, 762) moderately short and stout, strongly sclerotized, weakly curved. Median lobe branched out apically; flagellum with long, slender, submembranous gonopore. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 822). Ovipositor fused with abdominal sternite 8; coxites entirely fused, truncate at apex, with long apical setae. Spermatheca large, round-oval, membranous; accessory gland moderately large, oval, membranous; sperm duct long and slender. Bursa copulatrix moderately large with apical outlet of sperm duct and ventro-apical outlet of common oviduct.

Species examined. *C. elegans* Arrow, *C. pulchellus** Gerstaecker – 2 of 5 known species.

Distribution. Southeast Asia: Indonesia (Java), Burma, Laos, Thailand, India (Sikkim), South Korea.

Cymones Gorham

(Figs 35, 71, 131, 132, 205, 253, 306, 307, 370, 482–487, 631, 693, 694, 763, 764, 823, 866)

Cymones Gorham, 1886: 157. Type species, by subsequent designation of Strohecker (1953: 81): *Cymones cowani* Gorham, 1886 (= *Dioedes atroclavatus* Fairmaire, 1883).

Diagnosis. This genus resembles *Callimodapsa* in an overall body appearance including the elytra widest beyond mid length and the body coarsely reticulate. The body more convex, most often with extremely fine punctures, and lacking contrasting markings on the elytra can separate *Cymones* from *Callimodapsa*.

Redescription. Length 6.0–7.0 mm. Body (Fig. 866) long-oval, convex, shiny, glabrous; densely reticulate while punctures sparse and very fine. Colour yellow, brown, red or black without contrasting markings on the elytra.

Head partially retracted in prothorax, about as long as wide, almost circular in outline. Gular sutures poorly marked, confluent medially at base and extending anteriorly as short median line. Eyes moderately large, oval,

prominent, and coarsely faceted. Occipital file finely ridged, moderately large, long-oval. Antenna long and rather slender (Fig. 35) with, 3-segmented, narrow or moderately narrow, flattened club; scape almost 2.5 times as long as pedicel and subequal in length with antennomere 3; antennomeres 4–5 subequal and about 2 × shorter than antennomere 3; antennomeres 6–8 equal in length, slightly shorter than 4 or 5. Clypeus transverse, flat, widest at base, slightly convergent from base toward half length, thence parallel. Labrum (Fig. 71) sclerotized with membranous apex; anterior margin of membranous part truncate or sometimes sinuate, of sclerotized part emarginate; strongly transverse, coarsely punctured, covered with moderately long setae and with tufts of long setae on sides; basal margin with produced anteriorly triangular, raised edge medially; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 131, 132) broad, concave ventrally, convex dorsally with long pointed, apical tooth and slightly shorter subapical tooth, or sometimes look like two large apical teeth; mola large, well-developed, finely ridged; prostheca long and narrow, membranous, densely covered with short setae; submola small, setose, membranous. Maxilla (Fig. 205) with terminal palpomere longest (about 1.5 × longer than palpomere 3 and slightly longer than 2), cylindrical, blunt or weakly truncate at apex; galea broadly triangular, moderately densely setose; lacinia short and narrow, weakly tapering, fringed with moderately stiff setae on its inner edge and one or two long spines below them; digitus absent. Labium (Fig. 253) with palpi close together; palpomere 2 very short, strongly transverse and terminal palpomere transverse, rectangular to weakly oval, truncate at apex. Mentum transverse, with short, lateral lobes and arcuate, weakly raised anterior margin; covered with moderately long, sparse setae. Prementum short, moderately sclerotized; ligula with large, lateral lobes.

Prothorax transverse, widest at base. Pronotum (Fig. 306) narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; posterior margin weakly trisinate; basal sulcus deep, lateral sulci moderately long, linear and subparallel; anterior angles produced, subacute, hind angles right-angled or produced posteriorly and acute; lateral edges weakly sinuate with more or less distinct narrowing near basal third; pronotal disc weakly convex. Prosternum with a pair of small pits in front of procoxal cavities; prosternal process (Fig. 307) very narrow but separating front coxae, extending to their hind margin; front coxae prominent, circular in outline (Fig. 482); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum small, transverse, somewhat heart-shaped. Mesoventrite (Fig. 370) with a pair of pits near anterior margin, carinate, intercoxal process as long as wide,

arcuate anteriorly and sinuate posteriorly, with weakly raised borders; moderately widely separating mesocoxae; extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 483), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest beyond mid length, elongate, convex, blunt at apices with punctures very fine and sparse; humeral plates weakly prominent; epipleuron rather narrow, complete or almost so. Metaventricle (Fig. 370) large, strongly transverse, weakly convex, narrowing towards its anterior margin, provided with three pairs of postcoxal pits; discrimen long, almost complete; intercoxal process moderately widely bordered and distinctly raised. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing with two anal vein and two anal cells; medial fleck moderately large, almost rectangular, divided.

Legs (Figs 482–487). Trochanterofemoral attachment subheteromeroid. Femur long and somewhat clavate, slender at base, setose; fore and mid femora with short rows of obliquely directed spines on ventral surfaces; tibia and tarsus more densely setose than femur; tibia widening towards tarsus. Tarsi with terminal tarsomere about nine times longer than tarsomere 3. Claws simple or modified (Figs 486, 487). Empodium large, bisetose. In males sexual characters may be found in fore tibiae (stout tooth – Fig. 484) and mid tibiae (curvature and very small teeth).

Abdomen with five freely articulated ventrites. Ventrite 1 as long as three following ventrites combined with anterior margin of intercoxal process weakly emarginate medially; ventrites 2–4 subequal in length. Ventrite 5 may be modified in both sexes (excised or emarginate medially at apex). Male abdominal segment 8 (Fig. 631) with sternite very narrow and strongly emarginate medially, and tergite large, with membranous lobes at base. Male genital segment (Figs 693, 694) with sternite emarginate apically and paired apophyses fused along $\frac{1}{3}$ of their length; dorsal plate undivided.

Aedeagus (Figs 763, 764) stout, moderately long, strongly sclerotized, very weakly curved. Median lobe with two apical branches of different length or subequal. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut very short, but distinct.

Female genitalia (Fig. 823) compactly connected with segment 8 – tergite 8 sclerotized, and sternite 8 in from of two lateral plates fused with coxites. Ovipositor moderately sclerotized; coxites entirely fused; styli present, small. Spermatheca and accessory gland very small elongate, membranous; sperm duct long and slender. Bursa copulatrix large, elongate with ventro-apical outlet of common oviduct and apical outlet of sperm duct.

Species examined. *C. atroclavatus*⁺ (Faimraire), *C. tenuipes* Strohecker – 2 of 9 known species.

Distribution. Madagascar.

Dapsa Latreille

(Figs 36, 73, 133, 134, 206, 207, 260, 312, 313, 371, 488–494, 633, 691, 692, 767, 768, 824, 867, 868)

Dapsa Latreille, 1829: 159. Type species, by subsequent designation of Arrow (1925: 335): *Endomychus denticollis* Germar, 1817.

Phylira Mulsant, 1846: 23 (as subgenus). Type species, by monotypy: *Dapsa trimaculata* Motschulsky, 1835.

Diagnosis. An overall body appearance (e.g. body shape, colouration and the shape of pronotum) of *Dapsa* resembles *Archipines*. However the head with well developed, widely separated gular sutures, the terminal antennomere without membranous sensilla, the labium with terminal palpomere not being strongly transverse, the mandible with well developed apical tooth, the meso-metaventral junction with internal knob, and sterna with postcoxal pits can easily separate *Dapsa* from *Archipines*.

Redescription. Length 3.0–5.5 mm. Body (Figs 867, 868) elongate, moderately convex, shiny, and shortly pubescent; densely and coarsely, confusedly punctured. Colour yellow, brown or dark reddish-brown, most often with contrasting markings on the elytra (black or rarely lighter than background of elytra).

Head partially retracted in prothorax, almost as long as wide. Eyes moderately large, oval in outline, prominent, very coarsely faceted. Gular sutures well developed, widely separated, weakly convergent anteriorly. Occipital file large, oval, finely ridged. Antenna long and most often slender (Fig. 36) with 3-segmented, narrow and loose club; scape twice as long as pedicel; antennomere 3 $1.5 \times$ as long as pedicel or antennomere 4; antennomeres 4–7 subequal; antennomere 8 slightly smaller than 7 or 9. Clypeus transverse, flat, widest at base, slightly convergent from base toward half length, thence parallel. Labrum (Fig. 73) truncate apically or sometimes weakly emarginate; strongly transverse, sclerotized with membranous apex (at least at sides), moderately coarsely punctured, covered with long setae; tormae elongate, with mesal arms recurved posteriorly; labral rods very slender, divergent anteriorly. Mandible (Figs 133, 134) broad, concave ventrally, convex dorsally with long pointed, apical tooth and small subapical tooth (rarely left mandible with additional two very small sub-apical teeth); mola moderately large, well-developed, finely ridged; prostheca long and narrow, membranous, densely setose; submola small, setose, membranous. Maxilla (Fig. 206) with terminal palpomere longest (almost as long as palpomeres 2 and 3 combined), sub-cylindrical, rounded at apex; galea broadly triangular, moderately densely setose; lacinia (Fig. 207) short and narrow, tapering, provided with comb of stout setae on mesal edge, with row of slender spines on dorsal surface and two or three longest spines below them; digitus absent. Labium (Fig. 260) with palpi moderately close together; palpomere 2 weakly transverse and terminal

palpomere weakly elongate, rounded apically. Mentum transverse, almost rectangular in shape with weakly produced anterior angles, with weakly raised, curved ridge transversely or flat; covered with rather long setae. Prementum very short, moderately sclerotized with ligula formed by moderately large, lateral lobes.

Prothorax transverse, widest most often near apical third. Pronotum (Fig. 312) without lateral bordering; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, lateral sulci of different length, linear and subparallel or somewhat triangular, moderately deep; shape of pronotum variable, but generally with prominent, very acute angles; lateral edges often denticulate or at least sinuate; pronotal disc slightly convex. Prosternum with pair of pits in front of procoxal cavities; prosternal process (Fig. 313) very narrow, extending to hind margin of coxae, which are contiguous and prominent, circular in outline (Fig. 488); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum small, strongly transverse, widely rounded apically. Mesoventrite (Fig. 371) with a pair of pits near anterior margin, carinate; intercoxal process elongate, with elongate carina, bifurcate near apex; narrowly separating mesocoxae; extending beyond half of their length. Mesocoxa circular in outline (Fig. 492), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knob. Elytra widest near about basal third, elongate, convex, blunt at apices with punctures dense and irregular; humeral plates weakly prominent; epipleuron rather narrow, incomplete at apex. Metaventricle (Fig. 371) large, strongly transverse, weakly convex, narrowing towards its anterior margin, provided most often with two pairs of postcoxal pits; intercoxal process rather narrowly bordered and weakly raised; discrimen long but incomplete; in males hind margin, between coxae provided with some modifications (e.g. tubercles). Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons; anterior tendons comparatively short. Hind wing reduced (shorter and narrower than elytron) without anal lobe, or well developed, then with one anal vein, Mp-CuA cross vein reduced, and medial fleck undivided.

Legs (Figs 488–494). Trochanterofemoral attachment heteromeroid. Femur long and clavate, slender at base, setose; tibia widening towards tarsus. Tarsi with tarsomere 3 about four times shorter than tarsomere 4. Claws simple. Empodium bisetose. In males sexual characters may be found in fore trochanters (tubercles or spines) (Fig. 490) and fore and mid tibiae (teeth, spines and/or curvature) (Figs 489, 493).

Abdomen with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined with anterior margin of intercoxal process at least weakly emarginate; ventrites 2–4 subequal

in length. Ventrite 5 may be modified in both sexes (weakly truncate or emarginate apically). Male abdominal segment 8 (Fig. 633) with sternite very narrow and emarginate at apex, and tergite large, narrowly excised medially at base, without basal, membranous lobes. Male genital segment (Figs 691, 692) with additional narrow, internal, arched sclerite; sternite emarginate apically and paired apophyses fused along $\frac{1}{3}$ of their length; dorsal plate undivided.

Aedeagus (Figs 767, 768) stout, moderately long, strongly sclerotized, very weakly curved. Median lobe sometimes weakly branched out apically; endophallus often with stout spines. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 824). Ovipositor fused with abdominal sternite 8; coxites entirely fused; styli absent. Apex of bursa copulatrix sometimes in form of strongly sclerotized ring and whole bursa at least partially sclerotized. Spermatheca small, membranous; sperm duct short, rather slender; accessory gland very small, elongate, membranous. Bursa copulatrix moderately large, elongate with apical outlet of sperm duct and lateral (on left side of body) outlet of common oviduct.

Species examined. *D. adami* Tomaszewska, *D. celata* Arrow, *D. denticollis** (Germar), *D. edentata* Wollaston, *D. grancanariensis* Palm, *D. indica* Tomaszewska, *D. mizoramica* Tomaszewska et Pal, *D. palmensis* Franz, *D. trimaculata* Motschulsky – 9 of 36 known species.

Distribution. Widely distributed in Palaearctic Region and northern Orient (India, Nepal and Burma).

Daulis Erichson

(Figs 12, 37, 74, 135, 208, 254, 314, 315, 372, 495–499, 635, 687, 688, 765, 766, 825, 869)

Daulis Erichson, 1842: 241. Type species, by monotypy: *Daulis cimicoides* Erichson, 1842.

Diagnosis. *Daulis* appears to be closely related to *Daulotypus* sharing the dorsal vestiture double consisting of suberect setae originating from the punctures and very long, erect spines placed on small tubercles, the unique feature for the entire family Endomychidae. The lateral margins of the pronotum being coarsely crenulate, the prosternal process comparatively long and narrow and the intercoxal process of mesoventrite narrowly separating mesocoxae are also shared by *Daulis* and *Daulotypus*. *Daulis* however, can be separated from *Daulotypus* by having the terminal labial palpomere oval, the maxillary galea widely rounded at apex, and the elytral punctures arranged irregularly and the hind wing lacking medial fleck.

Daulis also seems to be closely related to the Neotropical genus *Archipines* sharing general body appearance, the

labrum produced laterally into rounded lobes, the apex of the sternite of the male genital segment visible in a deep excision of the ventrite 6, the terminal labial palpomere large and somewhat flattened dorso-ventrally and the female genitalia with strongly reduced coxites. However the body vestiture, the lateral margin of the pronotum coarsely crenulate and the mandible with blunt apex, without teeth separate easily *Daulis* from *Archipines*.

Redescription. Length 2.85–3.20 mm. Body (Fig. 869) long-oval in outline, moderately convex; very shiny; comparatively coarsely and moderately densely, confusedly punctured; covered with two kinds of pubescence – moderately long, suberect hairs growing out of punctures and about two times longer, sparse, erect hairs/ spines growing out of small tubercles, between punctures. Colour light brown, with some scattered, irregular, infuscate spots on the elytra.

Head weakly transverse, strongly narrowing from eyes towards clypeus; occipital file small, elongate, somewhat vase-shaped; postoccipital suture present; gular sutures slender, strongly convergent and confluent medially at base. Eyes moderately large, weakly oval in outline, strongly prominent, coarsely faceted. Antenna (Fig. 37) about as long as half length of body, with all antennomeres longer than wide; club 3-segmented, narrow, long, scarcely flattened and loose; antennomeres 1–4 gradually, scarcely shorter; antennomeres 4–8 subequal in length; terminal antennomere longest. Clypeus flat, almost rectangular, with weakly arcuate apical edge. Labrum (Fig. 74) strongly transverse, with sides produced laterally into rounded lobes; sclerotized with narrow membranous, apical part; coarsely punctured, covered with moderately dense, long setae and with sparse brushes of long setae on sides of apical margin; apical edge weakly emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods somewhat V-shaped, divergent anteriorly. Mandible (Fig. 135) hemicycloid, rounded apically without teeth; ventral surface, along outer edge covered with numerous long setae; mola moderately large, sclerotized, finely ridged; prosthema moderately wide and very long, membranous, covered with moderately dense, short setae; submola rather small, densely setose, membranous. Maxilla (Fig. 208) with palpomeres 2–4 much longer than wide, gradually slightly longer; terminal palpomere subcylindrical, blunt at apex. Galea large, widening and rounded apically, densely setose. Lacinia short and narrow, tapering towards its apex, with long, stout apical and mesal setae and two very long spines below them, growing out of dorsal surface. Labium (Fig. 254) with palpi rather close together; palpomere 2 transverse; terminal palpomere very large, about as long as wide, somewhat flattened dorso-ventrally, oval in outline. Mentum widest near half length with raised, curved ridge transversely, weakly concave and reticulate posteriorly. Prementum moderately long, covered

anteriorly with comparatively long setae; ligula lobed at sides, submembranous.

Prothorax strongly transverse, widest between apical third and half length. Pronotum (Fig. 314) with anterior margin provided with reduced, very small, produced anteriorly stridulatory membrane; lateral margins coarsely crenulate; basal sulcus deep and straight, lateral sulci comparatively long, deep, linear and subparallel; anterior angles very weakly produced forwards, blunt; posterior angles right-angled. Pronotal disc weakly convex, coarsely and densely punctured. Prosternum (Fig. 315) with pair of pits in front of procoxal cavities; prosternal process very narrow, not extending beyond coxae; procoxae (Fig. 495) contiguous, prominent, circular in outline; their cavities externally open, internally widely closed; trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum rather small, wider than long, somewhat heart-shaped with acute apex. Mesoventrite (Fig. 372) almost flat with pair of small and shallow pits near anterior margin; intercoxal process very narrow, flat, extending to about half length of coxae and meeting narrow intercoxal process of metaventrite; mesocoxae very narrowly separated. Mesocoxa circular in outline (Fig. 497) its cavity open outwardly; trochantin exposed. Meso-metaventral junction with small internal knob. Elytra (Fig. 12) much wider basally than prothorax; widest near basal third, thence subparallel and abruptly narrowing from apical third towards apex; convex with lateral margins moderately widely flattened, visible from above, from humeri to apical third; densely and coarsely, irregularly punctured; epipleuron comparatively broad, narrowing towards apex, extending to half length of abdominal ventrite 3; humeri weakly prominent. Metaventrite (Fig. 372) transverse, weakly convex, with two pairs of postcoxal pits; anterior margin narrowly bordered and weakly raised; discrimen long, incomplete. Metacoxae transverse, moderately widely separated; femoral lines absent. Metendosternite with comparatively long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck absent.

Legs (Figs 495–499) with trochanterofemoral attachment oblique. Femur widest near mid length, about twice as wide as tibia, covered with long and dense setae and at least fore femur bears a few additional, perpendicularly directed spines; tibia and tarsus very densely pubescent; tibia weakly widening towards tarsus, with outer edge provided with erect, very long setae. Tarsi with tarsomere 3 about 5–6 times shorter than terminal tarsomere. Claws simple. Empodium moderately large with two long setae.

Abdomen with six freely articulated ventrites (in male ventrite sixth at least partially visible); intercoxal process with anterior margin straight. Ventrite 1 in male not much longer than ventrite 2; in female almost as long as two following ventrites combined; ventrites 2–4

subequal in length. In female ventrites 5 and 6 simple at apex; in male ventrite 5 truncate to weakly emarginate at apex, ventrite 6 (Fig. 635) strongly incurved medially exposing apex of male genital segment; tergite 8 weakly emarginate medially at apex in both sexes. Male genital segment (Figs 687, 688) with sternite weakly rounded apically and paired apophyses fused along half length; dorsal plate undivided.

Aedeagus (Figs 765, 766) moderately long, rather thin, moderately sclerotized. Tegmen comparatively large with basal piece encircling penis near mid length; parameres fused; tegminal strut sclerotized, comparatively long, articulated or fused. Median lobe straight and curved apically, with small submembranous gonopore at apex.

Female genitalia (Fig. 825). Ovipositor almost membranous with coxites vestigial and styli absent. Spermatheca small, membranous, elongate; accessory gland minute, membranous; sperm duct stout and moderately long. Bursa copulatrix moderately large, membranous with apical outlet of sperm duct and medio-ventral outlet of common oviduct.

Species examined. *D. cimicoides** Erichson, *D. mon-teithi* Tomaszewska – all known species.

Distribution. Australia.

Daulotypus Lea

(Figs 18, 38, 75, 136, 137, 209, 255, 316, 317, 373, 500–504, 634, 689, 690, 769, 770, 826, 827, 870)

Daulotypus Lea, 1922: 301. Type species, by monotypy: *Daulotypus picticornis* Lea, 1922.

Diagnosis. *Daulotypus* appears to be closely related to *Daulis* and *Archipines* by having similar body appearance, the terminal labial palpomere large and flattened dorso-ventrally, the labrum produced laterally into rounded lobes, the trochanterofemoral attachment being oblique, apex of the sternite of the male genital segment visible in a deep excision of the ventrite 6 and the female genitalia with strongly reduced coxites. However the elytra with punctures being coarse and arranged into regular rows separates *Daulotypus* from both genera. Moreover the terminal labial palpomere transverse, the maxillary galea broadly triangular, and the hind wing with medial fleck separates easily *Daulotypus* from *Daulis*. The dorsal vestiture double consisting of suberect setae originating from the punctures and a very long, erect spines placed on small tubercles, the lateral margins of the pronotum being coarsely crenulate, the prosternal process comparatively long, and the mandible with blunt apex, without teeth distinguished *Daulotypus* from *Archipines*.

Redescription. Length 2.30–5.50 mm. Body (Fig. 870) long-oval in outline, moderately convex; very shiny; punctures coarse and dense, arranged in regular rows on elytra; covered with two kinds of pubescence – moder-

ately long, suberect hairs growing out of punctures and about two times longer, sparse, erect setae/ spines growing out of minute tubercles, between punctures. Colour light brown to reddish brown, sometimes bicoloured with prothorax, parts of head, antennae and legs black or infusate.

Head weakly transverse, strongly narrowing from eyes towards clypeus; occiput with transverse, finely ridged stridulatory area. Gular sutures slender, confluent medially at base. Eyes large, weakly oval in outline, strongly prominent, coarsely faceted. Antenna (Fig. 38) about as long as half length of body, with all antennomeres longer than wide; club 3-segmented, rather narrow, long, weakly flattened and loose, with antennomeres 9 and 10 produced inwardly; scape 1 about 1.5 × as long as pedicel and antennomere 3; antennomere 4 slightly shorter than 3 and 5; antennomere 7 longer than 6 and 8; terminal antennomere longest, elongate-oval, somewhat pointed apically. Clypeus flat, almost rectangular, with weakly arcuate apical edge. Labrum (Fig. 75) strongly transverse, with sides produced laterally into rounded lobes; sclerotized with narrow membranous, apical and lateral area; moderately coarsely punctured, covered with rather sparse, moderately long setae and with sparse brushes of long setae on sides of apical margin; apical edge emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods weakly divergent anteriorly. Mandible (Figs 136, 137) somewhat hemicycloid, rounded apically without teeth; ventral surface moderately concave, dorsum convex with elongate, sinuate ridge medially, with long setae near outer edge; mola moderately large, sclerotized, finely ridged; protheca rather narrow and long, membranous, covered with short, dense setae; submola rather small, densely setose, membranous. Maxilla (Fig. 209) with palpomeres 2–4 much longer than wide, gradually distinctly longer; terminal palpomere subcylindrical, weakly, obliquely truncate at apex. Galea large, broadly triangular, moderately densely setose at apex. Lacinia short and narrow, tapering towards its apex, with long, stout apical and mesal setae and two very long spines below them, on dorsal surface. Labium (Fig. 255) with palpi rather close together; palpomere 2 transverse; terminal palpomere very large, transverse, strongly flattened, truncate at apex. Mentum widest near basal third, sparsely setose, weakly concave and reticulate posteriorly. Prementum very short, sparsely and shortly setose; ligula acutely lobed at sides.

Prothorax strongly transverse, widest near apical third. Pronotum (Fig. 316) moderately coarsely and densely punctured; narrowly bordered laterally and moderately widely bordered anteriorly; anterior margin with minute, produced anteriorly stridulatory membrane; lateral margins densely sinuate; basal sulcus deep and straight, lateral sulci moderately long, deep, linear and subparallel or scarcely convergent anteriorly;

anterior angles weakly produced forwards, blunt or weakly acute; posterior angles weakly acute. Pronotal disc weakly convex with moderately deep impression on each side. Prosternum (Fig. 317) without pits in front of procoxal cavities; provided with two weak, median, elongate ridges; prosternal process narrow, extending to hind margin of procoxae, narrowly bordered laterally, rounded at apex; coxae (Fig. 500) narrowly separated, prominent, circular in outline; their cavities externally open, internally widely closed; trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum rather small, wider than long, angulated near base, widely rounded apically to somewhat truncate. Mesoventrite (Fig. 373) with pair of small and shallow pits near anterior margin; intercoxal process narrow, flat, extending to about half length of coxae and meeting narrow intercoxal process of metaventrite; mesocoxae narrowly separated. Mesocoxa circular in outline (Fig. 501), its cavity open outwardly; trochantin partially exposed. Meso-metaventral junction with small internal knob. Elytra much wider at base than prothorax; widest between basal third and half length, blunt apically; convex with lateral margins moderately widely flattened and finely denticulate (except apical part), visible from above almost throughout; densely and coarsely, more or less regularly punctured; epipleuron comparatively broad, narrowing towards apex, incomplete; humeri weakly prominent. Metaventrite (Fig. 373) strongly transverse, weakly convex, with two pairs of postcoxal pits; anterior margin narrowly bordered and weakly raised; discrimen long, incomplete. Metacoxae transverse, moderately widely separated; femoral lines absent. Metendosternite with comparatively long stalk and widely separated anterior arms and tendons. Hind wing (Fig. 18) with one anal vein and one anal cell; medial fleck moderately large, oval, partially divided.

Legs (Figs 500–504) with trochanterofemoral attachment oblique. Femur rather stout, widest near mid length, about twice as wide as tibia, covered with long and dense setae and at least fore femur provided with a few additional, obliquely directed, erect setae/spines; tibia long and very densely pubescent, scarcely widening towards tarsus, with outer edge provided with perpendicularly erect, very long, sparse setae; apical spurs absent. Tarsomere 3 about 5–6 times shorter than terminal tarsomere. Claws simple. Empodium indistinct with two long setae. Male hind- and sometimes mid tibiae with weak characters of sexual dimorphism (e.g. incurved along apical half and weakly denticulate).

Abdomen with six freely articulated ventrites (in male ventrite sixth at least partially visible); intercoxal process with anterior margin weakly emarginate. Ventrite 1 in male not much longer than ventrite 2; in female as long as 2.5 following ventrites combined; ventrites 2–4 subequal in length. In female ventrite 6 simple or weakly depressed in middle; in male ventrite 5 widely emar-

ginate apically, ventrite 6 (Fig. 634) strongly incurved medially exposing apex of male genital segment; tergite 8 widely rounded at apex with submembranous, lateral lobes at base. Male genital segment (Figs 689, 690) with sternite large, somewhat truncate at apex; paired apophyses fused apically; dorsal plate undivided.

Aedeagus (Figs 769, 770) moderately long and rather stout, strongly sclerotized. Tegmen moderately large with basal piece encircling penis in about half length; parameres fused; tegminal strut submembranous, long, with rounded capsule at apex. Median lobe straight, enlarged at base and somewhat branching out apically.

Female genitalia (Figs 826, 827). Ovipositor weakly sclerotized with coxites separated and reduced; styli absent. Spermatheca small, weakly or well sclerotized, elongate; accessory gland slightly smaller than spermatheca, membranous; sperm duct stout and short, sometimes with basal part in form of stout, weakly sclerotized pipe-like structure. Bursa copulatrix moderately large, membranous with apical outlet of sperm duct and ventro-apical outlet of common oviduct.

Species examined. *D. picticornis** Lea, *D. minor* Lea – 2 of 4 known species.

Distribution. Australia.

Dryadites Frivaldszky

(Figs 39, 76, 138, 139, 217, 218, 259, 318, 319, 375, 505–510, 653, 695, 696, 771, 772, 828, 871)

Dryadites Frivaldszky, 1883: 128. Type species, by monotypy: *Dryadites borneensis* Frivaldszky, 1883.

Diagnosis. The species of *Dryadites* are similar to those of *Beccariola* and *Cymbachus* in having the body short-oval and the prosternal process excised apically with subacute lateral lobes (forked), but can be distinguished from both these genera by having the intercoxal process of metaventrite widely bordered and raised, and the female genitalia with outlet of sperm duct placed near base of bursa and the accessory gland strongly elongate, provided with additional very long process. Moreover the pronotum with well developed, large stridulatory membrane and the presence of basal sulcus can separate *Dryadites* from *Beccariola*, while the mandible with apical tooth at most narrowly chisel-shaped, the abdominal tergite 8 simple and median lobe without apical branches separate it from *Cymbachus*.

Redescription. Length 5.0–9.0 mm. Body (Fig. 871) short-oval, rarely elongate-oval; rather highly convex, shiny, glabrous; punctures sparse and fine to moderately dense and coarse, confused, often with a few additional, distinct rows of punctures (sometimes punctures arranged with only minute rows of fine punctures). Colour red, purple, brown or black, sometimes with purplish or violet sheen, elytra with or without contrasting spots.

Head partially retracted in prothorax, weakly transverse. Gular sutures slender, confluent medially at base and shortly produced anteriorly as very slender median line. Eyes moderately large, oval, prominent, and coarsely faceted. Occipital file, finely ridged, moderately large, somewhat triangular in shape. Antenna moderately long and rather stout (Fig. 39) with, 3-segmented, moderately wide, flattened club; scape less than 2.0 times longer than pedicel and subequal in length with antennomere 3; antennomere 3 about 1.5 × longer than antennomere 4; antennomeres 4 scarcely longer than 5; antennomeres 5–7 subequal or 5 may be slightly longer than 6 or 7; antennomere 8 slightly longer than 7. Clypeus transverse, flat, widest at base, slightly convergent from base toward half length, thence parallel; anterior margin straight. Labrum (Fig. 76) sclerotized with membranous apex; anterior margin of both – membranous and sclerotized parts straight; transverse, moderately coarsely punctured, covered rather sparsely with moderately long setae (densely on anterior edge) and with a few long setae on sides; tormae elongate, with mesal arms recurved posteriorly; labral rods slender, widely divergent anteriorly. Mandible (Figs 138, 139) moderately broad, concave ventrally, convex dorsally with high arcuate, dorsal ridge, with large and stout apical tooth and moderately large, blunt subapical tooth; mola large, well-developed, finely ridged; protheca long and narrow, membranous, covered with dense, comparatively long and rather stiff setae. Maxilla (Fig. 217) stout with terminal palpomere longest (about 2.5 × longer than 3 and at most 1.5 × longer than palpomere 2), tapering, rounded at apex; galea enlarged apically, with apex longitudinally striped near outer edge and finely setose near inner edge; lacinia (Fig. 218) short and very narrow, weakly tapering, fringed with moderately stiff setae on its inner edge without longer spines below them; digitus absent. Labium (Fig. 259) with palpi rather close together; palpomeres 2 and 3 strongly transverse; terminal palpomere subtruncate at apex. Mentum transverse, widest in middle length; covered with fine, reticulate microsculpture and sparse, short setae. Prementum very short, moderately sclerotized; ligula with moderately large, lateral lobes.

Prothorax strongly transverse, widest at base, subparallel to about half length thence rounded toward anterior angles. Pronotum (Fig. 318) moderately widely bordered laterally and narrowly bordered anteriorly; anterior edge with conspicuous stridulatory membrane; posterior margin bisinuate; basal sulcus deep, lateral sulci moderately long, linear, weakly divergent anteriorly or parallel; anterior angles produced and acute; hind angles right-angled or weakly acute; pronotal disc moderately convex. Prosternum without pits; prosternal process (Fig. 319) short and moderately wide, more or less excised apically (to receive anterior part of pentagonal mesosternum) to almost truncate, not produced beyond coxae; front coxae prominent, circular in out-

line (Fig. 508), their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum small, somewhat heart-shaped, sparsely punctured. Mesoventricle (Fig. 375) carinate, with pair of pits near anterior margin; intercoxal process extending to about half length of coxae, transverse, pentagonal with a pair of oblique ridges convergent to front angle, almost flat posteriorly. Mesocoxa circular in outline (Fig. 507), its cavity outwardly open; trochantin exposed. Mesometaventral junction with internal knobs. Elytra very convex, widest near middle length, with sides rounded, blunt at apices with punctures rather fine and moderately dense most often with a few additional rows of punctures or elytra almost impunctate (with only minute rows of fine punctures); humeri weakly prominent; epipleuron wide, narrowing towards apex, almost complete or complete. Metaventricle (Fig. 375) large, strongly transverse; most often widely bordered and elevated between middle coxae, comparatively convex, weakly narrowing anteriorly, provided with three pairs of postcoxal pits; discrien long, almost complete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing with two anal veins and one anal cell; medial fleck moderately large, rectangularly-oval, divided.

Legs (Figs 505–510) moderately long and rather stout with trochanterofemoral attachment heteromeric. Femur widest near half length, slender at base, hardly setose; tibia and tarsus rather densely setose; tibia widening towards tarsus, without apical spurs. Tarsi with terminal tarsomere stout and about nine times longer than tarsomere 3. Claws simple, hollowed along inner edge, empodium absent (Fig. 510).

Abdomen with five freely articulated ventrites. Ventricle 1 at least as long as 3 following ventrites combined with intercoxal process comparatively wide, weakly emarginate medially; ventrites 2–4 gradually, slightly shorter. Ventricle 5 in male widely rounded apically, in female somewhat triangular. Male abdominal segment 8 (Fig. 653) with sternite very narrow, emarginate medially at apex, and tergite moderately sclerotized with small, lateral, membranous lobes at base. Male genital segment with additional, internal, paired, slender sclerites, connected medially by membrane; apical edge of sternite emarginate on sides and paired apophyses fused just at apex; dorsal plate divided in two separated, lateral parts (Figs 695, 696).

Aedeagus (Figs 771, 772) stout, moderately long, well sclerotized, curved. Penis weakly pointed apically, without distinct branches. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut short, but distinct.

Female genitalia (Fig. 828). Ovipositor sclerotized, fused with abdominal sternite 8; coxites entirely fused

with emarginate apex; styli absent or large. Spermatheca large, membranous, internally somewhat sclerotized, almost round with long and wide connection with sperm duct; accessory gland membranous, very long with additional apical, narrow projection; sperm duct moderately long and slender. Bursa copulatrix with large or moderately large, paired, sclerotized, internal plates; with outlet of sperm duct dorsally at about mid length of bursa; outlet of common oviduct at apex.

Species examined. *D. borneensis** Frivaldszky, *D. concolor* (Arrow), *D. purpureus* Arrow, *D. violaceus* Tomaszewska – 4 of 8 known species.

Distribution. Oriental Region.

Encymon Gerstaecker

(Figs 40, 78, 140, 141, 210, 211, 262, 320, 321, 376, 511–516, 647, 697, 698, 773, 774, 829, 872, 873)

Encymon Gerstaecker, 1857: 232. Type species, by monotypy: *Encymon violaceus* Gerstaecker, 1857.

Cranterophorus Blackburn, 1895: 232. Type species, by monotypy: *Mycella clavicornis* Blackburn, 1890 (= *Eumorphus immaculatus* Montruzier, 1855).

Diagnosis. This genus is very distinctive among Lycoperdininae by having the pronotum subquadrate with undulate sides, much narrower than base of the elytra, and the elytra strongly convex and very distinctly coloured (green, blue-green, dark blue or black with prothorax red or black and femora black or bicoloured). Among the genera of the Lycoperdininae, *Encymon* is most similar to *Avencymon* in having the labium with the terminal palpomere strongly transverse, the prosternal process narrow and not extending beyond front coxae, and the intercoxal process of mesoventrite elongate, and comparatively narrow between coxae. *Encymon* however, can easily be separated from *Avencymon* by having the body differently shaped and coloured, the antennal club wider and more flattened, and the mandible with apex produced, acute and bifid.

Redescription. Length 7.0–10.5 mm. Body (Figs 872, 873) long-oval, convex to strongly convex, shiny or pronotum sometimes opaque, glabrous; puncturation sparse and fine to moderately dense and coarse, confused. Colour may be green, blue-green, dark blue or black with prothorax red or black and femora black or bicoloured; elytra rarely with contrasting spots.

Head partially retracted in prothorax, weakly transverse. Gular sutures confluent medially at base and extending anteriorly as almost complete median line (median line sometimes absent). Eyes large, oval, very prominent, coarsely faceted. Occipital file large, oval, finely ridged. Antenna long and slender (Fig. 40) with 3-segmented, moderately narrow, flattened club; scape almost 3.0 × as long as pedicel; antennomere 3 almost 4.0 × longer than

pedicel and 2.0 × longer than antennomere 4; antennomeres 4–5 subequal in length; antennomeres 6–8 slightly shorter than preceding antennomeres, subequal in length (or antennomere 8 slightly shorter than 6 or 7); antennomeres 9 and 10 with anterior, inner angles somewhat produced internally. Clypeus transverse, flat, widest at base, slightly convergent from base toward basal third, thence parallel; anterior margin weakly pointed in mid length. Labrum (Fig. 78) sclerotized with membranous apex; anterior margin of both – membranous and sclerotized parts emarginate; transverse, moderately coarsely punctured, covered with long setae, and with a few very long setae on sides; tormae elongate, with mesal arms recurved posteriorly; labral rods slender, widely divergent anteriorly. Mandible (Figs 140, 141) broad, concave ventrally, convex dorsally with apex produced, acute and bifid; mola large, finely ridged; prosthema long and narrow, membranous, covered with fine short setae and a few long setae at apex; submola small, setose, membranous. Maxilla (Fig. 210) with terminal palpomere subequal in length with palpomere 2 and about 1.5 × longer than 3, cylindrical, blunt or weakly truncate at apex; galea broadly triangular, densely covered with short setae; lacinia (Fig. 211) short and narrow, tapering, fringed with moderately stiff setae on its inner edge, with row of spinulae on dorsal surface and one long spine below them; digitus absent. Labium (Fig. 262) with palpi close together; palpomere 2 very short, strongly transverse; terminal palpomere large, transverse (at least 3 × wider than long), truncate at apex. Mentum transverse, with short, lateral lobes and arcuate, weakly raised margin in middle; covered sparsely with moderately long setae. Prementum short, moderately sclerotized; ligula with rather small, lateral lobes.

Prothorax transverse with sides undulate, widest at about apical third and decidedly contracted behind. Pronotum (Fig. 320) narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; posterior margin almost straight; basal sulcus deep, lateral sulci long, weakly arcuate; anterior angles strongly produced, subacute or blunt; hind angles right-angled; pronotal disc weakly convex. Prosternum without pits; prosternal process (Fig. 321) narrow, subparallel, rounded apically; separating front coxae, not extending beyond them; front coxae prominent, circular in outline (Fig. 511), their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum small, widely triangular, with rounded apex, densely punctured. Mesoventrite (Fig. 376) with one or sometimes two pairs of pits near anterior margin, carinate; intercoxal process narrow and longer than wide, with arcuate ridge anteriorly, weakly concave medially; comparatively narrowly separating mesocoxae; extending to about half of their length. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knob. Elytra

very convex, widest near mid length, with sides rounded, blunt at apices with punctures moderately coarse and dense; humeri moderately prominent; epipleuron rather wide, incomplete at apex. Metaventricle (Fig. 376) large, moderately widely bordered and elevated between middle coxae, strongly transverse, comparatively convex on both sides of discimen, narrowing anteriorly, provided with three pairs of postcoxal pits; discimen long, almost complete or complete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck moderately large, rectangularly-oval, divided.

Legs (Figs 511–516) long and slender. Trochanterofemoral attachment heteromeroid. Femur long, strongly clavate, very slender at base, hardly setose; dorsal and ventral surfaces of fore femur and ventral surfaces of mid femur bear rows of obliquely directed short spines; tibia and tarsus densely setose especially at apical half. Terminal tarsomere very long, about nine times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium distinct, bisetose (Figs 516). In males sexual characters may be found in all tibiae (minute tooth, fine denticulation and curvature – Figs 512, 513, 514); all trochanters may bear more or less distinct tubercles (Fig. 511).

Abdomen with anterior margin of intercoxal process weakly emarginate medially; with five freely articulated ventrites. Ventrite 1 as long as about 2.5 following ventrites combined; ventrites 2–4 subequal in length; ventrite 5 may be modified apically in both sexes. Male abdominal segment 8 (Fig. 647) with sternite very narrow, with sinuate apical margin and additional emargination medially, tergite moderately sclerotized with large, lateral, membranous lobes at base. Male genital segment (Figs 697, 698) with sternite emarginate apically and paired apophyses fused along at least $\frac{1}{3}$ of their length; dorsal plate undivided.

Aedeagus (Figs 773, 774) stout, moderately long, strongly sclerotized, weakly curved. Median lobe with long, more or less curved apical branch. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 829) fused with abdominal segment 8 – tergite 8 moderately sclerotized, sternite 8 often in form of two lateral sclerotized plates connected medially by membrane and fused with coxites. Ovipositor moderately sclerotized; coxites entirely fused; styli absent. Spermatheca small, irregularly oval, membranous; accessory gland very small, elongate, membranous; sperm duct moderately long and slender. Bursa copulatrix large, partially sclerotized with apical outlets of sperm duct and common oviduct.

Species examined. *E. gorhami* Csiki, *E. immaculatus* (Montruzier), *E. regalis atripes* Csiki, *E. schwarzbauerei* Mader, *E. violaceus** Gerstaecker – 5 of 19 known species.

Distribution. Widely distributed in Oriental and Australian Regions.

Eumorphus Weber

(Figs 41, 80, 142, 143, 212, 264, 322, 323, 377, 517–521, 648, 699, 700, 775, 776, 830, 874–877)

Eumorphus Weber, 1801: 31. Type species, by monotypy *Eumorphus sumatrae* Weber, 1801 (= *Erotylus quadriguttatus* Illiger, 1800).

Eumorphoides Guérin, 1858: 12. Type species, by present designation: *Eumorphus tetraspilotos* Hope, 1832: 787.

Enaisimus Guérin, 1858: 16. Type species, by present designation: *Eumorphus quadrinotatus* Gerstaecker, 1857: 226.

Haplomorphus Guérin, 1858: 18. Type species, by present designation: *Eumorphus bipunctatus* Perty, 1831: 42.

Heterandrus Guérin, 1858: 26. Type species, by present designation: *Eumorphus confusus* Guérin, 1857a.

Diagnosis. The species of this genus are most similar to those of *Platindalmus* and *Gerstaeckerus*. The lateral margin of the pronotum with tendency to form irregularly broken lines, inconstant and often asymmetrical, distinguishes *Eumorphus* from both genera. Moreover the mandible at most narrowly chisel-shaped at apex, the elytra with basal margin simple, the intercoxal process of mesoventrite with lateral margins subparallel, can easily separate *Eumorphus* from *Gerstaeckerus*, while the male femora lacking fringes of long hairs on inner edges distinguish it from *Platindalmus*.

Redescription. Length 7.0–20.0 mm. Body (Figs 874–877) elongate, moderately convex, shiny, glabrous; densely and moderately coarsely, confusedly punctured. Colour black or sometimes blackish-brown or brown, almost always with four yellow spots on elytra.

Head partially retracted in prothorax, as long as wide, distinctly concave between eyes. Eyes moderately large, transversely oval in outline, prominent, moderately coarsely faceted. Occipital file large, finely ridged. Gular sutures fused medially at base and extending anteriorly as long, sometimes complete median line. Antenna long (about as long as half length of body) and comparatively slender (Fig. 41) with 3-segmented, very flat and comparatively wide club; scape at least 2 × as long as pedicel; antennomere 3 strongly elongate, about 3 × as long as pedicel and at least twice as long as antennomere 4; antennomeres 4–8 gradually slightly shorter. Clypeus transverse, flat, widest at base, slightly convergent basally, thence parallel. Labrum (Fig. 80) sclerotized with membranous apex; strongly transverse, moderately coarsely punctured, covered with short and long setae, and with tufts of long setae on sides; anterior edge of membranous part weakly sinuate and sclerotized part with anterior edge straight; tormae elongate, with mesal arms recurved posteriorly; labral rods slender but long, widely divergent anteriorly. Mandible (Figs 142, 143) with a few minute teeth or one strong, pointed api-

cal tooth; mola large, finely ridged; prostheca rather narrow, membranous, finely setose. Maxilla (Fig. 212) with terminal palpomere elongate (about $1.5 \times$ as long as palpomere 3), cylindrical or weakly tapering towards apex, blunt apically; galea large, broadly triangular, densely setose; lacinia moderately short and narrow, tapering, fringed with stiff setae on its inner edge, a row of slender spinulae on dorsal surface and two long spines below them; digitus absent. Labium (Fig. 264) with palpi close together; palpomere 2 strongly transverse; terminal palpomere transversely rectangular, blunt or truncate. Mentum transverse, widest in middle of its length with arcuate anterior edge, sometimes with raised, curved ridge transversely; covered with rather long, sparse setae. Prementum extremely short, moderately sclerotized with ligula produced into short, lateral lobes.

Prothorax transverse, widest at base or at apical third. Pronotum (Fig. 322) narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, lateral sulci linear, subparallel, moderately deep and long; anterior and posterior angles generally produced – anterior blunt, posterior acute; lateral margin bisinuate with tendency to form irregularly broken lines, inconstant and often asymmetrical; pronotal disc slightly convex. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 323) rather narrow, weakly concave at apex, extending shortly beyond front coxae and separating them distinctly; front coxae prominent, circular in outline; their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, distinctly transverse, sparsely punctured basally, somewhat heart-shaped with weak narrowing near base or widely rounded apically. Mesoventrite (Fig. 377) with a pair of distinct, rather deep pits near anterior margin and with transverse, declivent area in front of each coxa; intercoxal process pentagonal, longer than wide, angulate anteriorly and sinuate posteriorly, with median ridge along basal half and raised sides; comparatively widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 517), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near mid length, convex with punctures dense, moderately coarse and irregular; in female generally more elongate at apex; humeri prominent; lateral margins visible throughout, in some species wide and flattened (then males have those margins wider than female); in male of some species elytra conically elevated; blunt or acute at apices; epipleuron narrow or wide, complete or almost so. Metaventrite (Fig. 377) large, transverse, weakly convex, scarcely narrowing towards its anterior margin; intercoxal process moderately widely bordered and moderately raised; provided with three pairs of

postcoxal pits, in males sometimes also with small tubercles on sides of discrimen, in mid length; discrimen almost complete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with two anal vein and two anal cells; medial fleck moderately large, almost rectangular, divided.

Legs (Figs 517–521) long and comparatively slender; trochanterofemoral attachment heteromeroid. Femur widest near half length or sometimes clavate, hardly setose but dorsal and ventral surfaces of fore femur and ventral surface of mid femur bear rows of obliquely directed short spines; tibia and tarsus rather densely setose, especially along apical half; tibia weakly widening towards tarsus; tarsi with terminal tarsomere very long, 8–10 times longer than tarsomere 3, sometimes finely denticulate at basal third. Claws simple, hollowed along inner edge (Fig. 520); empodium with two short setae. Male trochanters with small tubercles and male tibiae with very distinctly marked sexual characters – protibia almost always with long tooth on inner edge and some additional denticulation along apical third, mesotibia often curved with small tooth, also with additional denticulation, metatibia straight or curved often with prolonged apex.

Abdomen with anterior margin of intercoxal process at least weakly emarginate; with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined; ventrites 2–4 subequal in length. Ventrite 5 may be modified at apex in both sexes. Male abdominal segment 8 (Fig. 648) with sternite very narrow and deeply emarginate medially at apex; tergite somewhat triangular with large, membranous lobes at base. Male genital segment with sternite weakly emarginate apically and paired apophyses fused along $\frac{2}{3}$ of their length; dorsal plate undivided (Figs 699, 700).

Aedeagus (Figs 775, 776) stout, moderately long, heavily sclerotized, very weakly curved. Median lobe branched out at apex. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 830) fused with abdominal segment 8 and compactly connected with segment 7. Ovipositor sclerotized, with coxites entirely fused; sternite 8 divided in two lateral, sclerotized plates sometimes connected by membrane and fused with coxites; styli present, very small, terminal. Spermatheca very small, rounded, membranous; sperm duct short, slender; accessory gland minute, elongate, membranous. Bursa copulatrix moderately large with apical outlet of common oviduct and latero-apical outlet of sperm duct.

Species examined. *E. assamensis subguttatus* Gerstaecker, *E. bipunctatus* Perty, *E. dilatatus* Perty, *E. marginatus* (Fabricius), *E. quadriguttatus** (Illiger), *E. sybarita* Gerstaecker, *E. tetraspilotus* Hope, *E. westwoodi* (Guérin) – 8 of 53 known species.

Distribution. Oriental Region.

***Gerstaeckerus* nomen novum**

(Figs 42, 79, 144, 145, 213, 214, 263, 324, 325, 378, 522–527, 649, 701, 702, 777, 778, 831, 878)

Engonius Gerstaecker, 1857: 220 (nec *Engonius* Perty, 1833). Type species, by subsequent designation of Arrow (1925: 310): *Engonius sexguttatus* Gerstaecker, 1857.

Diagnosis. *Gerstaeckerus* resembles *Ohtaius*, *Brachytrycherus* and *Eumorphus* in general body appearance. The maxillary lacinia without tuft of S-like setae at apex and provided with short spinulae and two long spines on dorsal surface separate *Gerstaeckerus* from *Brachytrycherus* and *Ohtaius*. Additionally the body more elongate, the head lacking well developed, separated gular sutures, and the intercoxal process of mesoventrite widening apically and covering part of coxae, separate it from *Brachytrycherus*, while the femora without fringe of long hairs on inner surface can distinguish it from *Ohtaius*. The mandible with widely chisel-shaped apex, the elytra with basal margin thickened and raised, the differently shaped intercoxal process of mesoventrite, and more raised anterior margin of intercoxal process of metaventrite easily distinguish *Gerstaeckerus* from *Eumorphus*.

Redescription. Length 8.0–12.0 mm. Body (Fig. 878) elongate, strongly convex, shiny, and glabrous; moderately densely and coarsely, confusedly punctured. Colour black with pale spots on elytra.

Head partially retracted in prothorax, weakly transverse. Eyes rather large, transversely oval in outline, prominent, coarsely faceted. Occipital file elongate, large, finely ridged. Gular sutures fused medially at base and extending anteriorly as slender but sometimes long median line, reaching almost submentum. Antenna rather stout (Fig. 42) with 3-segmented, flat and moderately wide club; scape about $1.5 \times$ as long as pedicel; antennomere 3 slightly more than twice as long as pedicel and $1.5 \times$ as long as antennomere 4; antennomeres 4–5 and 6–8 equal in length (4 and 5 scarcely longer than 6, 7 or 8). Clypeus transverse, flat, widest at base, slightly convergent basally, thence parallel toward apex. Labrum (Fig. 79) sclerotized with submembranous apex; strongly transverse, coarsely punctured, covered with long setae and with tufts of long setae on sides; anterior edge of membranous part simple (scarcely rounded) and sclerotized part with anterior edge weakly emarginate; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 144, 145) with chisel-shaped apical tooth and large subapical tooth; mola large, well-developed, finely ridged; prosthema rather narrow, membranous, covered with moderately dense and fine setae; submola small, densely setose, membranous. Maxilla (Fig. 213) with terminal palpomere about $1.5 \times$ as long as palpomere 3, subcylindrical, truncate apically; galea large, broadly triangular, moderately

densely setose; lacinia (Fig. 214) moderately long, rather slender, tapering, fringed with stiff setae on apex and its inner edge and a row of spines on ventral surface, and two longest spines below them. Labium (Fig. 263) with palpi close together; palpomere 2 strongly transverse; terminal palpomere large, strongly transverse, truncate. Mentum transverse, widest near posterior third with raised, curved ridge transversely; covered with moderately long, sparse setae variably directed. Prementum short, moderately sclerotized with ligula emarginate at apex, produced into large, lateral lobes.

Prothorax transverse, widest at base or at apical third. Pronotum (Fig. 324) rather narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, weakly sinuate, lateral sulci linear, subparallel, moderately deep and long; anterior angles moderately produced, blunt or subacute, posterior angles almost right-angled; lateral margin bisinuate; pronotal disc slightly convex. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 325) narrow to moderately wide, with apex weakly bifid to feebly bituberculate, extending shortly beyond front coxae; coxae prominent, circular in outline (Fig. 522); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, distinctly transverse, sparsely punctured, somewhat heart-shaped with weakly pointed apex or widely rounded apically and angulate near base. Mesoventrite (Fig. 378) with a pair of distinct pits near anterior margin; intercoxal process subquadrate or weakly transverse, somewhat arcuately bordered anteriorly and sinuate posteriorly, flat with weakly concave area near anterior margin; widely separating mesocoxae, extending to about half of their length, widening apically and covering part of coxae. Mesocoxa circular in outline (Fig. 525), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra with anterior edge thickened and raised; widest near mid length, convex with punctures moderately dense, moderately coarse and irregular; humeri comparatively prominent; lateral margins moderately widely flattened and visible from beyond humeri to almost apex; blunt at apices; epipleuron moderately wide, complete or almost so. Metaventrite (Fig. 378) large, transverse, weakly convex on sides of discrimen, scarcely narrowing anteriorly; anterior margin rather widely bordered especially between mesocoxae and raised; provided with three pairs of postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and two anal cells; medial fleck moderately large, almost rectangular, divided.

Legs (Figs 522–527) long and comparatively slender; trochanterofemoral attachment subheteromeroid.

Femur somewhat club-shaped, widest near apical third, hardly setose but ventral surfaces of fore and mid femur bear rows of obliquely directed short spines; tibia weakly widening towards tarsus; terminal tarsomere very long, about 11 times longer than tarsomere 3, sometimes finely denticulate along basal third, on outer edge. Claws simple, hollowed along inner edge; empodium with two short setae. Male fore trochanter sometimes with small tubercle; male fore tibiae with stout, sharp tooth near mid length (Fig. 523), mesotibia curved and may have internal, small tooth; metatibia simple.

Abdomen with anterior margin of intercoxal process straight; five freely articulated ventrites. Ventricle 1 almost as long as three following ventrites combined; ventrites 2–4 subequal in length. Ventricle 5 may be modified apically in both sexes. Male abdominal segment 8 (Fig. 649) with sternite very narrow and emarginate medially at apex; tergite truncate or widely rounded apically with large, membranous, basal plate, lobed at sides. Male genital segment (Figs 701, 702) with sternite emarginate apically and paired apophyses fused along about half of their length; dorsal plate undivided; additional, internal V-shaped sclerite present.

Aedeagus (Figs 777, 778) rather short and stout, heavily sclerotized, without basal curvature. Median lobe branched out at apex. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 831) fused with abdominal segment 8. Ovipositor moderately sclerotized, with coxites entirely fused; sternite 8 divided in two lateral, sclerotized plates connected medially by membrane and fused with coxites; styli present, very small, terminal. Spermatheca very small, oval, membranous; sperm duct moderately long, slender; accessory gland minute, rounded, membranous. Bursa copulatrix rather small with dorso-apical outlet of sperm duct and lateral outlet of common oviduct.

Species examined. *G. gratus* (Gorham), *G. klugi* (Gerstaecker), *G. sexguttatus** (Gerstaecker), *G. similis* (Arrow), *G. tetrasphaera* (Arrow) – 5 of 19 known species.

Distribution. Widely distributed in the Oriental Region.

Haploscelis Blanchard

(Figs 43, 81, 146, 147, 215, 216, 265, 326, 327, 379, 528–534, 651, 703, 704, 779, 780, 832, 879)

Haploscelis Blanchard, 1845: 312. Type species, by monotypy: *Eumorphus atratus* Klug, 1832.

Dioedes Gerstaecker, 1857: 231. Type species, by present designation: *Dioedes columbinus* Gerstaecker, 1857.

Hybopterus Faimaire, 1883: 365. Type species, by monotypy: *Hybopterus plaguicollis* Faimaire, 1883.

Diagnosis. *Haploscelis* is very distinctive among the Lycoperdininae. The body comparatively large, almost always deeply black, covered with coarse reticulate microsculpture, with punctures extremely fine or

absent, and dorsal surface of apical part of fore femur deeply excised, separate easily *Haploscelis* from all other genera of Lycoperdininae. Among them, the body comparatively convex, with extremely fine punctures, but coarsely reticulate, and the elytra lacking contrasting markings are similar as in *Cymones*.

Redescription. Length 8.0–13.0 mm. Body (Fig. 879) elongate-oval, convex, shiny with pronotum sometimes opaque, glabrous; very finely and sparsely punctured, covered with dense, reticulate microsculpture. Colour almost always black.

Head partially retracted in prothorax, as long as wide, with weak median concavity between eyes. Gular sutures poorly marked, fused medially at base; median line slender but sometimes long, reaching submentum. Eyes moderately large, transversely oval, prominent, and moderately coarsely faceted. Occipital file, moderately large, long-oval, finely or comparatively coarsely ridged. Antenna at least as long as third of body length (sometimes longer than half length of body), slender (Fig. 43) with 3-segmented, narrow or moderately wide, flattened, loose club; scape about 2.0 times as long as pedicel and slightly shorter than antennomere 3; antennomere 3 about 1.5 × longer than 4 or 5; antennomeres 6–7 subequal in length and slightly shorter than preceding ones; antennomere 8 distinctly shorter 7; terminal antennomere transverse with truncate or irregular apical edge. Clypeus transverse, flat, widest at base, strongly convergent from base toward basal third, thence parallel or even weakly divergent toward apex, with arcuate apical edge. Labrum (Fig. 81) sclerotized with membranous apex; anterior margin of both parts emarginate; strongly transverse, coarsely punctured, covered with long setae and with tufts of long setae on sides; tormae elongate, with mesal arms recurved posteriorly; labral rods absent; basal margin with median raised ridge, triangularly produced anteriorly. Mandible (Figs 146, 147) moderately broad, concave ventrally, convex dorsally with strong, chisel-shaped apical tooth and large, blunt subapical tooth; mola moderately large, finely ridged; prostheca long and rather narrow, membranous, densely covered with short setae; submola small, setose, membranous. Maxilla (Fig. 215) with terminal palpomere longest (about 1.5 × longer than palpomeres 3 or 2), subcylindrical, truncate at apex; galea broadly triangular, moderately densely setose; lacinia (Fig. 216) short and narrow, weakly tapering, fringed with comb of stiff setae on apex and inner edge, with row of moderately long spines and two very long spines on dorsal surface; digitus absent. Labium (Fig. 265) with palpi close together; palpomere 2 short, strongly transverse; terminal palpomere transversely rectangular, blunt at apex. Mentum transverse, with short, lateral lobes near posterior third and arcuate, weakly raised ridge transversely; sparsely setose and coarsely reticulate. Prementum very short, moderately sclerotized; ligula in form of large, lateral lobes.

Prothorax strongly transverse, widest at base. Pronotum (Fig. 326) moderately widely bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; posterior margin weakly trisinate; basal sulcus deep, lateral sulci short, linear and subparallel; anterior angles produced, blunt or subacute; hind angles right-angled or weakly acute; lateral edges weakly sinuate with more or less distinct narrowing near basal third; pronotal disc convex. Prosternum with a pair of small pits in front of procoxal cavities; prosternal process (Fig. 327) rather narrowly separating front coxae, not extending to their posterior margin; truncate or weakly emarginate at apex; coxae prominent, circular in outline (Fig. 528); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, somewhat heart-shaped, with weakly acute apex. Mesoventrite (Fig. 379) with a pair of pits near anterior margin, carinate, with transverse, declivent area in front of each coxa; intercoxal process weakly transverse or subquadrate, pentagonal, with weakly raised borders and median part convex; widely separating mesocoxae; extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 531), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near middle length, elongate-oval, convex, blunt, acute or excised at apices, sometimes with sexual dimorphic features on apex (e.g. apex of each elytron produced into blunt lobe) or disc (elongate, widely flattened and laterally prominent area on each elytron); punctures very fine and sparse; humeral plates weakly prominent; epipleuron moderately wide, complete or almost so. Metaventrite (Fig. 379) large, strongly transverse, weakly convex on sides of discrimen and weakly concave along it; scarcely narrowing towards its anterior margin which is moderately widely bordered and rather weakly raised; provided with three pairs of postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing one anal vein and one anal cell, Mp-CuA cross vein vestigial, medial bridge present; medial fleck moderately large, oval, undivided; radial cell reduced.

Legs (Figs 528–534) with trochanterofemoral attachment subheteromeroid. Femur long and somewhat clavate, slender at base, hardly setose; ventral surfaces of fore and mid femur provided with rows of obliquely directed short spines (sometimes only a few spines present); dorsal surface of apical part of fore femur deeply excised (Fig. 529). Terminal tarsomere about ten times longer than tarsomere 3. Claws simple; empodium moderately large, bisetose. In males sexual characters may be found in fore and mid trochanters (Figs 528, 529) and all tibiae (Figs 530, 532).

Abdomen with anterior margin of intercoxal process truncate or emarginate medially; with moderately wide, raised margins beyond coxae; provided with one or two pairs of postcoxal pits; with five freely articulated ventrites. Ventrite 1 at least as long as three following ventrites combined; ventrites 2 slightly longer than 3 or 4. Ventrite 5 may be modified in both sexes, often truncate at apex. Male abdominal segment 8 (Fig. 651) compactly connected with genital segment; sternite narrow, divided in two lateral, sclerotized parts connected medially by very narrow membranous belt; tergite widely truncate apically with sinuate edge, and with large, lateral, submembranous plates at base. Male genital segment with sternite moderately large, emarginate at apex; paired apophyses fused along $\frac{1}{2}$ of their length; dorsal plate undivided (Figs 703, 704).

Aedeagus (Figs 779, 780) long, moderately stout, strongly sclerotized, weakly curved. Median lobe branching out apically. Tegmen comparatively large, placed basally, ring-shaped with parameres fused and tegminal strut very short, but distinct.

Female genitalia (Fig. 832) fused with segment 8 – tergite 8 sclerotized, sternite 8 membranous or formed by two lateral, sclerotized plates connected by membranous, median part, fused with coxites. Ovipositor well sclerotized; coxites sometimes asymmetrical, fused at least at base; styli absent. Spermatheca small, rounded, membranous; accessory gland minute, elongate-oval, membranous; sperm duct long and slender. Bursa copulatrix sometimes sclerotized, moderately large with dorso-lateral outlet of common oviduct (near mid length of bursa) and dorso-apical outlet of sperm duct.

Species examined. *H. atratus** (Klug), *H. columbinus* (Gerstaecker), *H. oblongulus* (Fairmaire), *Haploscelis* sp. – 4 of 21 known species.

Distribution. Madagascar.

Hylaia Guérin

(Figs 44, 82, 148, 149, 219, 220, 266, 328, 329, 380, 541–545, 650, 705, 706, 781, 782, 833, 880)

Hylaia Guérin, 1857a: 273. Type species, by monotypy, *Lycoperdina rubricollis* Germar, 1843b.

Ceramis Gerstaecker, 1858: 220. Unnecessary replacement name for *Hylaia* Guérin, 1857a.

Diagnosis. The species of *Hylaia* resembles those of *Lycoperdina* in having similar body appearance, the head with well developed gular sutures, the prosternal process strongly reduced with procoxae contiguous and the mesosternal process narrow, with elongate median ridge. The antennal club distinctly 3-segmented, with male antennomere 9 distinctly larger than 10 and the ovipositor with apex of proctiger simple can however separate *Hylaia* from *Lycoperdina*.

Redescription. Length 2.8–3.2 mm. Body (Fig. 880) elongate-oval, moderately convex; shiny, covered with rather dense, moderately long pubescence; confusedly punctured with additional very fine reticulate microsculpture. Colour yellowish-brown to reddish-brown with black maculae on the elytra, sometimes whole elytra black; pronotum sometimes bicoloured.

Head almost circular in outline. Postoccipital suture very distinct. Gular sutures well developed, moderately long, widely separated, weakly convergent anteriorly. Eyes moderately large, weakly oval in outline, prominent, coarsely faceted. Occipital file moderately large, elongate, somewhat trapezoidal in shape. Antenna (Fig. 44) slightly shorter than a half of body length, with 3-segmented narrow, loose club; scape almost twice as long as pedicel; antennomere 3 scarcely longer than pedicel and about $1.5 \times$ as long as antennomere 4; antennomeres 4–8 short, at least weakly transverse; in male antennomere 9 distinctly larger than 10; terminal antennomere about as long as wide, weakly rounded apically. Clypeus transverse, flat, narrowing from base towards basal third, thence parallel, with simple apex. Labrum (Fig. 82) strongly transverse, sclerotized with submembranous apex; apical edge of sclerotized part truncate and of membranous part strongly emarginate medially; shortly setose with a few long setae on sides of anterior, sclerotized margin; tormae elongate, with mesal arms recurved posteriorly; labral rods moderately long, divergent anteriorly. Mandible (Figs 148, 149) moderately broad, strongly concave ventrally, convex dorsally with sharp, elongate ridge laterally; with acute apical tooth and small, blunt subapical tooth; mola moderately large, transversely ridged; prosthema narrow, finely setose; submola small, setose, membranous. Maxilla (Fig. 219) with terminal palpomere about $3 \times$ longer than palpomere 3, subcylindrical, weakly tapering from mid length towards apex; blunt apically. Galea elongate, weakly enlarged toward apex, moderately densely setose. Lacinia (Fig. 220) comparatively long and narrow, weakly tapering and obliquely truncate at apex; fringed with comb of rather stiff setae on inner edge, with row of stout spines on dorsal surface and two longest spines below them; digitus absent. Labium (Fig. 266) with palpi moderately close together; palpomere 2 transverse; terminal palpomere longer than wide, subcylindrical, truncate at apex. Mentum transverse, widest near posterior third with produced forwards anterior angles, punctured, and covered with moderately dense, long setae. Prementum transverse, sclerotized, densely setose anteriorly; ligula expanded laterally and produced into short lobes, truncate or weakly rounded apically.

Prothorax transverse, widest near apical third or at base. Pronotum (Fig. 328) most often with finely denticulate lateral edges; moderately coarsely and rather densely punctured; narrowly to moderately widely bordered laterally; anterior margin with conspicuous

stridulatory membrane; basal sulcus deep, lateral sulci somewhat triangular, deep, moderately long and subparallel; anterior angles weakly to distinctly produced, rounded; posterior angles right-angled or weakly acute; pronotal disc convex. Prosternum (Fig. 329) with pair of deep pits in front of procoxal cavities; prosternal process very narrow and short; front coxae prominent and contiguous. Procoxa circular in outline (Fig. 541); its cavity externally open, and widely closed internally; trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum strongly transverse, widely rounded apically; weakly angulate near base. Mesoventrite (Fig. 380) with pair of pits near anterior margin; intercoxal process rather narrow with moderately raised, elongate, median ridge, ending before apex; narrowly separates mesocoxae, reaching about middle of their length. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knob. Elytron elongate, convex, widest near basal third, thence tapering towards apex; blunt or rounded at apices; comparatively coarsely and moderately densely punctured; epipleuron narrow and short (extending only along basal third); lateral margin very narrowly flattened sometimes invisible from above. Metaventrite (Fig. 380) short, strongly transverse, comparatively convex, narrowing towards its anterior margin which is moderately widely bordered and weakly raised; provided with two pairs of postcoxal pits; discrien extending along basal third or along half length of metaventrite. Metacoxae weakly transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing vestigial.

Legs (Figs 541–545) with trochanterofemoral attachment subheteromeroid; femur widest near half length, about twice as wide as tibia, moderately densely setose with rather irregularly arranged obliquely directed suberect spines on ventral surfaces of fore and mid femora. Tarsomere 3 about five times shorter than tarsomere 4. Claws simple. Empodium distinct, bisetose. Male tibiae rarely with weak characters of sexual dimorphism.

Abdomen with five freely articulated ventrites; anterior margin of intercoxal process emarginate medially; ventrite 1 longer than 3 following ventrites combined and longer than metaventrite; ventrites 2–4 subequal in length; ventrite 5 in male sometimes weakly truncate at apex. Male abdominal segment 8 (Fig. 650) with sternite narrow, moderately sclerotized, truncate or emarginate at apex; tergite widely rounded apically with small submembranous, lateral lobes at base. Female sternite 8 emarginate apically. Male genital segment (Figs 705, 706) with sternite, with somewhat asymmetrical apical margin, at least partially truncate; paired apophyses fused near base or along apical third; dorsal plate large, undivided.

Aedeagus (Figs 781, 782) moderately long and rather slender, sclerotized, weakly arcuate. Tegmen placed near

base of median lobe, reduced, ring-shaped with parameres fused and tegminal strut short, submembranous.

Female genitalia (Fig. 833). Ovipositor at least compactly connected with sternite 8; moderately sclerotized, with coxites at least partially fused; styli moderately large, terminal. Spermatheca moderately large, elongate, membranous, accessory gland small, rounded, membranous; sperm duct short and slender. Bursa copulatrix elongate with apical outlet of sperm duct and lateral outlet of common oviduct.

Species examined. *H. dalmatina* Kaufmann, *H. reissi* Csiki, *H. rubricollis** (Germar) – 3 of 7 known species.

Distribution. South-eastern Europe and Caucasus.

Indalmus Gerstaecker

(Figs 17, 45, 83, 150, 151, 221, 222, 267, 330, 331, 385, 546–551, 652, 707, 708, 783, 784, 834)

Indalmus Gerstaecker, 1858: 185. Type species, by subsequent designation of Arrow (1925: 323): *Eumorphus kirbyanus* Latreille, 1807.

Mycella Chapuis, 1876: 104. Type species, by monotypy: *Mycella lineella* Chapuis, 1876.

Diagnosis. The species of *Indalmus* are most similar to those of *Callimodapsa* and *Parindalmus* by the overall body appearance, including the elytra being widest beyond mid length. *Indalmus* can be easily distinguished from *Parindalmus* in having the pronotum not much narrower than base of the elytra, the labrum with sides subparallel, the mandible with apical teeth, the labial palp distinctly 3-segmented, the male femora without fringes of long hairs on inner surface, and the hind margin of male metaventrite simple (without appendages). The body more convex, distinctly punctured sometimes with fine reticulation on the pronotum and elytra, the antennae and legs longer and more slender separate it from *Callimodapsa*.

Redescription. Length 5.5–8.0 mm. Body (Figs 881, 882) elongate, moderately convex, shiny, most often glabrous; sparsely and finely to densely and coarsely, confusedly punctured. Colour black or sometimes brown, always with contrasting (yellow or red) markings on the elytra.

Head partially retracted in prothorax, almost as long as wide. Gular sutures fused medially at base and extending anteriorly as short median line. Eyes moderately large, oval in outline, prominent, coarsely faceted. Occipital file moderately large, finely ridged, weakly elongate. Antenna long (slightly shorter than a half of body length) and comparatively slender (Fig. 45) with 3-segmented, most often rather narrow and weakly flattened, loose club; scape more than twice as long as pedicel; antennomere 3 twice as long as pedicel or antennomere 4; antennomeres 4–8 subequal or gradually slightly shorter. Clypeus transverse, flat, widest at base, slightly convergent from base toward half length, thence parallel. Labrum (Fig. 83) truncate apically; strongly transverse,

sclerotized with membranous apex, rather coarsely punctured, covered with moderately long setae and with tufts of long setae on sides; tormae elongate, with mesal arms recurved posteriorly; labral rods absent; basal margin with median, raised ridge, triangularly produced anteriorly. Mandible (Figs 150, 151) broad, strongly concave ventrally, convex dorsally; sharply cleft at tip forming apical and subapical teeth; mola large, well-developed, finely ridged; protheca rather narrow, membranous, covered densely with moderately long setae; submola small, densely setose, membranous. Maxilla (Fig. 221) with terminal palpomere elongate (at least $1.5 \times$ as long as palpomere 3), cylindrical, blunt at apex; galea broadly triangular, densely setose; lacinia (Fig. 222) short and narrow, tapering, fringed with stiff setae on its inner edge and two long spines below them; digitus absent. Labium (Fig. 267) with palpi close together, 3-segmented; palpomere 1 very small; palpomere 2 strongly transverse; terminal palpomere transversely rectangular. Mentum transverse, widest in middle of its length, with raised, curved ridge transversely; covered with short setae in anterior part. Prementum very short, moderately sclerotized with ligula in form of large lobes at sides, strongly emarginate at apex.

Prothorax transverse, widest near middle of its length. Pronotum (Fig. 330) rather narrowly bordered laterally and anteriorly; base margined; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, lateral sulci linear, weakly divergent anteriorly, deep and comparatively long; anterior angles distinctly produced forwards, acute; posterior angles right-angled or weakly acute; pronotal disc slightly convex. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 331) very narrow not extending beyond coxae, which are almost contiguous or sometimes moderately narrow with weak longitudinal ridge, extending shortly beyond procoxae and separating them distinctly; front coxae prominent, circular in outline (Fig. 546); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, somewhat pentagonal. Mesoventrite (Fig. 385) with a pair of pits near anterior margin; intercoxal process pentagonal, longer than wide and comparatively widely separating mesocoxae, angulate anteriorly and sinuate posteriorly, with median tubercle or ridge and raised borders; extending to about half of length of coxae. Mesocoxa circular in outline (Fig. 548), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest at about apical third, elongate, convex, blunt at apices with punctures dense and irregular; epipleuron rather narrow, complete or almost so. Metaventrite (Fig. 385) large, transverse, weakly convex, scarcely narrowing towards its anterior margin; intercoxal process comparatively widely bordered and raised,

provided with three pairs of postcoxal pits, in males sometimes with small tubercles near hind coxae; discrimin almost complete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing (Fig. 17) with two anal veins and two anal cells; medial fleck moderately large, rectangularly-oval, at least partially divided.

Legs (Figs 546–551) with trochanterofemoral attachment subheteromeroid. Femur widest near half length, less than twice as wide as tibia, hardly setose. Tarsi with terminal tarsomere four-five times longer than tarsomere 3. Claws simple or rarely with distinct teeth (Fig. 551). Empodium bisetose. In males sexual characters may be present in all tibiae (Figs 547, 549).

Abdomen with anterior margin of intercoxal process at least weakly emarginate; with five freely articulated ventrites. Ventrite 1 longer than three following ventrites combined; ventrites 2–4 subequal in length. Ventrite 5 may be modified apically in both sexes. Male abdominal segment 8 with sternite very narrow and emarginate at apex (Fig. 652). Male genital segment (Figs 707, 708) with sternite weakly emarginate apically and paired apophyses fused along $\frac{2}{3}$ of their length; dorsal plate undivided.

Aedeagus (Figs 783, 784) stout, moderately long, strongly sclerotized, very weakly curved. Median lobe branched out apically. Tegmen placed at base, strongly reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 834). Ovipositor sclerotized, fused with abdominal segment 8; coxites entirely fused; sternite 8 divided in two lateral, sclerotized plates sometimes connected by membrane and fused with coxites; styli present, small, terminal. Spermatheca small, membranous; sperm duct short, slender; accessory gland very small, elongate, membranous. Bursa copulatrix moderately large, elongate with apical outlet of sperm duct and ventral or lateral (on left side of body) outlet of common oviduct.

Species examined. *I. formosanus* (Csiki), *I. kirbyanus** (Latreille), *I. lineella* (Chapuis), *I. malayanus* Arrow, *I. oblongulus* Fairmaire, *I. pubescens* (Arrow) – 6 of 30 known species.

Distribution. Eastern and South-eastern Asia, Africa and North-eastern Australia.

Lycoperdina Latreille

(Figs 46, 84, 152, 153, 223, 224, 268, 332, 333, 386, 558–561, 655, 709, 710, 785, 786, 835, 883, 884)

Lycoperdina Latreille, 1807: 73. Type species, by monotypy: *Galleruca bovistae* Fabricius, 1792.

Gorgia Mulsant, 1846: 17 (as subgenus). Type species, by monotypy: *Silpha succincta* Linnaeus, 1767.

Lycoperdinella Arrow, 1920b: 23 (nec *Lycoperdinella* Champion, 1913).

Type species, by monotypy: *Lycoperdinella morosa* Arrow, 1920b.

Lycoperdinodes Arrow, 1923: 485. Replacement name for *Lycoperdinella* Arrow, 1920b.

Falsoylaia Pic, 1945: 11. Type species, by monotypy: *Falsoylaia obscurisuturalis* Pic, 1945.

Diagnosis. This genus is most similar to *Hylaia* and *Achuarmychus* in having similar body appearance and the head with well developed gular sutures. The prosternal process strongly reduced with procoxae contiguous and the mesosternal process narrow, with rounded antero-lateral borders and elongate median ridge present in *Lycoperdina* are also shared with *Hylaia*. *Lycoperdina* however can be distinguished from both genera by the antennal club 2-segmented and the ovipositor with apex of proctiger acutely produced backwards. Moreover the mandible with small apical and subapical teeth, the procoxae contiguous, the intercoxal process of mesoventrite with median ridge, the ovipositor with fused coxites and the tegmen with basal piece encircling median lobe at its base separate easily *Lycoperdina* from *Achuarmychus*.

Redescription. Length 3.0–6.0 mm. Body (Figs 883, 884) elongate to ovate, weakly to distinctly convex; shiny, covered with fine and very short pubescence; densely but rather finely, confusedly punctured. Colour black, reddish-black, reddish-brown to light brown, sometimes with black markings on the elytra.

Head almost circular in outline. Gular sutures well developed, widely separated, weakly convergent anteriorly. Eyes moderately large, weakly oval in outline, prominent, very coarsely faceted. Occipital file large, wide basally and narrowing anteriorly. Antenna slightly shorter than a half of body length (Fig. 46), with 2-segmented narrow, loose club; scape almost twice as long as pedicel; antennomere 3 almost as long as pedicel; antennomeres 4–8 subequal in length or gradually shorter; antennomere 9 slightly longer and broader than 8, but narrower and shorter than 10. Clypeus transverse, flat, narrowing from base towards half length, thence parallel, with simple apex. Labrum (Fig. 84) strongly transverse, shortly setose with submembranous, emarginate apex; tormae elongate, with mesal arms straight or recurved posteriorly; labral rods absent or very short, divergent anteriorly. Mandible (Figs 152, 153) broad, strongly concave ventrally, convex dorsally; with small apical tooth and very small, blunt subapical tooth; mola transversely ridged; prosthema covered with sparse, short setae. Maxilla (Fig. 223) with terminal palpomere elongate, subcylindrical, weakly tapering towards apex, and rounded; galea elongate, narrowing towards its apex, densely setose; lacinia (Fig. 224) short and narrow, fringed with rather stiff setae on its inner edge, a few long spinulae and two longest spines below them on dorsal surface; digitus absent. Labium (Fig. 268) with palpi widely separated; palpomere 1 almost square;

palpomere 2 transverse; terminal palpomere ovate or long-oval. Mentum transverse, widest in middle of its length, punctured, covered with several short setae and weakly raised across middle. Prementum transverse, sclerotized, punctured, shortly pubescent anteriorly; ligula densely setose, expanded laterally and emarginate medially at apex.

Prothorax transverse, widest near mid length or at apical third, narrowly bordered laterally. Pronotum (Fig. 332) with anterior margin provided with conspicuous stridulatory membrane; basal sulcus distinct, lateral sulci deep, long and subparallel; anterior angles weakly to distinctly produced, acute or narrowly rounded; posterior angles right-angled or acute; pronotal disc convex. Prosternum with a pair of small pits in front of procoxal cavities; prosternal process (Fig. 333) very narrow and short; front coxae prominent and contiguous. Procoxa circular in outline (Fig. 558); its cavity externally open, and widely closed internally; trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum transverse, most often semicircular in outline. Mesoventrite (Fig. 386) with a pair of large pits near anterior margin; intercoxal process short, narrow, carinate, with sharp, median ridge; narrowly separating mesocoxae, not extending beyond them, reaching about half of their length. Mesocoxa circular in outline (Fig. 559), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knob. Elytron elongate, convex, widest between basal third and mid length, thence strongly tapering towards apex; blunt apically; very densely, finely and irregularly punctured; epipleuron narrow or moderately wide, incomplete at apex. Metaventricle (Fig. 386) transverse, weakly narrowing towards its anterior margin; intercoxal process moderately widely bordered and weakly raised; discrimen moderately long; postcoxal pits sometimes extremely large and deep. Metacoxae weakly transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing well developed, but with reduced venation and with partially divided medial fleck, or shortened with reduced apical field (in both cases CuA2 absent); sometimes wingless.

Legs (Figs 558–561) with trochanterofemoral attachment subheteromeroid. Femur widest in apical third, about twice as wide as tibia, hardly setose, but ventral surfaces of fore and mid femora provided with numerous, obliquely directed short spines. Tarsomeres 1 and 2 comparatively narrowly flattened and ventrally lobed; tarsomere 3 about four times shorter than tarsomere 4. Claws simple. Empodium distinct, bisetose. In males, sexual characters may be found in all tibiae.

Abdomen with five freely articulated ventrites; anterior margin of intercoxal process straight; ventrite 1 as long as 3.5 following ventrites combined; ventrites 2–4 subequal in length; ventrite 5 simple in both sexes. Male

abdominal segment 8 (Fig. 655) with sternite rather well developed and sclerotized at least at apex, weakly emarginate medially. Male genital segment (Figs 709, 710) with sternite weakly emarginate or distinctly asymmetrical at apex; paired apophyses fused near base or near mid length; dorsal plate divided in two sclerotized parts connected by membrane.

Aedeagus (Figs 785, 786) rather stout, moderately long, heavily sclerotized, weakly or distinctly curved. Tegmen placed at base of median lobe, reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 835). Ovipositor moderately sclerotized, with elongate coxites, fused at least partially; styli absent; sternite 8 partially or entirely fused with coxites. Spermatheca and accessory gland membranous; sperm duct short and slender, connected sometimes with stout, membranous connection between spermatheca and accessory gland. Bursa copulatrix moderately large, elongate with apical outlet of sperm duct and lateral outlet of common oviduct. Proctiger produced apically into more or less acute process.

Species examined. *L. apicata* Fairmaire, *L. bovistae** (Fabricius), *L. ferruginea* LeConte, *L. mandarinea* Gerstaecker, *L. maritima* Reitter, *L. morosa* (Arrow) *L. succincta* (Linnaeus), *L. validicornis* Gerstaecker – 8 of 28 known species.

Distribution. Widely distributed in Palaearctic and Nearctic Regions, South Africa and Madagascar.

Malindus Viliers

(Figs 3, 4, 47, 85, 154, 155, 225, 269, 334, 335, 381, 535–540, 656, 711, 712, 787, 788, 836, 885)

Malindus Viliers, 1953: 181. Type species, by original designation: *Malindus excavatus* Viliers, 1953.

Diagnosis. *Malindus* resembles *Avencymon* and *Ancylopus* in general body appearance (long-oval and of moderate size). These genera share also the labrum with median part of basal margin raised and triangularly produced anteriorly. *Malindus* however can be easily separated from both genera in having a very distinctive body colouration, being dark red and the pronotum with anterior angles almost not produced. Moreover the female pronotum with lateral sulci not being connected medially by arcuate ridge, the elytra without maculae and the labrum with sides produced antero-laterally into rounded lobes, separate *Malindus* from *Ancylopus*, while the pronotum less transverse with lateral edges simple, and lateral sulci short and shallow separate it from *Avencymon*.

Redescription. Length 6.5–7.0 mm. Body (Fig. 885) elongate, weakly flattened; shiny, glabrous; confusedly punctured with more or less distinct reticulate microsculpture. Colour dark red with legs, antennae, clypeus, and base, sides and apex of elytra black.

Head (Figs 3, 4) partially retracted in prothorax, weakly transverse, with a pair of weak, elongate concavities between eyes. Eyes large, transversely oval in outline, prominent, coarsely faceted. Occipital file large, broadly-oval, finely ridged. Gular sutures poorly marked, fused medially at base, extending anteriorly as long (almost complete – reaching submentum) median line. Antenna (Fig. 47) longer than half length of body, slender, with 3-segmented, narrow, weakly flattened club; scape about $3 \times$ as long as pedicel and distinctly longer than antennomere 3 and almost as long as 4 and 5 combined; antennomere 3 about $1.5 \times$ longer than antennomeres 4; antennomeres 4 and 5 equal in length; 6–8 gradually slightly shorter; terminal antennomere elongate-oval, truncate at apex. Clypeus large, transverse, flat, widest at base, convergent towards half length, thence parallel with apical margin somewhat pointed medially. Labrum (Fig. 85) sclerotized with membranous anterior margin; strongly transverse, with sides produced antero-laterally into rounded lobes; coarsely and densely punctured, covered with long setae and with a few very long setae on sides; anterior edge emarginate medially, base with median, triangular raised area; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 154, 155) with apex little produced and feebly notched; mola moderately large, finely ridged; prosthema large, membranous, covered with moderately dense and fine setae; submola small, minutely setose, membranous. Maxilla (Fig. 225) with terminal palpomere elongate (more than $1.5 \times$ as long as palpomere 3), cylindrical, blunt at apex; galea large, broadly triangular, densely setose; lacinia short and narrow, tapering, fringed with stiff setae on its inner edge, with two long spines below them and two long spines at apex – both pairs on inner-dorsal surface, and with minute hairs on dorsal surface. Labium (Fig. 269) with palpi close together; palpomere 2 and 3 strongly transverse; terminal palpomere somewhat transversely rectangular with truncate apex. Mentum transverse, widest in mid length, with weakly raised, curved ridge transversely; covered with short, sparse setae and densely reticulate. Prementum very short, sclerotized with ligula formed by short, lateral lobes.

Prothorax transverse, almost rectangular, widest near apical third. Pronotum (Fig. 334) sparsely and shallowly punctured, with very distinct microsculpture; narrowly bordered laterally and moderately widely bordered anteriorly; base distinctly margined; anterior edge with moderately large stridulatory membrane; basal edge weakly sinuate; basal sulcus rather deep, lateral sulci fine, short, weakly divergent anteriorly; anterior angles very weakly produced, rounded; posterior angles almost right-angled; pronotal disc weakly convex with weak median, cross-like concavity near base. Prosternum with small pit in front of each procoxal cavity; prosternal process (Fig. 335) narrow, not extending beyond

front coxae; coxae (Fig. 535) prominent, circular in outline, distinctly separated; their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, comparatively convex, sparsely punctured, rounded apically. Mesoventrite (Fig. 381) with a pair of very small pits near anterior margin and with median, elongate, ridge in front of intercoxal process; with transverse, declivent area in front of each coxa; intercoxal process elongate and narrow, somewhat sinuate posteriorly, with weakly raised, arcuate ridge anteriorly and with raised lateral margins; narrowly separating mesocoxae, extending shortly beyond half of their length. Mesocoxa circular in outline (Fig. 536), its cavity outwardly open; trochantin exposed. Mesometaventral junction with internal knobs. Elytra elongate, weakly arcuate laterally; moderately convex with punctures moderately dense and coarse but shallow and interspaces finely reticulate; sutural stria deep, incomplete at apex; humeri weakly prominent; lateral margins narrowly flattened, visible throughout; apices blunt; basal margin narrowly bordered and raised; epipleuron comparatively wide, incomplete at apex. Metaventrite (Fig. 381) large, transverse, weakly convex and concave along discrimen (especially along posterior half), provided with three pairs of postcoxal pits; scarcely narrowing towards its anterior margin; intercoxal process widely bordered and raised; discrimen long but incomplete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with two anal veins and one anal cell; medial fleck rather small, oval, undivided.

Legs (Figs 535–540) long and comparatively slender; trochanterofemoral attachment heteromeroid. Femur widest near apical third, hardly setose, provided with short rows of obliquely directed short spines on ventral surfaces of fore and mid tibiae; tibia weakly widening towards tarsus; tarsi with terminal tarsomere about 7 times longer than tarsomere 3. Claws simple; empodium distinct, bisetose. Male fore and mid trochanters, and tibiae bear sexual dimorphic characters (Figs 537, 538).

Abdomen with anterior margin of intercoxal process truncate in males and weakly emarginate in females; with five freely articulated ventrites. Ventrite 1 as long as two following ventrites combined; ventrites 2–3 equal in length and ventrite 3 slightly shorter. Ventrite 5 modified in both sexes – in male, excised apically and in female narrowly truncate. Male abdominal segment 8 (Fig. 656) with sternite narrow, irregularly W-shaped, with apical edge sinuate; tergite widely rounded at apex, with very large, submembranous, basal lobes. Male genital segment with sternite moderately large, somewhat emarginate at apex and paired apophyses fused along $\frac{2}{3}$ of their length; dorsal plate undivided, but with submembranous median part (Figs 711, 712).

Aedeagus (Figs 787, 788) stout, moderately long, heavily sclerotized, weakly curved. Median lobe branched out at apex, with apical submembranous gonopore provided with short, stout spines. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 836) fused with abdominal segment 8. Ovipositor sclerotized, with coxites entirely fused, emarginate at apex; styli absent. Sternite 8 sclerotized laterally with membranous middle part, fused with coxites. Spermatheca small, round-oval, membranous; sperm duct moderately long, slender; accessory gland minute, elongate-oval, membranous; outlet of common oviduct lateral and outlet of sperm duct near apex but covered by hood-like, submembranous structure formed by apex of bursa.

Species examined. *M. excavatus** Viliers – monotypic genus.

Distribution. Equatorial Africa (Congo, Cameroon, Guinea).

Microtrycherus Pic

(Figs 40, 86, 156, 157, 226, 227, 270, 336, 337, 382, 552–557, 654, 713, 714, 797, 798, 837)

Microtrycherus Pic, 1937: 488. Type species, by monotypy: *Microtrycherus luteosignatus* Pic, 1937.

Diagnosis. The spermatheca lacking the accessory gland appears to be a unique character for *Microtrycherus*, *Chetryrus* and *Trycherus*. These genera share also the very similar body shape and the colouration. *Microtrycherus* however can be distinguished from *Chetryrus* and *Trycherus* in having the base of elytra much wider than the base of the pronotum, the maxillary galea short, bluntly rounded at apex and the terminal maxillary palpomere about as long as wide.

Redescription. Length 8.0–10.0 mm. Body (Fig. 886) elongate-oval to broad-oval, moderately convex, shiny, glabrous or minutely pubescent; confusedly punctured with interspaces densely reticulate. Colour dark brown to black with contrasting (yellow or orange) markings on the elytra.

Head rather deeply retracted in prothorax, transverse. Eyes very large, oval in outline, very prominent, coarsely faceted. Gular sutures fused medially at base and extending anteriorly as moderately long, slender median line. Occipital file reduced, very small, finely ridged, sometimes occiput provided only with coarse reticulation.

Antenna (Fig. 40) shorter than half length of body, moderately slender, with 3-segmented, narrow, weakly flattened, loose club; scape almost 2 × longer than pedicel and subequal with antennomere 3; antennomere 3 about 1.5 × as long as antennomere 4; antennomere 4 slightly longer than 5; antennomeres 5–8 equal in length; terminal antennomere short, transversely-oval, weakly

rounded at apex. Clypeus transverse, flat, widest at base, convergent from base toward basal third, thence parallel or weakly divergent toward apex, with weakly arcuate anterior edge. Labrum (Fig. 86) strongly transverse, sclerotized with small, median, membranous area at apex; densely and moderately coarsely punctured, covered with rather short setae; anterior edge simple to weakly truncate, basal margin with median, triangular, raised area; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 156, 157) moderately broad, strongly concave ventrally, convex dorsally with sharp, elongate ridge; shallowly notched at apex forming two apical teeth and with slightly smaller, blunt, subapical tooth; mola large, finely ridged; prostheca moderately broad, membranous, finely setose. Maxilla (Fig. 226) with terminal palpomere elongate, subcylindrical or subquadrate, widest near mid length (about 1.5 × longer than palpomeres 3), truncate at apex; palpomeres 2 and 3 transverse; galea moderately large, elongate with blunt apex, densely setose apically; lacinia (Fig. 227) moderately long and narrow, weakly tapering, with comb of long setae on inner edge, with row of moderately long spines on dorsal surface and three longest spines below them. Labium (Fig. 270) with palpi close together; palpomeres 2 and 3 strongly transverse; terminal palpomere truncate at apex. Mentum transverse, widest near posterior third, somewhat pentagonal, finely setose, more or less concave medially, and densely reticulate posteriorly. Prementum very short, moderately sclerotized with ligula in form of small, submembranous, lateral lobes.

Prothorax strongly transverse, widest near anterior third or at base, distinctly narrower than base of elytra. Pronotum (Fig. 336) rather densely and moderately coarsely to very coarsely punctured and densely reticulate; sides sinuate with distinct constriction near basal third; lateral margins moderately widely bordered; anterior margin narrowly bordered with stridulatory membrane reduced, sometimes only with strong thickening in middle of anterior edge; basal sulcus present, moderately deep, lateral sulci linear, subparallel, rather short and deep; anterior angles produced forwards, blunt; posterior angles weakly acute; pronotal disc moderately convex, in males sometimes with median, longitudinal concavity in posterior half. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 337) moderately wide, distinctly separating procoxae; almost parallel-sided with sides weakly bordered and apex narrowly rounded, extending distinctly beyond procoxae; coxae prominent, circular in outline (Fig. 552); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, widest at base, thence shortly convergent, then almost parallel-sided, widely rounded to almost truncate at apex. Mesoventrite (Fig. 382) moderately carinate, with a pair of pits near anterior margin; intercoxal process somewhat pentagonal,

longer than wide, widely separating mesocoxae, angulate anteriorly and truncate to weakly emarginate posteriorly, with weakly raised borders and weakly convex medially; extending slightly beyond half length of coxae. Mesocoxa circular in outline (Fig. 554), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with small internal knobs. Elytra broadly-oval, widest near half length, convex, blunt at apices, with punctures moderately dense and coarse; densely reticulate; humeri scarcely prominent; lateral margins moderately widely flattened, visible from above almost through; epipleuron comparatively wide, incomplete at apex. Metaventricle (Fig. 382) large, strongly transverse, weakly convex, narrowing towards its anterior margin which is moderately widely bordered and raised, provided with two pairs of rather small postcoxal pits; discripen long but incomplete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck moderately large, almost rectangular in shape, divided.

Legs (Figs 552–557) moderately long and rather stout; trochanterofemoral attachment heteromeroid. Femur widest near mid length, less than twice as wide as tibia, hardly setose, with row of rather sparse, obliquely directed short spines on ventral surface of fore and mid femora; terminal tarsomere about six–seven times longer than tarsomere 3. Claws simple, hollowed along inner edge. Empodium small, bisetose. Male trochanters provided with erect setae; inner edge of mid and hind femora fringed along basal half; fore tibiae weakly curved before apex and provided with small tooth (Figs 553).

Abdomen with anterior margin of intercoxal process weakly emarginate; with five freely articulated ventrites. Ventrite 1 longer than two following ventrites combined; ventrites 2–4 equal in length or ventrite 4 sometimes slightly shorter. Ventrite 5 may be weakly modified at apex in both sexes. Male abdominal segment 8 (Fig. 654) compactly connected with genital segment; sternite narrow, divided in two sclerotized, lateral parts connected medially by very narrow membranous belt; tergite widely truncate at apex in both sexes, provided with large, lateral, submembranous plates at base (in females these plates smaller). Male genital segment (Figs 713, 714) with sternite narrow, emarginate at apex; paired apophyses fused along $\frac{2}{3}$ of their length; dorsal plate undivided, but with submembranous, median connection.

Aedeagus (Figs 797, 798) moderately long and stout, sclerotized, strongly curved near base. Median lobe without apical branches. Tegmen moderately large, placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 837) fused with abdominal sternite 8. Ovipositor elongate, sclerotized, with coxites entirely fused, truncate apically; sternite 8 entirely fused with coxites; styli absent. Spermatheca small, mem-

branous, elongate-oval; sperm duct moderately long, slender; accessory gland absent. Bursa copulatrix moderately large, long and narrow with dorso-apical outlet of common oviduct and apical outlet of sperm duct.

Species examined. *M. luteosignatus** (Pic), *M. rugicollis* (Strohecker) – 2 of 4 known species.

Distribution. Central Africa.

Mycetina Mulsant

(Figs 7, 49, 87, 158, 159, 230, 231, 271, 342, 343, 383, 562–566, 644, 715, 716, 793, 794, 838, 887–889)

Mycetina Mulsant, 1846: 15. Type species, by monotypy: *Chrysomela cruciata* Schaller, 1783.

Mycetina Pic, 1929: 35 (as subgenus). Type species, by monotypy: *Pseudindalmus testaceitarsis* Pic, 1926: 35.

Phaeomychus Gorham, 1887: 649. Type species, by original designation: *Endomychus rufipennis* Motschulsky, 1860: 18.

Diagnosis. This genus resembles *Pseudindalmus* possessing the antennae stout, the prosternal process long and rather narrow, the intercoxal process of mesoventrite trapezoidal in shape and the pronotum with sides parallel from base to about mid length thence rounded to the front angles, with short triangular lateral sulci. *Mycetina* however can be separated from *Pseudindalmus* by having antennomere 9 smaller than 10 in both sexes, without tendency for bulbous enlargement in males, the intercoxal process of mesoventrite distinctly shorter, the terminal labial palpomere as long as wide or weakly elongate, the elytra short (less elongate) and the metaventricle without femoral lines.

Redescription. Length 3.3–6.0 mm. Body (Figs 887–889) elongate-oval to short-oval, moderately convex, shiny, glabrous or rarely finely pubescent; confusedly punctured with interspaces on pronotum and elytra sometimes finely reticulate. Colour light brown, reddish-brown or black, often with contrasting markings on the elytra or sometimes bicoloured (e.g. pronotum and elytra of different colour).

Head partially retracted in prothorax, weakly transverse. Eyes moderately large, weakly oval in outline, prominent, moderately coarsely faceted. Occipital file large, transverse, finely ridged. Postoccipital suture present. Gular sutures fused medially at base and extending anteriorly as long, slender median line. Antenna (Fig. 49) stout, distinctly shorter than half length of body, with 3-segmented, moderately wide and weakly flattened, loose or somewhat compact club; scape almost 3 × as long as pedicel and 1.5 × as long as antennomere 3; antennomere 3 slightly longer than 4; antennomeres 4–5 and 6–8 often subequal in length; antennomeres 2 and 6–8 most often at most as long as wide; terminal antennomere weakly transversely oval. Clypeus transverse, flat, widest at base, convergent from base toward basal third, thence parallel. Labrum (Fig. 87) strongly transverse, sclerotized

with membranous apex; anterior edge of sclerotized part truncate, and of membranous part deeply emarginate medially; moderately coarsely and rather sparsely punctured, covered with rather short setae and with brushes of long setae on sides of anterior margin; tormae elongate, with mesal arms recurved posteriorly; labral rods short, subparallel. Mandible (Figs 158, 159) moderately broad, strongly concave ventrally, convex dorsally with sharp, curved, elongate ridge; most often sharply cleft at tip forming moderately large, apical and subapical teeth, sometimes with sharp, apical tooth and numerous fine teeth below; mola moderately large, finely ridged; prosthema narrow, membranous, densely setose; submola very small. Maxilla (Fig. 230) with palpomeres 2 and 4 distinctly longer than wide; terminal palpomere about $2 \times$ as long as palpomere 3, subcylindrical, weakly tapering and narrowly rounded at apex; galea broadly triangular, moderately densely setose apically; lacinia (Fig. 231) short and narrow, tapering, fringed with stiff setae on its inner edge, with row of moderately long spines on dorsal surface and one longest spine below them. Labium (Fig. 271) with palpi close together; palpomere 2 strongly transverse; terminal palpomere cylindrical, as long as wide or weakly elongate, blunt or truncate at apex. Mentum transverse, widest anteriorly, flat; covered with sparse and short pubescence; anterior margin at least weakly acutely produced forwards in mid length. Prementum short, moderately sclerotized with ligula weakly lobed at sides, submembranous, truncate at apex.

Prothorax most often almost as wide as base of elytra, strongly transverse, nearly parallel-sided from base to near mid length, thence tapering anteriorly and produced into blunt anterior angles. Pronotum (Fig. 342) very finely to moderately coarsely punctured; narrowly to moderately widely bordered laterally; anterior edge with large stridulatory membrane (Fig. 7); basal sulcus deep with large pits on sides; lateral sulci triangular (wide at base and narrowing anteriorly), deep and comparatively long; posterior angles right-angled or weakly acute, pronotal disc convex. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 343) moderately wide, extending distinctly beyond coxae, with lateral margins widely bordered, most often parallel-sided; truncate or rounded at apex; front coxae prominent, circular in outline (Fig. 562); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum with scutellum rather small, flat, weakly transverse, with truncate, rounded or weakly acute apex. Mesoventrite (Fig. 383) carinate, with oval median concavity, normally covered by apical part of prosternal process; provided with a pair of pubescent pits near anterior margin; intercoxal process moderately widely separating mesocoxae, more or less trapezoidal, at most as long as wide; flat, truncate posteriorly; extending to about half length of coxae. Mesocoxa circular in outline, its cavity outwardly open;

trochantin exposed. Meso-metaventral junction with broad internal knob. Elytra almost parallel-sided or widest near basal third, short-oval, moderately convex, blunt or weakly rounded at apices with punctures rather moderately dense and fine; epipleuron moderately wide, incomplete at apex; lateral margins narrowly or moderately widely flattened, visible from above almost throughout; humeri weakly to distinctly prominent. Metaventrite (Fig. 383) strongly transverse, weakly convex, narrowing towards its anterior margin which is rather narrowly bordered and very weakly raised, provided with one pair of pubescent, postcoxal pits; discrimen reaching about mid length of metaventrite. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with short stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck comparatively large, roundly-oval, partially divided.

Legs (Figs 562–566) with trochanterofemoral attachment subheteromeroid. Femur widest near apical third or mid length, slender at base, less than twice as wide as tibia, hardly setose, with row of rather weak, obliquely directed, short spines on ventral surfaces of at least fore femora; tibia and tarsus rather densely setose. Terminal tarsomere 7–8 times longer than tarsomere 3. Claws simple. Empodium small with two short setae. Male tibiae bear characters of sexual dimorphism (Figs 563, 564).

Abdomen with anterior margin of intercoxal process straight; with five freely articulated ventrites. Ventrite 1 slightly shorter than metaventrite and longer than three following ventrites combined, with anterior edge narrowly bordered and weakly raised; ventrites 2–4 subequal in length or gradually slightly shorter. Ventrite 5, in male sometimes weakly emarginate at apex. Male abdominal segment 8 (Fig. 644) with sternite narrow, somewhat W-shaped; tergite widely rounded at apex. Male genital segment (Figs 715, 716) with sternite moderately large, in form of two, lateral, sclerotized parts with median membranous connection, weakly emarginate at apex; paired apophyses fused throughout; dorsal plate divided in two lateral parts connected by membrane.

Aedeagus (Figs 793, 794) short to moderately long, slender to stout, strongly sclerotized, straight to moderately curved near base or near apex. Median lobe most often branched out apically. Tegmen obsolete, fused with base of median lobe.

Female genitalia (Fig. 838) at least compactly connected with sternite 8. Ovipositor sclerotized with coxites well developed, separated; styli absent. Spermatheca moderately large, elongate-oval, membranous; sperm duct short, slender; accessory gland very small, elongate, membranous. Bursa copulatrix moderately large, elongate with apical outlet of sperm duct and medio-ventral outlet of common oviduct.

Species examined. *M. apicalis* Motschulsky, *M. cruciata* (Schaller), *M. cyanescens* Strohecker, *M. marginalis*

(Gebler), *M. perpulchra* (Newman), *M. pulchella* Arrow, *M. rufipennis* (Motschulsky), *M. testaceitarsis* (Pic), *M. turneri* Arrow – 9 of 66 known species.

Distribution. Widely distributed in Holarctic, Oriental and Afrotropical Regions.

Ohtaius Chûjô

(Figs 50, 92, 160, 161, 228, 229, 272, 338, 339, 384, 567–573, 638, 717, 718, 799, 800, 842, 890)

Ohtaius Chûjô, 1938: 398 (as subgenus of *Brachytrycherus* Arrow, 1920b). Type species, by original designation: *Brachytrycherus mushanus* Ohta, 1931.

Ohtaius. Strohecker 1964: 324.

Diagnosis. The species of *Ohtaius* are most similar to those of *Brachytrycherus* and *Gerstaeckerus* in having the body black or blackish-brown with elytra decorated most often with orange or yellow, transverse bands. The mandible with widely chisel-shaped apex is also shared by these genera. *Ohtaius* however can be separated from *Brachytrycherus* in having the body more elongate, the head lacking well developed, separated gular sutures and the intercoxal process of mesoventrite widening apically and covering part of coxae. The maxillary lacinia provided with tuft of S-like setae at apex along with a row of long, stout spines, subequal in length, and the femora provided with fringe of long hairs on inner surface can distinguish *Ohtaius* from *Gerstaeckerus*.

Redescription. Length 8.0–11.0 mm. Body (Fig. 890) elongate-oval, subparallel, convex, shiny, glabrous or finely to distinctly pubescent; confusedly punctured with interspaces smooth or sometimes with weak reticulation. Colour brownish-black or black with yellow or orange, transverse bands on elytra.

Head rather deeply retracted in prothorax, transverse, with two elongate, shallow concavities between eyes. Eyes rather large, transversely oval, prominent, and coarsely faceted. Occipital file large, finely ridged. Gular sutures confluent medially at base and extending anteriorly as slender, rather short median line. Antenna as long as half length of body, rather stout (Fig. 50) with 3-segmented, narrow or moderately wide, weakly flattened, loose club; scape about 1.5 × as long as pedicel and almost as long as antennomere 3; antennomere 3 about 1.5 × as long as antennomere 4; antennomeres 4–6 equal in length, scarcely longer than antennomeres 7 or 8; terminal antennomere about as long as wide, bluntly rounded at apex. Clypeus strongly transverse, flat, widest at base, narrowing towards basal third, thence parallel with apical margin straight. Labrum (Fig. 92) sclerotized with membranous apex; strongly transverse, moderately densely punctured, covered with rather short setae and with a few long setae on sides of anterior margin; anterior edge of both – membranous and sclerotized parts truncate; tormae elongate, with mesal arms recurved anteriorly;

labral rods slender, moderately long, widely divergent anteriorly. Mandible (Figs 160, 161) with strong, chisel-shaped apex and moderately large, blunt subapical tooth; mola large, finely ridged; prosthema large, membranous, moderately densely setose; submola comparatively large, setose, membranous. Maxilla (Fig. 228) with terminal palpomere elongate, weakly tapering, blunt at apex, at least 1.5 × as long as palpomere 3 and slightly longer than 2; galea moderately large, long-oval, bluntly rounded and covered with dense, long setae at apex; lacinia (Fig. 229) as large as galea, not tapering, bluntly rounded at apex, with tuft of somewhat S-shaped, apical spines, row of setae on its inner edge and row of long spines on inner-dorsal edge. Basistipes provided with small setose tubercle. Labium (Fig. 272) with palpi rather close together; palpomeres 2 and 3 strongly transverse; terminal palpomere truncate at apex. Mentum transverse, flat, widest near half length, covered with short, sparse, suberect setae, with interspaces densely reticulate. Prementum short, moderately sclerotized with ligula weakly lobed at sides, somewhat emarginate medially at apex.

Prothorax strongly transverse, widest near anterior third, sometimes at base or sides almost parallel. Pronotum (Fig. 338) comparatively widely bordered laterally and anteriorly; basal margin also bordered; anterior edge with conspicuous and weakly prominent stridulatory membrane; basal sulcus deep, weakly sinuate, lateral sulci linear, weakly arcuate or subparallel, deep and long; anterior angles produced, blunt or rounded, posterior angles weakly acute or right-angled; pronotal disc moderately convex sometimes with median tubercle; lateral areas of uneven surface; puncturation moderately dense and coarse with interspaces finely reticulate, especially on sides (disc without microsculpture). Prosternum with a pair of small pits in front of procoxal cavities; prosternal process (Fig. 339) moderately wide, narrowly rounded at apex, extending at least to posterior margin of front coxae; coxae prominent, circular in outline (Fig. 567); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, weakly convex, strongly transverse, angulate at base, widely rounded apically, sparsely punctured. Mesoventrite (Fig. 384) carinate, with a pair of large, deep pits near anterior margin, and with transverse, declivent area in front of each coxa; intercoxal process transverse, bordered anteriorly by weakly arcuate ridge and sinuate posteriorly, with lateral edges weakly raised and median area of uneven surface; widely separating mesocoxae, extending slightly beyond half of their length, widening laterally at apex and overlapping part of coxae. Mesocoxa circular in outline (Fig. 569), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra elongate-oval, almost parallel-sided; rounded at apices; convex, with basal margins moderately widely bordered and raised;

humeri weakly prominent; puncturation moderately coarse and rather dense with interspaces rather smooth; lateral margins narrowly flattened, visible from above almost throughout; epipleuron comparatively wide, complete. Metaventrite (Fig. 384) strongly transverse, convex (weakly concave along discrimen), narrowing anteriorly; anterior margin moderately widely bordered and distinctly raised (especially between coxae); provided with three pairs of postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing two anal veins and one anal cell; medial fleck moderately large, almost rectangular in shape, undivided.

Legs (Figs 567–573) long and rather stout with trochanterofemoral attachment heteromeroid. Femur more or less clubbed, moderately slender at base, hardly setose but ventral surfaces of fore and mid femora provided with rows of obliquely directed short spines; tarsi with terminal tarsomere about 8–9 times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium very distinct, bisetose. Male hind femur and tibia fringed with long setae, at least along apical half (Figs 572, 573); fore tibiae (sometimes also mid and hind) with distinctly marked sexual characters – curvatures and/or small teeth (Fig. 568).

Abdomen with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined with narrow, postcoxal concavities and sometimes also with postcoxal pits and with anterior margin of intercoxal process weakly emarginate medially; ventrites 2–3 equal in length, ventrite 4 slightly shorter. Ventrite 5 in male with transverse, bilobed tubercle, in female simple or weakly modified at apex (emarginate or somewhat truncate). Male abdominal segment 8 with sternite very narrow, somewhat W-shaped, (Fig. 638), emarginate at apex; tergite widely rounded apically with two large, lateral, submembranous plates at base. Male genital segment (Figs 717, 718) with sternite narrow, asymmetrically, strongly emarginate at apex; paired apophyses fused along $\frac{1}{2}$ of their length with distinct, elongate ridge on ventral surface along fused part, dorsal plate undivided; additional, internal, somewhat V-shaped sclerite present.

Aedeagus (Figs 799, 800) short and stout, heavily sclerotized, almost straight. Median lobe branched out apically. Tegmen placed near base, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 842) fused with abdominal segment 8. Sternite 8 visible as lateral sclerotized, wing-shaped, processes; tergite 8 emarginate at apex and compactly connected with tergite 9. Ovipositor sclerotized, with coxites entirely fused; styli absent. Spermatheca small, rounded, membranous; sperm duct short, slender; accessory gland small, elongate-oval, membranous. Bursa copulatrix moderately large with lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *O. annularis* (Gerstaecker), *O. lunulatus* (Gerstaecker), *O. mushanus** (Ohta), *O. signifer* (Gorham) – 4 of 8 known species.

Distribution. Oriental Region.

Parindalmus Achard

(Figs 51, 88, 162, 163, 232, 233, 273, 340, 341, 387, 574–579, 640, 719, 720, 791, 792, 841, 891)

Parindalmus Achard, 1922: 29. Type species, by monotypy: *Parindalmus tonkineus* Achard, 1922.

Pedanus, Gerstaecker, 1857: 230 (nec *Pedanus* Fischer de Waldheim, 1829). Type species, by subsequent designation of Arrow (1925: 319): *Pedanus quadrilunatus* Gerstaecker, 1857.

Diagnosis. The species of *Parindalmus* resemble those of *Indalmus* in having similar body shape and colouration. The pronotum much narrower than base of the elytra, the labrum with sides produced antero-laterally into rounded lobes, the mandible without apical teeth, the labial palp appearing 2-segmented, the mid and hind femora of males provided with fringe of long hairs on inner surface, and the hind margin of male metaventrite with large appendages (Fig. 387) (in most cases) can easily distinguish *Parindalmus* from *Indalmus*.

Redescription. Length 7.0–9.0 mm. Body (Fig. 891) long oval, highly convex, somewhat pear-shaped with thorax relatively small, shiny, finely and moderately sparsely setose; covered by fine, reticulate microsculpture along with rather dense and moderately coarse, confused punctures. Colour brownish black or black with two yellow or orange maculae on each elytron.

Head partially retracted in prothorax, weakly transverse, somewhat concave between antennal sockets. Gular sutures fused medially at base and extending anteriorly as slender, long median line. Eyes large, oval in outline, prominent, moderately coarsely faceted. Occipital file large, broad basally and acutely produced anteriorly, finely ridged. Antenna long (about as long as half of body length) and rather slender (Fig. 51) with 3-segmented, rather narrow, moderately compact, flattened club; scape almost 3 × as long as pedicel and equal in length with antennomere 3 or longer; antennomere 4 about 1.5 × shorter than 3 and slightly longer than antennomere 5; antennomeres 5–8 subequal; antennomeres 9 and 10 with anterior, inner angles somewhat produced internally; terminal antennomere truncate at apex. Clypeus transverse, flat, widest at base, convergent toward basal third thence parallel, weakly produced and pointed medially at apex. Labrum (Fig. 88) emarginate medially at apex; strongly transverse, produced antero-laterally into rounded lobes; sclerotized with lateral, membranous insertions and sometimes membranous in middle of anterior margin; rather coarsely punctured, covered with long, sparse, differently directed, curved apically setae and with lateral tufts of long setae; tormae elongate, with

mesal arms recurved posteriorly; labral rods slender, divergent anteriorly; base with small triangularly raised area. Mandible (Figs 162, 163) hemicycloid with rounded apex without teeth; mola large, strongly sclerotized, finely ridged; prostheca large, moderately wide, membranous, covered densely with short setae. Maxilla (Fig. 232) with palpomere 2 longest (nearly twice as long as palpomere 3 or 4), terminal palpomere subcylindrical, truncate at apex; galea broadly triangular, covered with dense, short setae; lacinia (Fig. 233) half as long as galea, very narrow, tapering, fringed with stiff setae on its inner edge, with two rows of short spinulae and one very long spine below them, on dorsal surface. Labium (Fig. 273) with palpi closely separated, short and compact, with palpomeres 1 and 2 fused, transverse; terminal palpomere large, transverse, truncate at apex, provided with tuft of long setae on anterior, inner edge. Mentum transverse with short, lateral lobes near base, covered with several long setae. Prementum short, moderately sclerotized; ligula membranous, transverse, lobed at sides, emarginate at apex.

Prothorax strongly transverse but distinctly narrower than base of elytra, almost always widest near apical third – nearly parallel in front and weakly contracted behind. Pronotum (Fig. 340) narrowly bordered laterally and anteriorly; basal margin straight; anterior edge with large stridulatory membrane; basal sulcus deep, lateral sulci well marked and long (reaching about mid length of pronotum), linear; anterior angles more or less produced, blunt or rounded; posterior angles right-angled or weakly acute; pronotal disc moderately convex. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 341) narrow, shortly extending beyond coxae, rounded at apex; front coxae prominent, circular in outline (Fig. 574); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum moderately large, transverse, with apex truncate or widely rounded. Mesoventrite (Fig. 387) with a pair of pits near anterior margin; with median tubercle or ridge anteriorly; intercoxal process somewhat pentagonal, longer than wide, comparatively widely separating mesocoxae, extending slightly beyond half length of coxae, weakly angulate anteriorly and concave in basal half, with raised borders. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near apical third, long-oval, convex, blunt or weakly rounded at apices with punctures rather dense, moderately coarse and irregular; epipleuron rather narrow, incomplete at apex; humeri prominent; narrow, reflexed margins visible at least from basal fifth to apical fifth. Metaventrite (Fig. 387) large, transverse, weakly convex, gradually narrowing anteriorly; in male often with a pair of characteristic appendages on hind margin, between hind coxae; anterior margin rather narrowly bordered but intercoxal process convex, provided with three pairs of small, postcoxal pits; discri-

men almost complete. Metacoxae transverse, widely separated, almost perpendicular to metasternum; femoral lines absent. Metendosternite with rather long stalk, widely separated anterior arms and moderately widely separated tendons. Hind wing with one anal vein and two anal cells; medial fleck rather large, rectangularly-oval, divided.

Legs (Figs 574–579) with trochanterofemoral attachment heteromeroid. Femur long and clavate, very slender at base, hardly setose but dorsal and ventral surfaces of fore femur and ventral surface of mid femur bear rows of obliquely directed short spines; tibia and tarsus densely setose. Tarsi with tarsomeres 1 and 2 strongly flattened and broadly lobed ventrally; terminal tarsomere at least 11 times longer than tarsomere 3. Claws simple, hollowed along inner edge. Empodium distinct, elongate with two setae. Mesotibiae of males with small tooth near apical third (Fig. 578); hind trochanters sometimes very long, produced in rounded lobe (Fig. 575).

Abdomen with anterior margin of intercoxal process more or less distinctly emarginate medially; with five freely articulated ventrites. Ventrite 1 at least as long as two following ventrites combined; ventrites 2–4 subequal in length. Ventrite 5 may be modified apically in both sexes (e.g. emarginate and weakly concave). Male abdominal segment 8 (Fig. 640) with sternite very narrow, sinuate; tergite with large, lateral, membranous, basal lobes. Male genital segment (Figs 719, 720) with sternite emarginate apically and paired apophyses fused along at least $\frac{1}{3}$ of their length; dorsal plate undivided, sclerotized.

Aedeagus (Figs 791, 792) short and stout, strongly sclerotized, weakly curved. Median lobe with long, pointed apical branch. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 841). Ovipositor fused with abdominal segment 8; moderately sclerotized, with coxites entirely fused, weakly rounded or emarginate apically; sternite 8 divided in two lateral, sclerotized plates connected medially by membrane and fused with coxites; styli small; tergite 8 somewhat truncate at apex, compactly connected with genital segments. Bursa copulatrix large with dorso-apical outlet of sperm duct and ventro-apical outlet of common oviduct. Spermatheca slightly larger than accessory gland – both small, membranous; sperm duct long and slender.

Species examined. *P. quadrilunatus* (Gerstaecker), *P. tonkineus** Achard – 2 of 5 known species.

Distribution. Oriental Region.

Platindalmus Strohecker

(Figs 52, 95, 164, 165, 166, 234, 274, 344, 345, 388, 580–587, 639, 721, 722, 789, 790, 839, 892)

Platindalmus Strohecker, 1979: 290. Type species, by original designation: *Eumorphus calcaratus* Arrow, 1920a.

Diagnosis. *Platindalmus* appears to be closely related to *Eumorphus*. Apart from very similar body appearance, both genera share many characters, including labial structures and the female genitalia fused not only with segment 8 but also compactly connected with at least sternite 7. *Platindalmus* however differs from *Eumorphus* in having the intercoxal process of mesoventrite almost flat, the lateral margins of the pronotum simple, the male abdominal ventrites each with setose tubercles, and the male mid and fore femora provided with fringes of long hairs on inner edges.

Redescription. Length 7.0–8.0 mm. Body (Fig. 892) broad-oval, moderately convex, shiny, glabrous; covered with dense and fine reticulate microsculpture; punctures moderately dense, rather fine, confused. Colour black with four yellow spots on elytra.

Head partially retracted in prothorax, weakly transverse, with two elongate concavities between eyes. Eyes moderately large, transversely oval in outline, prominent, coarsely faceted. Occipital file moderately large, long-oval, finely ridged. Gular sutures fused medially at base and extending anteriorly as slender, short median line. Antenna about as long as half of body length and moderately slender (Fig. 52) with 3-segmented, weakly flattened and moderately broad club; scape at least twice as long as pedicel; antennomere 3 strongly elongate, about $3 \times$ as long as pedicel and almost twice as long as antennomere 4; antennomeres 4–8 gradually scarcely shorter. Clypeus transverse, flat, widest at base, arcuately convergent toward basal third, thence parallel; anterior margin somewhat pointed in middle. Labrum (Fig. 95) sclerotized with membranous apex; strongly transverse, moderately coarsely punctured, covered with long, erect setae and with tufts of long setae on sides; anterior edge weakly emarginate; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 164, 165) with large and strong, narrowly chisel-shaped apical tooth (large, hook-like apical tooth observed in one of eight examined specimens) (Fig. 166) and moderately large subapical tooth; mola large, well-developed, finely ridged; prosthema moderately broad, membranous, covered with dense and rather long setae. Maxilla (Fig. 234) with terminal palpomere elongate (slightly longer than palpomere 3), tapering towards apex, blunt apically; galea large, broadly triangular, densely setose; lacinia short and narrow, blunt at apex, fringed with stiff setae on apex and inner edge, with dense and rather irregularly arranged short spinulae/ hairs and three long spines somewhat below them, on dorsal surface. Labium (Fig. 274) with palpi close together; palpomere 2 strongly transverse; terminal palpomere transversely rectangular, truncate at apex. Mentum transverse, widest near mid length with arcuate anterior edge and weakly concave medially; covered with rather short and sparse setae. Prementum very short, moderately sclerotized with ligula produced into long, lateral lobes.

Prothorax transverse, widest near apical third. Pronotum (Fig. 344) narrowly bordered laterally and anteriorly; anterior edge with conspicuous stridulatory membrane; basal sulcus deep, lateral sulci linear, subparallel, moderately deep and long; anterior angles produced, blunt; posterior angles right-angled; pronotal disc slightly convex. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 345) moderately broad, weakly rounded apically, extending shortly beyond front coxae and separating them distinctly; front coxae prominent, circular in outline (Fig. 580); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, strongly transverse, semicircular, not angulate, comparatively coarsely punctured. Mesoventrite (Fig. 388) with a pair of small pits near anterior margin; intercoxal process subquadrate, flat with side and front edges raised; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline (Fig. 581), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra widest near mid length, thence abruptly rounded and blunt apically; convex with punctures dense but rather fine; humeri almost flat; comparatively narrowly flattened lateral margins visible almost throughout; epipleuron moderately wide, incomplete at apex. Metaventricle (Fig. 388) large, transverse, weakly convex on sides of discrimen, especially near hind coxae; scarcely narrowing towards its anterior margin which is moderately widely bordered and distinctly raised; provided with two pairs of postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with two anal veins and two anal cells; medial fleck moderately large, almost rectangular, divided.

Legs (Figs 580–587) long and comparatively slender; trochanterofemoral attachment heteromeroid. Femur widest near half length, hardly setose but ventral surfaces of fore and mid femora bear long rows of obliquely directed, moderately long, suberect spines; tibia and tarsus rather densely setose; tibia weakly widening towards tarsus; tarsi with terminal tarsomere 8–9 times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium with two short setae. Male fore tibia with stout, broadly triangular tooth on inner edge, near apical third (Fig. 586); male hind tibia (Fig. 584) with apical, acutely triangular lobe directed mesad and fringed with setae; female hind tibia with somewhat similar lobe, but much shorter and rather rounded at apex, not directed mesad (Fig. 583); male mid and hind femora with long, fringe-like setae along inner edge, almost throughout (Fig. 582).

Abdomen with anterior margin of intercoxal process weakly emarginate; with five freely articulated ventrites.

Ventrite 1 almost as long as three following ventrites combined; ventrites 2–4 subequal in length. Ventrite 5 emarginate apically in both sexes, each ventrite of male bears tuft of dense and rather long setae along middle. Male abdominal segment 8 (Fig. 639) with sternite very narrow and strongly emarginate at apex; tergite rounded apically with large, membranous, basal lobes. Male genital segment (Figs 721, 722) with sternite weakly emarginate at apex and paired apophyses fused along $\frac{2}{3}$ of their length; dorsal plate undivided.

Aedeagus (Figs 789, 790) stout, moderately long, heavily sclerotized, very weakly curved. Median lobe weakly branched out at apex. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut short.

Female genitalia (Fig. 839) fused with abdominal segment 8 and at least with sternite 7. Ovipositor sclerotized, with coxites entirely fused, weakly emarginate at apex; sternite 8 divided in two lateral, sclerotized plates and fused with coxites; styli absent. Spermatheca very small, oval, membranous; sperm duct short, slender; accessory gland small, elongate-oval, membranous. Bursa copulatrix moderately large with dorso-apical outlet of sperm duct and ventro-apical outlet of common oviduct.

Species examined. *P. calcaratus calcaratus** (Arrow) – monotypic genus (incl. 2 subspecies of the type species).

Distribution. Oriental Region (Laos, Vietnam).

Pseudindalmus Arrow

(Figs 19, 53, 94, 167, 168, 235, 275, 346, 347, 393, 588–592, 641, 723, 724, 801, 802, 840, 893)

Pseudindalmus Arrow, 1920a: 330. Type species, by monotypy: *Pseudindalmus tonkinensis* Arrow, 1920a.

Falsodanaë Pic, 1940: 11. Type species, by monotypy: *Falsodanaë rufonotata* Pic, 1940.

Diagnosis. Most similar to *Mycetina* in having stout antennae, long and moderately wide prosternal process, trapezoidal intercoxal process of mesoventrite, the pronotum with sides parallel from base to about mid length thence rounded to the front angles, and with short triangular lateral sulci. *Pseudindalmus* however is easily distinguished from *Mycetina* by its male antennomere 9 larger than 10 with tendency for bulbous enlargement, the intercoxal process of mesoventrite distinctly longer, the terminal labial palpomere transverse, the elytra more elongate and the mataventrite with femoral lines.

Redescription. Length 5.0–7.0 mm. Body (Fig. 893) elongate-oval, weakly to moderately convex, shiny, glabrous; confusedly punctured with interspaces on pronotum and sometimes on elytra finely reticulate. Colour dark brown to black, always with contrasting (yellow or red) markings on the elytra.

Head comparatively deeply retracted in prothorax, weakly transverse. Eyes large, oval in outline, prominent,

coarsely faceted. Occipital file large, elongate, somewhat trapezoidal in shape. Gular sutures fused medially at base and extending anteriorly as slender, long median line. Antenna at least as long as $\frac{1}{3}$ length of body, comparatively stout (Fig. 53) with 3-segmented, moderately wide and very weakly flattened, loose club; antennomere 9 in male with tendency to bulbous enlargement, sometimes large, swollen; scape about twice as long as pedicel and $1.5 \times$ as long as antennomere 3; antennomere 3 equal in length with antennomere 4 or slightly longer; antennomeres 4–8 most often as long as wide or at least 7–8 weakly transverse; antennomeres 9–10 produced inwardly; terminal antennomere transversely oval, somewhat truncate at apex. Clypeus transverse, flat, widest at base, convergent from base toward basal third, thence parallel. Labrum (Fig. 94) strongly transverse, sclerotized with narrow submembranous apex (at least laterally), with anterior edge deeply emarginate medially; moderately coarsely and rather sparsely punctured, covered with long setae; tormae elongate, with mesal arms recurved posteriorly; labral rods slender, weakly divergent anteriorly. Mandible (Figs 167, 168) broad, strongly concave ventrally, convex dorsally with sharp, curved, elongate ridge; sharply cleft at tip forming moderately large, apical and subapical teeth; mola large, finely ridged; prostheca rather narrow, membranous, finely setose. Maxilla (Fig. 235) with terminal palpomere elongate, about $1.5 \times$ as long as palpomere 3 and subequal in length with palpomere 2, subcylindrical, blunt or narrowly rounded at apex; galea broadly triangular, rather sparsely setose at apex; lacinia short and narrow, tapering, fringed with stiff setae on its inner edge, with row of long spinule on dorsal surface and three longest spines below them. Labium (Fig. 275) with palpi close together; palpomere 2 strongly transverse; terminal palpomere transversely rectangular. Mentum transverse, widest in mid length, flat with anterior raised, transverse ridge; covered with sparse and moderately long setae. Prementum short, moderately sclerotized with ligula formed by moderately large lobes at sides, strongly emarginate medially at apex.

Prothorax transverse, nearly parallel-sided from base to beyond mid length, thence tapering anteriorly and produced into blunt anterior angles. Pronotum (Fig. 346) very finely to moderately coarsely punctured with interspaces finely reticulate; narrowly to comparatively widely bordered laterally and narrowly bordered anteriorly; lateral margins weakly raised; anterior edge with moderately large stridulatory membrane; basal sulcus deep, sometimes with distinct impression in mid length; lateral sulci triangular (wide at base and narrowing anteriorly), subparallel, deep and comparatively long; posterior angles right-angled or weakly acute; pronotal disc convex. Prosternum with sinuate anterior edge and weak median, transverse ridge; with a pair of densely pubescent pits in front of procoxal cavities;

prosternal process (Fig. 347) narrow to comparatively broad, extending far beyond coxae, distinctly bordered laterally, most often almost parallel-sided, truncate or rounded at apex; front coxae prominent, circular in outline (Fig. 588); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, flat, transverse, with truncate, rounded or weakly acute apex. Mesoventrite (Fig. 393) carinate, with long, median concavity, normally covered by apical part of prosternal process; provided with a pair of densely pubescent pits near anterior margin; intercoxal process moderately widely separating mesocoxae, more or less trapezoidal, at least slightly longer than wide; weakly concave medially with bordered and raised lateral margins; truncate posteriorly; extending to about half length of coxae. Mesocoxa circular in outline (Fig. 589), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with wide internal knob. Elytra almost parallel-sided or widest at about basal third, elongate-oval, weakly to moderately convex, blunt or weakly rounded at apices with punctures rather dense and moderately coarse with interspaces most often finely reticulate (sometimes glabrous); epipleuron moderately wide, incomplete at apex; lateral margins narrowly or moderately widely flattened, visible from above almost throughout; humeri almost flat. Metaventrite (Fig. 393) large, transverse, weakly convex, narrowing towards its anterior margin, provided with one pair of densely pubescent, postcoxal pits; discrien reaching about mid length of metaventrite; intercoxal process narrowly bordered and weakly raised. Metacoxae transverse, widely separated; femoral lines present. Metendosternite with short stalk and very widely separated anterior arms and tendons. Hind wing (Fig. 19) with one anal vein and one anal cell; medial fleck moderately large, roundly-oval, undivided.

Legs (Figs 588–593) with trochanterofemoral attachment heteromeroid. Femur widest near mid length, slender at base, less than twice as wide as tibia, hardly setose, with row of rather weak, obliquely directed spines on ventral surfaces of front and mid femora; tibia and tarsus more densely setose than femur. Terminal tarsomere 7–8 times longer than tarsomere 4. Claws simple. Empodium bisetose. In males sexual characters may be found in tibiae (Figs 591, 592), femora (Fig. 589) and trochanters (Fig. 588).

Abdomen with anterior margin of intercoxal process straight or emarginate between coxae; with five freely articulated ventrites. Ventrite 1 slightly shorter than metaventrite and longer than three following ventrites combined, with weakly raised margins beyond coxae; ventrites 2–4 gradually slightly shorter. Ventrite 5, in male sometimes weakly emarginate at apex. Male abdominal segment 8 (Fig. 641) with sternite narrow, divided in two separated lateral parts; tergite widely rounded api-

cally. Male genital segment (Figs 723, 724) with sternite moderately large, weakly sclerotized, emarginate at apex; paired apophyses fused shortly beneath apex; dorsal plate divided in two lateral parts connected by membrane.

Aedeagus (Figs 801, 802) short to moderately long, slender to stout, strongly sclerotized, straight to moderately curved near base (sometimes with two curvatures – near base and in mid length). Median lobe most often branched out apically. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut short.

Female genitalia (Fig. 840). Ovipositor sclerotized, with coxites entirely fused; sternite 8 widely emarginate at apex, sclerotized with submembranous anterior part, compactly connected or fused with coxites; styli present, small, terminal. Spermatheca small, membranous; sperm duct short, slender; accessory gland very small, elongate, membranous. Bursa copulatrix large, elongate with apical outlet of sperm duct and lateral (near apex) outlet of common oviduct.

Species examined. *P. burckhardti* Tomaszewska, *P. depressus* (Gerstaecker), *P. longicornis* Tomaszewska, *P. similis* Tomaszewska, *P. sumatrensis* Tomaszewska, *P. rufonotatus* (Pic), *P. tonkinensis** Arrow – 7 of 13 known species.

Distribution. Widely distributed in Oriental Region.

Sinocymbachus Strohecker et Chûjô

(Figs 54, 93, 169, 170, 236, 276, 348, 349, 390, 594–598, 646, 725, 726, 803, 843, 894, 895)

Sinocymbachus Strohecker et Chûjô, 1970: 511. Type species, by original designation: *Engonius excisipes* Strohecker, 1943.

Diagnosis. *Sinocymbachus* appears to be closely related to *Cymbachus* sharing numerous characters including labial and maxillary structures, the mandible with apex widely chisel-shaped, tergite 8 of both sexes with tuft of long setae at apex, and the aedeagus short with apical branches often as long as half length of median lobe. *Sinocymbachus* however differs from *Cymbachus* in having the body decidedly larger (in most cases), more elongate, and the intercoxal process of mesoventrite narrower and at least weakly ridged or tuberculate.

Redescription. Length 7.5–10.0 mm. Body (Figs 894, 895) short oval to long oval, highly convex, shiny, glabrous; rather densely and moderately coarsely, confusedly punctured. Colour brownish black or black, sometimes with purple reflections or cupreous sheen, always with yellow markings on the elytra.

Head partially retracted in prothorax, almost as long as wide, somewhat circular in outline, with weak, elongate concavities between eyes. Gular sutures fused medially at base and extending anteriorly as slender, moderately long median line. Eyes moderately large, oval in outline,

prominent, moderately coarsely faceted. Occipital file large, wide basally, narrowing and strongly produced anteriorly, finely ridged (sometimes with coarse ridges at base). Antenna about as long as half length of body, rather slender (Fig. 54) with 3-segmented, wide, flattened club; scape more than twice as long as pedicel; antennomere 3 more than twice as long as pedicel and twice as long as antennomere 4; antennomeres 4–7 subequal; antennomere 8 slightly shorter. Clypeus transverse, flat, widest at base, slightly convergent toward apex and weakly rounded apically. Labrum (Fig. 93) somewhat truncate apically; strongly transverse, sclerotized with membranous apex, coarsely punctured and covered with long setae; tormae elongate, with mesal arms recurved posteriorly; labral rods absent. Mandible (Figs 169, 170) broad, concave ventrally, convex dorsally; with apex chisel-shaped and with subapical tooth; mola large, strongly sclerotized, with dorsal and ventral edges finely ridged and inner surface densely granulate; prostheca large, moderately narrow, membranous, covered with dense, short setae. Maxilla (Fig. 236) with terminal palpomere elongate (slightly longer than palpomere 3 and slightly shorter than 2), subcylindrical, blunt at apex or minutely truncate; galea widening towards apex and rounded, densely setose; lacinia comparatively long and narrow, tapering, fringed with stiff setae on its inner edge, with a few long subapical spinulae on dorsal surface and two or three long spines below them. Labium (Fig. 276) with palpi moderately widely separated; palpomere 1 very small; palpomere 2 longer than wide; terminal palpomere distinctly elongate or sometimes subquadrate, subcylindrical in shape. Mentum rectangularly transverse with angles rounded, with weakly raised, arcuate ridge transversely; covered with long setae. Prementum short, moderately sclerotized with ligula membranous, transverse, lobed at sides, truncate at apex.

Prothorax transverse, almost always widest at base, with sides often sinuate basad. Pronotum (Fig. 348) narrowly bordered laterally and anteriorly; base weakly trisinuate; anterior edge most often with large stridulatory membrane; basal sulcus deep, lateral sulci rather well marked and comparatively long, linear, subparallel; anterior angles strongly produced forwards, bluntly rounded or subacute; posterior angles weakly acute, pronotal disc moderately convex. Prosternum without pits in front of procoxal cavities; prosternal process (Fig. 349) moderately wide, not extending beyond coxae, distinctly v-excised at apex; front coxae prominent, circular in outline (Fig. 594); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum moderately large, transverse, somewhat semi-oval or slightly more elongate apically. Mesoventrite (Fig. 390) with a pair of small and shallow pits near anterior margin; intercoxal process somewhat pentagonal, as long as wide, with median ridge and distinct tubercle,

comparatively widely separating mesocoxae; extending at least to half length of coxae. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs.

Elytra widest near mid length, elongate, convex, blunt or weakly acute at apices (in males sometimes weakly sinuate apically) with punctures dense, moderately coarse and irregular; epipleuron rather narrow, incomplete at apex; humeri prominent. Metaventrite (Fig. 390) large, transverse, weakly convex, narrowing towards its anterior margin which is moderately widely bordered and weakly raised, provided with three pairs of post-coxal pits; discrimen complete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with rather long stalk, widely separated anterior arms and moderately widely separated tendons. Hind wing with one anal vein and two anal cells; medial fleck moderately large, roundly-oval, divided.

Legs (Figs 594–598) with trochanterofemoral attachment subheteromeroid. Femur not clavate, less than twice as wide as tibia, hardly setose; tibia and tarsus rather densely setose; tibia slender. Terminal tarsomere about five times longer than tarsomere 3; in male terminal tarsomere sometimes with weak tooth (or tubercle) at about basal third. Claws simple, hollowed along inner edge. Empodium distinct with two or three setae. Mesotibiae of males with sexual characters (teeth and various excisions) (Fig. 595).

Abdomen with anterior margin of intercoxal process straight or emarginate medially; with five freely articulated ventrites. Ventrite 1 as long as three following ventrites combined; ventrites 2–4 subequal in length or gradually slightly shorter. Ventrite 5 simple or rarely may be modified in both sexes (e.g. in male – apex sinuate with double concavity and tuft of long setae laterally, while in female somewhat triangular). Male abdominal segment 8 (Fig. 646) with sternite very narrow, truncate or emarginate apically; tergite with apical tuft of setae medially and sometimes with additional, large, asymmetrical, basal membrane. Male genital segment (Figs 725, 726) with sternite weakly or distinctly emarginate apically and paired apophyses fused near base or along $\frac{1}{3}$ of their length; dorsal plate divided in two, lateral, sclerotized plates, connected medially by membrane.

Aedeagus (Fig. 803) short and stout, strongly sclerotized, curved. Median lobe strongly branched out apically; endophallus provided with large sclerite. Tegmen placed basally, strongly reduced, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 843) fused with abdominal sternite 8, which is divided in two lateral, sclerotized plates connected medially by membrane. Ovipositor moderately sclerotized, with coxites entirely fused; styli absent; tergite 8 somewhat triangular with apical tuft of long setae, loosely connected with genital segments. Spermatheca and accessory gland moderately large,

membranous; sperm duct short and slender. Bursa copulatrix elongate with lateral outlet of sperm duct and latero-apical outlet of common oviduct.

Species examined. *S. bimaculatus* (Pic), *S. excisipes** (Strohecker), *S. humerosus* (Mader) – 3 of 10 known species.

Distribution. South and East China, Taiwan, Vietnam.

Spathomeles Gerstaecker

(Figs 14, 55, 91, 171, 172, 237, 238, 277, 350, 351, 391, 599–605, 645, 727, 728, 795, 796, 844, 896, 897)

Spathomeles Gerstaecker, 1857: 218. Type species, by subsequent designation of Arrow (1925: 307): *Spathomeles anaglyptus* Gerstaecker, 1857.

Rhachidophorus Guérin, 1857b: 581. Type species, by present designation: *Cacodaemon hopei* Thomson, 1857 (= *Eumorphus hopei* Guérin, 1857a: 255).

Diagnosis. *Spathomeles* appears to be closely related to *Amphistethus*, *Stictomela*, *Amphisternus* and *Cacodaemon* by having the elytra (at least in males) provided with tubercles and/or spines, and the base of spermatheca with at least small sclerotized structure. The pronotum with anterior angles produced anteriorly, thickened and raised distinguishes *Spathomeles* from *Stictomela*, *Amphisternus* and *Cacodaemon*, and the terminal maxillary palpomere at least weakly elongate and differently shaped prosternal process separate it from *Amphistethus*. The last character differs *Spathomeles* also from *Amphisternus* and *Cacodaemon*.

Redescription. Length 10.0–14.0 mm. Body (Figs 896, 897) long-oval, strongly convex, very shiny with pronotum or elytra sometimes dull, glabrous, rarely shortly pubescent; confusedly punctured (rarely punctures regularly arranged) with interspaces finely to distinctly reticulate. Colour blackish-brown or black, sometimes with bluish or green sheen, with yellow or orange maculae on elytra and often with tubercle; male elytra often provided with erect or curved spines.

Head moderately deeply retracted in prothorax, almost as long as wide, with two weak, elongate concavities between eyes. Eyes large, transversely-oval, prominent, moderately coarsely faceted. Occipital file moderately large, long-oval, finely ridged. Gular sutures fused medially at base and extending anteriorly as slender, almost complete median line. Antenna (Fig. 55) shorter than half length of body, moderately slender with 3-segmented, wide, flattened and compact club; scape about twice as long as pedicel and almost as long as antennomere 3; antennomere 3 at least 1.5 × longer than 4; antennomeres 4–5 subequal in length or antennomeres 4–8 gradually slightly shorter; terminal antennomere transversely oval. Clypeus strongly transverse, flat, widest at base, narrowing towards basal third, thence parallel, truncate apically. Labrum (Fig. 91)

sclerotized with very narrow, submembranous apex; strongly transverse, moderately coarsely and densely punctured, covered with moderately long setae, anterior edge truncate; tormae weakly elongate, with mesal arms recurved posteriorly; labral rods very short and slender, widely divergent anteriorly. Mandible (Figs 171, 172) with strong, chisel-shaped apical tooth and small sub-apical tooth; mola large, finely ridged; prostheca large, membranous, with tuft of long setae along apical half; submola moderately large, densely setose, membranous. Maxilla (Fig. 237) with terminal palpomere elongate, subcylindrical or sometimes subquadrate, truncate or blunt at apex; galea moderately large, long-oval, weakly enlarged apically, densely setose at apex; lacinia (Fig. 238) comparatively large (long and wide), weakly tapering along basal third, thence parallel, rounded at apex, with tuft of somewhat S-shaped, apical spines, row of rather fine setae on its inner-ventral edge and row of long spines on inner-dorsal edge; digitus absent. Labium (Fig. 277) with palpi rather close together; palpomeres 2 and 3 strongly transverse; terminal palpomere somewhat cup-shaped, truncate at apex. Mentum transverse, widest near basal fourth, almost flat; covered with short, sparse setae. Prementum short, moderately sclerotized with ligula lobed at sides and with apical edge emarginate medially.

Prothorax strongly transverse, widest in about half length; lateral edges weakly sinuate with distinct narrowing near base. Pronotum (Fig. 350) with lateral margins rather narrowly bordered along basal half and widely bordered along apical half – borders at base distinctly raised; anterior margin moderately widely bordered with small and weakly prominent stridulatory membrane; basal sulcus deep, weakly sinuate to almost straight, lateral sulci linear, weakly curved, moderately deep and long; anterior angles produced forwards, rounded, posterior angles weakly acute; pronotal disc of uneven surface, in males sometimes with deep, long, median sulcus; sides widely dilated; punctures minute to moderately dense and coarse with interspaces finely reticulate. Prosternal process (Fig. 351) moderately wide or wide, bordered laterally, concave along middle, expanded apically or subparallel, rounded, truncate or even shallowly excised at apex, sometimes with apical tubercle; extending shortly beyond front coxae and separating them distinctly; front coxae prominent, circular in outline (Fig. 599); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, strongly transverse, moderately densely punctured, widely rounded apically or somewhat emarginate; angulate near base, widely rounded apically. Mesoventrite (Fig. 391) with a pair of small, shallow pits near anterior margin or pits absent; intercoxal process transverse, somewhat angulate anteriorly and sinuate posteriorly, with lateral borders raised, expanded laterally at

apex and covering part of coxae; widely separating mesocoxae, extending slightly beyond half of their length; of uneven surface, sometimes with distinct, median elevation. Mesocoxa circular in outline, its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra (Fig. 14) moderately coarsely and densely punctured with fine reticulation; basal margins moderately widely bordered and raised; sides nearly parallel from beyond shoulders to about apical fourth thence abruptly tapering towards apices; very convex with tubercles and often with spines (in males); humeri prominent; lateral margin moderately widely flattened, visible throughout from above; blunt or rounded at apices; epipleuron moderately wide, complete. Metaventrite (Fig. 391) about twice as wide as long, convex (especially on sides of discrimen), narrowing anteriorly; anterior edge moderately widely bordered and distinctly raised between coxae and weakly raised laterally; provided with three pairs of very small postcoxal pits; discrimen long, incomplete; deep, oval concavity placed beneath raised margin of intercoxal process. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and two anal cells; medial fleck rather small, rectangularly-oval, divided.

Legs (Figs 599–605) long and moderately stout; trochanterofemoral attachment subheteromeroid. Femur somewhat clavate, slender at base, very hardly setose, with rows of short, erect, obliquely directed spines on ventral surfaces of fore and mid femora; tibia and tarsus moderately densely setose along apical half and hardly setose basally; tibia very weakly widening towards tarsus; terminal tarsomere about 10 times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium distinct with two short setae. Male tibiae, and sometimes also femora and trochanters provided with very distinct characters of sexual dimorphism (Figs 600, 602, 603).

Abdomen with anterior margin of intercoxal process weakly emarginate; with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined; ventrites 2–4 gradually slightly shorter or subequal in length. Male ventrite 5 may be modified at apex (e.g. truncate). Male abdominal segment 8 (Fig. 645) with sternite very narrow, W-shaped; tergite widely rounded apically with two large, lateral, submembranous plates at base. Male genital segment with sternite narrow, strongly emarginate medially at apex; paired apophyses fused along about $\frac{1}{2}$ of their length; dorsal plate narrow, undivided (Figs 727, 728); additional, internal U-shaped sclerite present.

Aedeagus (Figs 795, 796) stout, moderately long, heavily sclerotized, very weakly curved basally or almost straight. Median lobe strongly branched out apically, with submembranous gonopore provided with numerous small sclerites. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut very short.

Female genitalia (Fig. 844) fused with abdominal segment 8 – sternite 8 entirely fused with coxites and tergite 8 compactly connected with tergites 9 and 10. Ovipositor sclerotized, with coxites entirely fused; styli present, small, terminal. Spermatheca small, oval, membranous with weakly sclerotized, basal ring; sperm duct short, slender; accessory gland very small, elongate-oval, membranous. Bursa copulatrix partially sclerotized, short with ventro-lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *S. anaglyptus** Gerstaecker, *S. anceps* (Gorham), *S. bonthainicus* Heller, *S. decoratus* Gerstaecker, *S. dohrnii* Gerstaecker – 5 of 15 known species.

Distribution. Oriental Region.

Stictomela Gorham

(Figs 13, 56, 89, 173, 174, 239, 240, 278, 352, 353, 389, 606–612, 643, 729, 730, 804, 805, 845, 898)

Stictomela Gorham, 1886: 155. Type species, by subsequent designation of Arrow (1925: 288): *Stictomela chrysomeloides* Gorham, 1886.

Diagnosis. The species of *Stictomela* are most similar to those of *Spathomeles* but can be distinguished by having the body less elongate and the pronotum with anterior angles weakly produced anteriorly, without raised thickening. Having the elytra strongly tuberculate and the base of the spermatheca with sclerotized structure *Stictomela* appears to be related also to *Amphistethus*, *Amphisternus* and *Cacodaemon*. *Stictomela* differs however from these genera in having differently shaped prosternal process (not extending beyond fore coxae and not being deeply excised at apex). Additionally the mandibles with apices symmetrical separate it from *Amphisternus* and *Cacodaemon*.

Redescription. Length 8.0–10.5 mm. Body (Fig. 898) short-oval, strongly convex, very shiny, sometimes covered with minute pubescence; sparsely and very finely, confusedly punctured with interspaces on elytra glabrous while on pronotum reticulate. Colour black with elytra blood-red, coopery- or purplish-brown, sometimes with orange spots.

Head moderately deeply retracted in prothorax, almost as long as wide, with two, elongate concavities between eyes. Eyes moderately large, very narrow and transverse, prominent, coarsely faceted. Occipital file large, finely ridged, strongly produced anteriorly into rounded lobe. Gular sutures poorly marked, fused medially at base and extending anteriorly as slender but almost complete median line. Antenna long and slender (Fig. 56) with 3-segmented, narrow, moderately flattened and rather loose club; scape less than twice as long as pedicel; antennomeres 3–8 distinctly widening apically; antennomere 3 strongly elongate, about 2 × as long as pedicel and antennomere 4; antennomeres 4–8 gradually slightly shorter.

Clypeus strongly transverse, flat, widest at base, narrowing towards basal third, thence parallel. Labrum (Fig. 89) sclerotized with membranous apex; strongly transverse, covered with two kinds of puncturation – coarse and minute punctures, with long, stiff setae on anterior margin; anterior edge of membranous part straight and of sclerotized part emarginate medially; tormae elongate, with mesal arms recurved posteriorly; labral rods slender, widely divergent anteriorly. Mandible (Figs 173, 174) with strong, chisel-shaped apical tooth and moderately large subapical tooth; mola large, well-developed, finely ridged; prostheca large, membranous, rather sparsely setose; submola small, setose, membranous. Maxilla (Fig. 239) with terminal palpomere somewhat oval in shape, rounded at apex, about $1.5 \times$ as long as palpomere 3; galea moderately large, long-oval, rounded and densely setose apically; lacinia (Fig. 240) comparatively large (long and wide) tapering along basal third, thence parallel, rounded at apex, with tuft of somewhat S-shaped, apical spines, row of rather fine setae on its inner-ventral edge and row of long spines on inner-dorsal edge. Labium (Fig. 278) with palpi moderately close together; palpomere 2 strongly transverse; terminal palpomere almost as long as wide, somewhat cup-shaped, truncate apically. Mentum transverse; widest near basal fourth with weakly raised, strongly curved ridge transversely; covered with moderately long, sparse setae variably directed. Prementum short, moderately sclerotized with ligula moderately lobed at sides and emarginate at apex.

Prothorax strongly transverse, widest in about half length. Pronotum (Fig. 352) rather narrowly bordered laterally and anteriorly; anterior edge with conspicuous and prominent stridulatory membrane; basal sulcus distinct, weakly sinuate, lateral sulci linear, subparallel, moderately deep and long; anterior angles produced, blunt, posterior angles weakly produced, blunt or somewhat acute; pronotal disc convex with deep median sulcus; sides widely dilated; puncturation very fine with interspaces reticulate. Prosternum with a pair of pits in front of procoxal cavities; prosternal process (Fig. 353) moderately wide, rounded or truncate apically with high tubercle before apex, extending shortly beyond front coxae and separating them distinctly; front coxae prominent, circular in outline (Fig. 606); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, strongly transverse, moderately densely punctured, widely rounded apically or somewhat emarginate; weakly angulate near base. Mesoventrite (Fig. 389) with a pair of distinct, rather deep pits near anterior margin and with transverse, declivent area in front of each coxa; intercoxal process distinctly transverse, somewhat rectangular, weakly angulate anteriorly and sinuate posteriorly, almost flat, moderately widening laterally at apex; widely separating mesocoxae, extending slightly beyond half of their length. Mesocoxa circular in outline

(Fig. 608), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with internal knobs. Elytra (Fig. 13) with basal margins moderately widely thickened and raised, regularly rounded from base to apex or lateral margins nearly parallel from beyond shoulder to about apical fourth; very convex with uneven surface near base and distinct, small tubercle near scutellum; sutural striae complete; humeri inflated and produced outwards; lateral margins narrowly flattened, visible almost throughout; rounded at apices; epipleuron comparatively wide, incomplete at apex. Metaventricle (Fig. 389) more than twice as wide as long, weakly convex, narrowing anteriorly; anterior margin comparatively widely bordered and raised between coxae; provided with three pairs of postcoxal pits; discrimen complete. Metacoxae transverse, widely separated. Metendosternite with rather short stalk and widely separated anterior arms and tendons. Hind wing reduced (shorter and narrower than elytron).

Legs (Figs 606–612) long and stout, coarsely punctured; trochanterofemoral attachment heteromeroid. Femur widest near mid length, somewhat clavate, hardly setose but ventral surfaces of fore and mid femora bear rows of obliquely directed short spines; tibia and tarsus moderately densely setose, especially along apical half; tibia weakly widening towards tarsus; terminal tarsomere about 10 times longer than tarsomere 3. Claws simple, hollowed along inner edge; empodium distinct, bisetose. Male tibiae with very distinct sexual characters (Figs 607, 609, 610) – curvatures and apical teeth.

Abdomen with anterior margin of intercoxal process weakly emarginate; with five freely articulated ventrites. Ventrite 1 almost as long as three following ventrites combined; ventrites 2–4 subequal in length. Male ventrites 4 and 5 may be modified (e.g. provided with tubercles). Male abdominal segment 8 (Fig. 643) with sternite W-shaped; tergite weakly rounded apically with two small, lateral, membranous plates at base. Male genital segment (Figs 729, 730) with sternite reduced, emarginate apically and paired apophyses fused along $\frac{1}{2}$ of their length; dorsal plate undivided; additional, internal U-shaped sclerite present.

Aedeagus (Figs 804, 805) stout, moderately long, heavily sclerotized, without basal curvature. Median lobe branched out apically. Tegmen placed basally, ring-shaped with parameres fused and tegminal strut short.

Female genitalia (Fig. 845) fused with abdominal segment 8. Ovipositor sclerotized, with coxites entirely fused; styli present, small, terminal. Spermatheca small, oval, membranous with weakly sclerotized, basal ring; sperm duct short, slender, connected directly with spermatheca; accessory gland very small, rounded, membranous. Bursa copulatrix short with lateral outlet of common oviduct and apical outlet of sperm duct.

Species examined. *S. chrysomeloides** Gorham, *S. inflata* (Gorham) – 2 of 4 known species.

Distribution. Sri Lanka, India (Kerala).

***Trycherus* Gerstaecker**

(Figs 57, 90, 175, 176, 241, 279, 354, 355, 392, 613–618, 642, 731, 732, 806, 807, 846, 899, 900)

Trycherus Gerstaecker, 1857: 222. Type species, by subsequent designation of Strohecker (1953: 97): *Trycherus bifasciatus* Gerstaecker, 1857.

Olenus Thomson, 1857: 157 (nec Dalman 1826). Type species, by present designation: *Trycherus senegalensis* Gerstaecker, 1857: 223.

Balius Guérin, 1857a: 261 (nec Gistel 1848). Replacement name for *Olenus* Thompson, 1857.

Diagnosis. The body shape and the colouration of *Trycherus* are very similar to those of *Chetryrus* and *Microtrycherus*. These genera appear to be closely related by having the spermatheca lacking the accessory gland. *Trycherus* however differs from *Microtrycherus* in having the base of elytra slightly wider than base of the pronotum, the maxillary galea broadly triangular and the terminal maxillary palpomere distinctly elongate and from *Chetryrus* it differs in having the antenna longer and more slender, and the lateral margins of the pronotum rather narrowly bordered.

Redescription. Length 8.0–13.0 mm. Body (Figs 899, 900) long-oval, moderately convex, shiny, glabrous; confusedly punctured with interspaces densely reticulate. Colour dark brown to black, almost always with contrasting (yellow or orange) markings on the elytra.

Head partially retracted in prothorax, weakly transverse. Eyes large, oval in outline, prominent, moderately coarsely faceted. Gular sutures fused medially at base and extending anteriorly as long, sometimes complete median line. Occipital file finely ridged, small, oval (sometimes occiput provided only with coarse reticulation). Antenna (Fig. 57) shorter than a half length of body, moderately slender with 3-segmented, narrow or moderately wide, weakly flattened, loose club; scape almost 2 × longer than pedicel and subequal with antennomere 3; antennomere 3 about 1.5 × as long as antennomere 4; antennomeres 4–8 equal in length or antennomere 4 slightly longer; terminal antennomere short, transverse, truncate apically. Clypeus transverse, flat, widest at base, convergent from base toward half length, thence parallel, with weakly arcuate anterior edge, sometimes with weakly pointed apex. Labrum (Fig. 90) strongly transverse, sclerotized sometimes with membranous apex, densely and moderately coarsely punctured, covered with long setae and with tufts of long setae on sides; anterior edge truncate to weakly emarginate; basal margin with median, triangular, raised area; tormae elongate, with mesal arms recurved posteriorly; labral rods present or absent. Mandible (Figs 175, 176) broad, strongly concave ventrally, convex dorsally with sharp, elongate ridge; shallowly notched at apex with moderately large, blunt, subapical tooth; mola large, finely ridged; prosthema rather narrow, membranous, finely setose; submola rather small, setose, membranous. Maxilla (Fig. 241) with terminal

palpomere elongate (about 1.5 × longer than palpomeres 2 or 3), subcylindrical, blunt at apex; galea broadly triangular, moderately densely setose; lacinia short and narrow, tapering, fringed with stiff, long setae on apex and inner-ventral edge, with row of short spines on dorsal surface and one or two very long spines below them. Labium (Fig. 279) with palpi close together; palpomere 2 strongly transverse; terminal palpomere transversely rectangular, blunt at apex. Mentum transverse, widest near posterior third, with raised, curved ridge transversely; covered with short setae anteriorly and densely reticulate posteriorly (beyond ridge). Prementum very short, moderately sclerotized with ligula in form of moderately large, submembranous, lateral lobes.

Prothorax strongly transverse, widest at base. Pronotum (Fig. 354) rather finely punctured and densely reticulate; sides sinuate with distinct constriction near basal third; lateral margins moderately widely bordered; anterior margin narrowly bordered with minute stridulatory membrane; basal sulcus present or absent, lateral sulci linear, subparallel, moderately long and deep; anterior angles produced forwards, blunt; posterior angles acute; pronotal disc moderately convex. Prosternum sometimes with a pair of very shallow pits in front of procoxal cavities; prosternal process (Fig. 355) moderately wide, parallel-sided with sides scarcely bordered, more or less distinctly rounded apically, extending distinctly beyond procoxae and separating them distinctly; coxae prominent, circular in outline (Fig. 613); their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Mesonotum sclerotized with scutellum rather small, transverse, widely rounded or somewhat truncate at apex. Mesoventrite (Fig. 392) weakly carinate, with a pair of pits near anterior margin or sometimes pits absent, or very shallow; intercoxal process somewhat pentagonal, longer than wide, widely separating mesocoxae, weakly angulate anteriorly and truncate posteriorly, with weakly raised borders and weakly convex median area; extending slightly beyond half length of coxae. Mesocoxa circular in outline (Fig. 614), its cavity outwardly open; trochantin exposed. Meso-metaventral junction with small internal knobs. Elytra elongate-oval, widest near half length, convex, blunt or sometimes rounded at apices, with punctures fine and moderately dense; humeri weakly prominent; lateral edge moderately widely flattened, visible from above almost throughout; epipleuron comparatively wide, incomplete at apex. Metaventricle (Fig. 392) large, strongly transverse, weakly convex, narrowing towards its anterior margin which is moderately widely bordered and raised, sometimes provided with one pair of very shallow postcoxal pits; discrimen long but incomplete. Metacoxae transverse, widely separated; femoral lines absent. Metendosternite with moderately long stalk and widely separated anterior arms and tendons. Hind wing with one anal vein and one anal cell; medial fleck rather small, oval, at least partially divided.

Legs (Figs 613–618) long and comparatively stout; trochanterofemoral attachment heteromeroid. Femur widest near half length, less than twice as wide as tibia, hardly to moderately densely setose, with long rows of obliquely directed short spines on ventral surface of fore and mid femora; tibia and tarsus moderately densely setose; terminal tarsomere about 10 times longer than tarsomere 4. Claws simple, hollowed along inner edge. Empodium distinct, bisetose. Male fore and mid tibiae with characters of sexual dimorphism (Figs 615, 616).

Abdomen with anterior margin of intercoxal process truncate or weakly emarginate at apex; with five freely articulated ventrites. Ventrite 1 longer than two following ventrites combined; ventrites 2–4 equal in length or ventrite 2 sometimes slightly longer. Ventrite 5 simple or modified apically in both sexes (e.g., in males often truncate and with weak concavity, in females with different degrees of emargination, sometimes deeply excised). In males, one or more of remaining ventrites sometimes provided with tubercles or carinae. Male abdominal segment 8 (Fig. 642) with sternite narrow, weakly emarginate medially at apex; tergite truncate to weakly emarginate at apex with moderately large, lateral, submembranous plates at base. Male genital segment (Figs 731, 732) with sternite comparatively large, emarginate at apex; paired apophyses fused along $\frac{1}{2}$ of their length; dorsal plate undivided.

Aedeagus (Figs 806, 807) moderately long and stout, sclerotized, strongly curved near base. Median lobe with membranous gonopore at apex, poorly branched out at apex. Tegmen moderately large, placed basally, ring-shaped with parameres fused and tegminal strut vestigial.

Female genitalia (Fig. 846) fused with abdominal sternite 8. Ovipositor elongate, sclerotized, with coxites entirely fused, somewhat truncate apically; sternite 8 entirely fused with coxites, without distinct borders; styli absent. Spermatheca rather small, membranous, oval; sperm duct moderately long, slender; accessory gland absent. Bursa copulatrix moderately large, long and narrow with dorso-apical outlet of common oviduct; outlet of sperm duct placed at apex, provided with small sclerite.

Species examined. *T. bifasciatus** Gerstaecker, *T. longanimis* (Thomson), *T. lootensi* Strohecker, *T. senegalensis* Gerstaecker, *Trycherus* sp. – 5 of 75 known species.

Distribution. Afrotropical Region.

Genera incertae sedis

Polymus Mulsant

Polymus Mulsant, 1846: 10. Type species, by monotypy: *Polymus nigricornis* Mulsant, 1846. Holotype not available for study. – Marseul 1868: 111; Strohecker 1953: 91.

Mulsant described this species based on a single specimen from “le environs de Loudun”, which is neither in

Paris nor in Lyon Museums. All references in the literature are based on this specimen and it seems that apart from the author, only Marseul (1868) saw it. The subsequent redescription of Strohecker (1953) was based on the original description (Mulsant 1846) and redescription of Marseul (1868). He (Strohecker 1953) placed *Polymus* in the subfamily Eumorphinae (=Lycoperdininae) based on Marseul, who emphasized its resemblance to *Dapsa* and *Hylaia*. Strohecker (1953) indicated however that “the description of the insect could apply very well to some species of the Asiatic genus *Saula*”. I studied a series of specimens from the collection of Oberthür in Paris Museum, and labelled probably by Oberthür as *Polymus nigricornis* Muls. They were collected by Simon in 1892, from Sri Lanka and Java and belong doubtless in the genus *Saula* Gerstaecker (classified in the subfamily Stenotarsinae). It is probable that the Mulsant’s specimen was mislabelled and it was not a European species, and that *Polymus* is a senior synonym of *Saula*, but without a study of the holotype of *P. nigricornis* and without any additional specimens of *Polymus* discovered from Europe its status cannot be resolved.

Larval morphology

Achuarmychnus Tomaszewska et Leschen (Figs 901–910)

Diagnosis. Among Lycoperdininae, the larva of *Achuarmychnus* is most similar to *Archipines* by having the prosthema present as two widely separate and fixed parts and 1-segmented labial palp (present also in *Eumorphus*) and to *Aphorista* and *Mycetina* by having similar-looking body. *Achuarmychnus* can be distinguished from all of these larvae by having the mala fimbriate, and the terga lacking dorsal tubercles and/or sublateral lobes. Moreover it differs from *Archipines* and *Eumorphus* by the absence of deciduous tergal lobes, from *Eumorphus* by the absence of urgomphi and double hypostomal rods, and from *Aphorista* and *Mycetina* by the lack of tergal sclerotizations or verrucae.

Description of mature larva. 2.8 mm long, 1.5 mm wide. Body (Fig. 901) broadly ovate, moderately dorsoventrally flattened, lacking dorsal lobes or scoli, gradually narrowing posteriorly, constricted between segments; colour dark yellow tan, with tips of frayed setae, mouthparts, antennae, legs, and lateral lobes of abdominal segment 1 lighter. Surface texture microgranulate. Vestiture consisting of apically branching, frayed setae (Fig. 906), longer on the lateral lobes and denser on lateral lobes, and head.

Head transverse in dorsal view and triangular in anterior view, hypognathous, and visible in dorsal view. Epicranial stem present and short, frontal arms V-shaped. Median endocarina absent. Hypostomal rods present, single, and elongate extending to edge of cranium; par-

agular area well developed and bordered posteriorly by a transverse endocarina. Stemmata 4 per side; 1 directly ventral to antennal insertion, the remaining stemmata positioned posterior to insertion. Antenna (Fig. 902) inserted in well developed circular membrane; partially retracted; about $0.25 \times$ as long as head, ratio: A1:A2:A3 = 1.9:2.2:0.6; surface slightly granulate; antennomere 1 with a single campaniform sensillum; antennomere 2 with three apical and subapical setae; terminal antennomere shorter than sensorium with 4 apical scolendia and two short setae along shaft. Frontoclypeal suture present, and nearly straight. Clypeus transverse and glabrous. Labrum (Fig. 903) free; slightly longer than clypeus and $2 \times$ wider than long, glabrous and very weakly emarginate with 4 pairs of long setae, 3 pairs of shorter anterior setae, and 6 apical setae. Epipharynx with 4 anteromedial campaniform sensilla; tormae transverse; sclerotized brace present posteriorly. Mandible (Fig. 907) more or less transverse with a simple incisor lobe lacking subapical ridges or teeth; "prosthema" present as two widely separated and fixed parts, apically brushy and posteriorly hyaline and falcate; mola well developed and finely tuberculate. Maxillolabial complex retracted; well developed articulating area present; maxilla (Fig. 904) with stipes about $2 \times$ longer than wide, cardo divided by internal ridge, distal portion triangulate and proximal portion diminutive, well defined and longitudinally ovate; mala (Fig. 905) fimbriate and flattened distally bearing 2 inner rows of elongate rake-like setae and an outer unicus, unmodified present on the inside base (7) and outer apical margins (4); maxillary palpomere 1 short with 2 campaniform sensilla; palpomere 2 $1.2 \times$ longer and slightly wider than 1, unisetose with campaniform sensillum; palpomere 3 narrow and longer than 1 and 2 combined, unisetose, bearing an apical elongate conical sensillum. Labium (Fig. 908) with mentum and submentum fused, demarcated by a weak transverse line; prementum rather short with ligula narrowly rounded at apex; labial palps 1-segmented (palpiger not present?), elongate (over $2 \times$ longer than basal width), bases approximate; with 1 subapical campaniform sensillum and apical elongate conical sensillum. Hypopharynx with 4 longitudinal rows of laterally directed trichia; sclerites consisting of well developed lantern-shape hypopharyngeal sclerome (Fig. 909), bracon, and slightly convergent posteriorly directed hypopharyngeal rods.

Thorax about $0.5 \times$ as long as body length, widest across mesothorax; prothorax as long as meso- and metathorax together. Terga transverse with plates absent; ecdysial suture present on segments T1–3. Terga lacking dorsal tubercles or sublateral lobes, expanded laterally to form lateral lobes (absent from T1); obvious glands absent. Lateral lobes weakly developed on T2, well developed on T3.

Legs (Fig. 910) slender, relatively long, setose, and isomorphic. Coxae widely separated at their bases; lateral

surfaces with short frayed setae and a few unmodified setae. Trochanter short with 1 primary seta, at least 2 secondary setae, and 6 campaniform sensilla. Femur with two pores, 1 very long seta, 8 shorter primary setae, and 2 campaniform sensilla. Tibiotarsus narrower and about equal to femur with several setae along inner surface; claw with single subapical seta.

Abdomen. Lateral lobes well developed on A1–8; lobes on A1–7 delimited by a line of granules; long frayed setae arising from well developed lateral tubercles. Laterosterna of A1–8 bearing posterolateral lobes delimited by a furrow at their bases (especially A4–8) and smaller than tergal lobes. Abdominal sterna mainly with evenly distributed unmodified setae: S1, aetose; S2 with 4 very short frayed setae at middle and 2 at each side; S3 with 2 very short simple setae at middle; S4 with 4 elongate (= primary) setae at middle and 4 very short frayed setae at each side; S5 with 4 primary and 6 smaller (secondary) setae at middle and 3 very short frayed setae at each side; S6 with 4 primary and 16 secondary setae at middle and 1 very elongate seta at each posterolateral corner; S7 with 4 primary and 10 secondary setae at middle and 1 very elongate seta at each posterolateral corner; S8 with 4 primary and 1 very elongate seta at each posterolateral corner. Tergum 9 without urogomphi. Sternum 9 with 4 primary setae. Segment A10 bearing simple setae. Spiracles annular, raised on very short tubercles, hidden between tergal and sternal lobes; perispiracular setae or sensilla absent.

Material examined. *Achuarmyichus carltoni* Tomaszewska et Leschen. "Ecuador, Napo Pr, 15 km S. Baeza on rd. to Tena, elev. 2200 m., primary forest litter berlesate, 28 April 1990, C. Carlton, 28-037004-1" – associated with adults (1: MIZ, 1: RALC).

Acinaces Gerstaecker

(Figs 911–925)

Diagnosis. Larva of *Acinaces* is somewhat similar to *Amphix* in having the body short-oval, somewhat onisciform, finely pubescent and without any processes, verrucae or tubercles. *Acinaces* however differs from *Amphix* in having the head with epicranial stem present, the frontal arms V-shaped, the spiracles visible ventrally and the body covered with fine, simple setae.

Description of mature larva – first description for the genus. Length 4.50–4.60 mm; head width 1.35 mm; width of thorax 3.20 mm; width of abdomen 3.25 mm. Body (Fig. 911) broadly-oval, somewhat onisciform, very weakly constricted between segments, convex dorsally and flat to weakly concave ventrally, with lateral parts of tergites tucked ventrally; each pleurite (visible ventrally) weakly convex bearing small patch of hairs that looks like a small process; widest at middle (across abdominal segment 2), gradually, weakly tapering anteriorly and

posteriorly; without urogomphi. Dorsum brown with sides and venter slightly paler; antennae, mouth frame and claw dark brown. Surface texture microgranulate. Vestiture consisting of short, fine, simple and moderately dense setae arising from small tubercles (ventral surfaces sparsely setose); legs covered with moderately long and long, pointed setae arising from tubercles. Head (Figs 912, 913) protracted, hypognathous, somewhat triangular, moderately flattened dorsoventrally, at least partially visible from above; about $0.83 \times$ as long as wide and about $0.48 \times$ as wide as prothorax; comparatively densely setose. Epicranial stem short, frontal arms long, V-shaped. Median endocarina absent. Hypostomal rods present, moderately long and divergent posteriorly. Stemmata 4 per side, hemispherical; 3 stemmata placed close together, situated on moderately large convexity/ tubercle, posteriorly to antennal base, and 1 stemmata situated antero-ventrally to antennal insertion. Frontoclypeal suture rather poorly marked, incomplete. Clypeus strongly transverse, bearing 2 pointed setae. Labrum (Fig. 920) free, about $1.45 \times$ as wide as long, with anterior margin narrowly membranous, emarginate medially and sinuate laterally, bearing 2 pairs of long setae medially; sclerotized part with 3 pairs of long pointed setae transversely, near anterior margin. Epipharynx (Fig. 921) membranous; sides of anterior margin provided with 3 pairs of long, weakly curved and pointed setae; antero-median area with 2 patches of outwardly directed, fine setae and 2 pairs of pores. Antenna (Figs 914, 915) rather short and slender, 3-segmented, inserted in weak convexities of head, in circular membrane, distant from mandibular articulations. Antennomere 1 short bearing 2 dorsal pores; antennomere 2 about $8.0 \times$ as long as 1 and over $13.0 \times$ as long as antennomere 3, with 1 dorsal, subapical pore and 2 long, subapical setae; antennomere 3 almost $1.3 \times$ longer than sensory appendage, subcylindrical with 2 elongate, apical process and 1 short ventral seta; sensory appendage swollen at base and abruptly narrowing towards mid length, thence produced into long apical process and 2 shorter subapical processes, with 2 campaniform sensilla ventrally. Mandible (Figs 918, 919) broad, somewhat triangular with two sharp apical teeth; incisor edge weakly denticulate; ventral accessory process absent; protheca large, membranous, minutely setose, with stiff, submembranous, curved processes in apical part; mola well developed, large, covered with coarse transverse ridges, prominent with mesal surface weakly incised; outer edge with two long, stout, pointed setae. Maxillolabial complex retracted. Maxilla (Figs 916, 917) with well-developed articulating area; cardo triangular; stipes elongate with 3 ventral setae proximad, 2 ventral setae near base of palp on outer edge, and 1 long, ventral seta mesally to palpifer. Mala almost twice as long as wide, submembranous, with 2 stout, triangular meso-apical processes; apex provided with elongate, stout and blunt apically, modified setae/ processes; dorsal surface

with oblique row of 6 long, pointed setae near inner edge (Fig. 917). Maxillary palp 3-segmented, based on large membranous palpifer, provided with very long seta on ventral surface; terminal palpomere as long as palpomeres 1 and 2 combined; palpomere 1 slightly shorter than palpomere 2, with 1 ventral pore and short dorsal seta; palpomere 2 with very long seta on outer edge and group of very short processes/ sensilla on dorsal surface; terminal palpomere weakly tapering, bearing 3 moderately long setae, 1 dorsal pore and a group of short, apical sensory processes. Labium (Fig. 922) with prementum at least as long as wide, ligula submembranous, produced anteriorly into narrow densely setose, rounded lobe; postmentum large, well developed, much longer than wide with mentum and submentum fused, bearing 2 pairs of setae (2 mesal setae extremely long and 2 lateral setae moderately long); palpi 2-segmented, with palpigers submembranous, large and somewhat prominent, moderately distant from each other, each bearing 1 very long, pointed seta; palpomere 1 about $0.6 \times$ shorter than terminal palpomere, provided with 1 short seta, directed outwardly; terminal palpomere subcylindrical, rounded at apex with 1 ventral pore and group of apical sensilla; hypopharynx (Fig. 923) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, brachon and parallel hypopharyngeal rods; submembranous anterior part covered with dense, minute setae, directed outwardly.

Thorax about $0.45 \times$ as long as body length, widest across metathorax; prothorax almost $3.0 \times$ as wide as long, widest posteriorly, $1.75 \times$ longer than mesothorax and $2.10 \times$ longer than metathorax; ecdysial suture and a pair of small, lighter notal plates distinct on each tergum. Obvious glands absent.

Legs (Figs 924, 925) moderately long and rather stout, covered with short and a few long, pointed setae; coxae moderately widely separated at their bases, almost as long as trochanters and femur combined, with a few pointed setae; trochanter elongate, with 5 short mesal setae and 2 ventral pores; femur about $2.0 \times$ as long as wide, with few short setae, and 3 long mesal setae; tibiotarsus about as long as femur, narrowing towards apex, bearing numerous, short, pointed setae; claw moderately stout with single, pointed seta.

Abdomen widest across segment 1. Segments A1–7 similar in shape, but gradually narrowing posteriorly; terga of A1–3 bearing similar notal plates as those on thorax; pleural regions (visible ventrally) with similar very small projections. A8 distinctly shorter and narrower than preceding segments. A9 small, postero-ventral, not visible from above. Segment 10 ventral. Spiracles small, annular, surrounded with sclerotized ring, not raised on tubes, located in folds between tergites and pleurites.

Material examined. *Acinaces* sp. "Cerro Campana, Panama, 9.VIII.1969. J. Lawrence, B. and T. Hlavac, coll." (14: ANIC).

Amphisternus Germar
(Figs 926–941)

Diagnosis. The larva of *Amphisternus* is most similar to those of *Ancylopus*, *Encymon* and *Eumorphus* in having the body provided with lateral, large processes and the tergite of abdominal segment 1 with gland openings. *Amphisternus* larva however can be separated from all mentioned larvae by having the body more oval, the body processes paired on each tergum, somewhat rounded apically and not being deciduous, and the apex of maxillary mala covered with numerous, long, pointed setae.

Description of mature larva – first description for the genus. Length 5.80 mm; head width 1.50 mm; width of thorax 4.85 mm; width of abdomen 5.20 mm. Body (Fig. 926) broadly-oval, comparatively convex dorsally and flat ventrally with lateral, tergal, paired, not deciduous processes – anterior larger, elongate-oval and posterior much smaller, somewhat triangular; body widest across abdominal segment 3 and 4, gradually narrowing anteriorly and posteriorly, constricted between segments, with long urogomphi. Dorsum well sclerotized, light brown with body processes lighter; venter pale, moderately sclerotized; mandibular apex, mola and claw dark brown. Surface texture microgranulate. Dorsum covered with dense and small but distinct tubercles with one, two or three short setae arising from each tubercle; anterior part of head covered with a few long pointed setae; ventral surfaces with very sparse and fine, simple setae arising from small tubercles; body processes (Fig. 931) with large tubercles provided with stout, pointed spines, along with setose tubercles similar to those on dorsal surface of body; legs and antennae with long, pointed setae arising from small tubercles.

Head (Figs 927, 928) retracted, not visible from above; hypognathous with mouthparts directed ventrally; moderately flattened dorsoventrally; dorsal surface with three strongly convex areas of antennal insertions and median part between antennae (Fig. 928). $0.70 \times$ as long as wide and about $0.55 \times$ as wide as prothorax; covered with simple, short setae arising from moderately large tubercles and a few long, pointed setae anteriorly. Epicranial stem absent; frontal arms long, U-shaped. Median endocarina absent. Hypostomal rods present, long, subparallel. Stemmata 4 per side, hemisphaerical; 3 stemmata surrounding closely antennal insertions posteriorly, ventrally and antero-ventrally and 1 stemmata situated postero-ventrally, moderately far from antennal insertion. Frontoclypeal suture poorly marked, straight. Clypeus strongly transverse, emarginate anteriorly, submembranous, bearing a few, short setae. Labrum (Fig. 936) free, about $0.50 \times$ as long as wide, with membranous, moderately large anterior part; anterior margin of sclerotized part emarginate, and of membranous part truncate; membranous part provided with 2 pairs of setae, 1 pair of pores, and with dense brush of somewhat triangular setae

on anterior margin; sclerotized part with 1 long, stout seta accompanying with one pore on each side anteriorly, and with 4 pairs of moderately long setae directed posteriorly, positioned in central area. Epipharynx (Fig. 937) membranous with 3 long stout, blunt apically, curved setae on each side of anterior margin, a few lateral rows of inwardly directed, short setae and 2 pairs of pores positioned anteriorly to moderately large central sclerotization. Antenna (Figs 929, 930) 3-segmented, long and moderately stout, about $0.75 \times$ as long as head; situated in circular membrane; distant from mandibular articulations. Antennomere 1 very short with 1 dorsal seta and 3 ventral pores; antennomere 2 longest, about $10.0 \times$ as long as 1 and about $20.0 \times$ as long as antennomere 3, densely setose; sensory appendage (Fig. 930) situated meso-apically, about as large as antennomere 3, subcylindrical with somewhat sinuate, membranous apex and with small, blunt, process; antennomere 3 weakly tapering anteriorly with blunt, membranous apex. Mandible (Figs 934, 935) broad, triangular with blunt apical tooth and incisor edge somewhat chisel-shaped, provided with a few similar blunt teeth; protheca large, membranous; ventral accessory process absent; mola large, transversely, moderately coarsely ridged and granulate; outer edge with one stout seta. Maxillolabial complex retracted. Maxilla (Figs 932, 933) with well-developed articulating area; cardo somewhat triangular with one, outer seta; stipes elongate with one ventral, long seta near palp and one long seta on outer edge, near cardo; mala about $2.5 \times$ as long as wide, rounded apically, with apex covered with numerous, long, pointed setae and subapical, dorsal surface provided with 2 rows of very long, pointed setae (5 setae in inner row and 3 setae in outer row). Maxillary palp 3-segmented based on large, membranous palpifer provided with long outer seta; palpomere 1 with two ventral pores; palpomere 2 with one ventral pore and two setae on outer edge; terminal palpomere about $1.35 \times$ longer than palpomeres 1 and 2 combined, somewhat conical, narrowly rounded apically, bearing 2 setae and apical group of sensilla. Labium (Fig. 938) with mentum and submentum fused; prementum without distinct ligula, sinuate anteriorly and with weakly rounded anterior angles; 2 pairs of setae positioned anteriorly, 1 pair of setae in central area between palps, 1 pair of setae directed posteriorly on hind margin and patch of outwardly directed fine setae on each side (antero-laterally); labial palp 2-segmented with palpifers moderately distant from each other; palpomere 1 cylindrical, almost as long as wide, provided with one seta; terminal palpomere elongate, about $1.4 \times$ as long as palpomere 1, subcylindrical, weakly tapering anteriorly, rounded at apex, with two pores and group of apical sensilla; hypopharynx (Fig. 939) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and parallel, long hypopharyngeal rods; anterior submembranous part covered densely with fine setae.

Thorax about $0.38 \times$ as long as body length, widest across metathorax; prothorax about $1.4 \times$ as long as mesothorax and $1.28 \times$ as long as metathorax; each tergum strongly transverse, sclerotized, meso- and metatergum with a pair of small lighter notal plates, and each tergum divided by pale longitudinal line. Paired lateral, tergal, not dehiscent processes present on each segment. Obvious glands absent.

Legs (Figs 940, 941) moderately long and rather stout; all pairs of subequal lengths; coxae widely separated, covered with a few moderately long, pointed setae. Trochanter elongate, somewhat triangular with one long, and few short setae, and two pores; femur subcylindrical, slender at base, weakly widening towards apex, moderately densely setose and with 1 long seta on inner edge, and 2 ventral pores; tibiotarsus narrower and about $1.25 \times$ longer than femur, bearing numerous stout, pointed, short and moderately long setae; claw with single, long seta.

Abdomen widest across segments 3 and 4; segments A1 and A3–6 subequal in length, A2 slightly longer and A8 shorter. A1 with lateral, repugnatorial gland openings (Fig. 926). Segments A1–8 bearing paired lateral, tergal, not dehiscent processes, same as those on thoracic segments, and two pairs of small notal plates. A9 positioned postero-ventrally with only urogomphi visible from above; segment 10 ventral. Spiracles annular, not raised on tubes, visible ventrally.

Material examined. *Amphisternus verrucosus* Gorham, Java occ. Tjibodas, 1400 m. Rarahan, on tree trunk, Endomychid with its supposed larva (1: BMNH) – associated with adults, *Amphisternus verrucosus*, det. H. F. Strohecker.

***Amphix* Laporte**
(Figs 942–958)

Diagnosis. The larva of *Amphix* can resemble *Acinaces* in having the body short-oval, onisciform, almost glabrous and without any processes, verrucae or tubercles, but it is separated from *Acinaces* in having the head without epicranial stem, the frontal arms U-shaped, the spiracles placed dorsally and the body being apparently glabrous.

Description of mature larva – first description for the species. Length 5.00–6.00 mm; head width 1.75–1.80 mm; width of thorax 4.35–4.60 mm; width of abdomen 4.80–5.00 mm. Body (Fig. 942) broadly-ovate, onisciform, very weakly constricted between segments, comparatively convex dorsally and flat ventrally, without body processes, apparently glabrous; widest at middle (across abdominal segment 2), gradually tapering anteriorly and posteriorly; without urogomphi. Dorsum light brown with sides pale; venter slightly paler and feebler sclerotized than dorsum; mandibular apex and

mola, claw and dorsal body plates dark brown. Surface texture microgranulate. Dorsal vestiture consisting of sparse, minute club-like setae (Fig. 950) (slightly longer and denser laterally) and sparse simple setae on anterior and ventral surfaces of head; ventral surfaces covered with very sparse simple, minute setae; legs covered with stout, erect, pointed setae of different length.

Head (Figs 943, 944) protracted, partially visible from above, hypognathous, somewhat triangularly-oval, moderately flattened dorsoventrally; about $0.70 \times$ as long as wide and about $0.60 \times$ as wide as prothorax; covered with club-shaped setae posteriorly and moderately dense, pointed setae anteriorly. Epicranial stem and median endocarina absent; frontal arms long, U-shaped. Hypostomal rods long and subparallel. Stemmata 4 per side, hemispherical; 3 stemmata close together and situated posteriorly to antennal insertions, and 1 stemmata positioned antero-ventrally to antennal insertion. Frontoclypeal suture rather weakly developed, straight. Clypeus transverse, bearing few pointed setae. Labrum (Fig. 951) free, about $1.75 \times$ as wide as long, with anterior moderately large submembranous part; anterior margin sinuate, bearing 4 pairs of setae and 2 pores; sclerotized part with 2 long setae antero-laterally on each side, 6 medial setae and 2 pores positioned laterally, and 2 pairs of setae near posterior margin. Epipharynx (Fig. 952) membranous with two antero-lateral patches of short spinules directed inwardly and 2 pairs of pores in central area; postero-median part with large sclerotization, accompanying with patches of dense setae laterally and a pair of campaniform sensilla anteriorly. Antenna (Figs 945, 946) comparatively long (about $0.75 \times$ as long as head) and rather slender, 3-segmented, situated in circular membrane, distant from mandibular articulations. Antennomere 1 very short; antennomere 2 longest, about $11.5 \times$ as long as antennomere 1 and almost $14.5 \times$ as long as antennomere 3, covered densely with very fine pubescence, with 2 very long subapical, pointed setae and two ventral pores; antennomere 3 subequal in length with sensory appendage, broad basally and narrowing towards apex with pointed apical process; sensory appendage elongate, subcylindrical with acute process apically and two setae of different length. Mandible (Figs 947, 948) broad, somewhat triangular with blunt apex; incisor edge weakly hollowed medially with sharp edges; ventral accessory process absent; prosthema moderately large, membranous with apex acutely produced mesally; mola well developed, large, prominent with mesal surface somewhat arcuate, and transversely ridged; outer edge with two long, stout setae; ventral surface, near outer edge with 2 moderately long setae. Maxillolabial complex retracted. Maxilla (Fig. 953) with well-developed, articulating area; cardo elongate; stipes more than $2.0 \times$ as long as wide, with numerous ventral setae proximad, and one ventral pore. Mala about $4.0 \times$ as long as wide, submembranous, covered with dense

fringe of long apical setae and one ventral subapical, very long, pointed seta; dorsal surface provided with elongate row of 8 very long, pointed subapical setae near inner edge. Maxillary palp 3-segmented, based on large membranous palpifer, provided with 2 very long setae on outer edge; palpomere 1 provided with 2 ventral pores, subequal in length with terminal palpomere and slightly longer than palpomere 2; palpomere 2 with long seta on outer edge and one ventral pore; terminal palpomere (Fig. 954) subcylindrical, weakly tapering apically, provided with short subapical seta, one subapical pore and apical group of short sensory processes. Labium (Fig. 955) with mentum and submentum fused; prementum almost as long as wide, with weakly rounded apical margin and somewhat produced basally into narrowly rounded median lobe; ligula submembranous with numerous short spinules, 2 long, pointed setae and 2 pores; posterior part of prementum with 2 stout setae behind palps and 2 setae directed backwardly, each situated laterally on posterior margin; postmentum moderately large, well developed; palpi 2-segmented, with palpigers distant from each other; palpomere 1 about $0.75 \times$ as long as terminal palpomere 1, provided with 1 very long seta on outer edge; terminal palpomere subcylindrical, rounded at apex with group of apical sensilla; hypopharynx (Fig. 956) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and subparallel hypopharyngeal rods; anterior membranous part covered laterally and apically with very dense minute setae, directed inwardly.

Thorax about $0.35 \times$ as long as body length, widest across metathorax; prothorax about $3.40 \times$ as wide as long, widest near mid length, $1.37 \times$ longer than meso- or metathorax; protergum bearing two large notal plates; mesotergum about $6.25 \times$ as wide as long and metatergum about $7.25 \times$ as wide as long, each with two moderately large, tergal plates (distinctly smaller than those on prothorax); broad ecdysial line present on each tergum. Obvious glands absent.

Legs (Figs 957, 958) moderately long and stout; coxae about $3 \times$ longer than wide, moderately widely separated at their bases, covered with a few rather short setae; trochanter elongate, triangular with a few short and one very long setae, and two ventral pores; femur elongate, about $2.4 \times$ as long as wide, with numerous short setae, 1 long mesal seta and 1 ventral pore; tibiotarsus about $1.2 \times$ as long as femur, narrowing towards apex, bearing a few short setae on dorsal and ventral surfaces and 7 setae on inner edge; claw rather slender with single, long seta.

Abdomen widest across segment 2. Segments A1–7 similar in shape; terga A1–8 bearing notal plates similar to those on thorax, but smaller; A1 (Fig. 949) with small, paired, pubescent tubercle on sides; A2–8 with very small, dark, granulated plates near spiracles. A8 distinctly shorter than preceding segments. A9 short, rounded posteriorly. Segment 10 postero-ventral.

Spiracles located dorsally, small, annular, accompanying with slightly smaller rounded tubercle, both surrounded with sclerotized ring, not raised on tubes (Figs 942, 949).

Material examined. *Amphix vestitus cinctus* (Fabricius). Canal Zone: Achiote Rd., 9 mi. SW Gatun, 19.VI.1976, surface of logs 4138 JFL (Newton), ascomyc. *Amphix* sp. (6: ANIC) – associated with adults.

Aphorista Gorham

(Figs 959–976)

Diagnosis. The larva of *Aphorista* is most similar to *Mycetina*. Both larvae share numerous characters including the body with short thoracic and abdominal lateral, tergal lobes, vestiture of specialized fan-shaped setae, the tergal plates with weak protuberances/verrucae, the tergum 9 emarginate and the labrum with anterior margin multidenticulate. *Aphorista* can be separated from *Mycetina* by having the thoracic segments 2 and 3 with one pair of dorsal, tergal protuberances, the frayed setae shorter, the antennal sockets placed in about mid length of head and the caudal notch on the abdominal tergite 9 weakly emarginate.

Description of mature larva. Length 8.00 mm; head width 1.35 mm; width of thorax 3.55 mm; width of abdomen 4.00 mm. Body (Fig. 959) elongate-oval, somewhat onisciform, constricted between segments, weakly dorsoventrally flattened, with lateral pleural and tergal, small processes; widest at middle (across abdominal segment 3), gradually, weakly tapering anteriorly and posteriorly; without urogomphi. Dorsum yellowish-brown with venter slightly paler, feebler sclerotized than dorsum; mandibular apex and mola dark brown. Surface texture microgranulate. Dorsal vestiture consisting of frayed (fan-shaped) setae arising from distinct tubercles (Fig. 963) (longer on lobes – Fig. 962) and sparse simple setae on head; ventral surfaces covered with numerous simple minute setae, and sparse frayed setae; body processes provided with modified setae and legs covered mainly with short and long, pointed setae arising from small tubercles.

Head (Figs 960, 961) protracted, hypognathous, somewhat triangular, moderately flattened dorsoventrally, partially visible from above, about $0.74 \times$ as long as wide and about $0.46 \times$ as wide as prothorax; covered with fan-shaped setae and a few long, pointed setae anteriorly. Epicranial stem very short, frontal arms long, V-shaped. Median endocarina absent. Hypostomal rods present, long and divergent posteriorly. Stemmata 4 per side, hemispherical; 2 stemmata close together and situated posteriorly to antennal base, 1 situated far posteriorly to both of them, and 1 positioned ventrally to antennal insertion. Frontoclypeal suture rather distinct and almost straight. Clypeus transverse, bearing few

pointed setae. Labrum (Fig. 973) free, about $2.3 \times$ as wide as long, rather evenly sclerotized; anterior margin bearing 6 obtuse denticles, 2 short setae laterally and 2 pores positioned medially; two median setae near anterior margin, one very long, pointed seta, each on lateral edge and posterior half bearing three pairs of long setae positioned transversely near posterior margin and two pores anteriorly to them. Epipharynx (Fig. 974) membranous; each side of anterior margin provided with five long, obliquely directed, curved and pointed setae; central part with two patches of somewhat posteriorly directed, short spinules; lateral parts with similar short spinules, directed antero-mesally; median area, near posterior margin with 3 pairs of sensilla. Antenna (Figs 964, 965) rather short and slender, 3-segmented, situated in large, circular membrane, distant from mandibular articulations. Antennomere 1 short; antennomere 2 about $4.5 \times$ as long as 1 and almost $15.0 \times$ as long as antennomere 3, with three long, subapical setae and one campaniform sensillum near mid length; antennomere 3 almost $2 \times$ shorter than sensory appendage, subcylindrical with 4 long, apical setae and 1 acute, apical process; sensory appendage elongate, swollen at base and distinctly narrowing apically, incised at apex in two pointed processes. Mandible (Figs 969, 970) broad, somewhat triangular with pointed apical tooth; incisor edge sharp with a few small, subapical teeth; ventral accessory process absent; protheca moderately large, membranous, minutely setose; mola well developed, moderately large, prominent with mesal surface somewhat arcuate, with coarse, transverse ridges; outer edge with two long, stout setae; ventral surface, near mola with minute spinules, directed mesally. Maxillolabial complex retracted. Maxilla (Figs 966, 967) with well-developed articulating area; cardo somewhat triangular; stipes elongate with 2 ventral setae proximad, 1 ventral seta near base of palp, one ventral and one dorsal short setae directed mesally, near mala, and two long setae on outer edge near palp. Mala about twice as long as wide, membranous, covered densely with long, pointed setae on apical, ventral surface (Fig. 966); dorsal surface provided with many similar setae on apical edge, additionally with oblique row of long setae/spines across middle part of mala, and 6 campaniform sensilla near them (Fig. 967). Maxillary palp 3-segmented, based on large membranous palpifer, provided with very long seta on outer edge; terminal palpomere longest, about as long as palpomeres 1 and 2 combined; palpomere 1 with 2 ventral pores, palpomere 2 with 1 ventral and 1 dorsal pores and long seta on outer edge, terminal palpomere (Fig. 968) subcylindrical, weakly tapering apically, bearing a group of short, apical sensory processes. Labium (Fig. 971) with prementum short, much wider than long, provided with 2 pairs of very long, pointed setae between palps and 2 pairs of short setae near posterior edge; ligula membranous, widely rounded at apex, with

3 apical setae; postmentum large, well developed; mentum and submentum fused; palpi 2-segmented, with bases distant from each other; palpomere 1 about $2 \times$ shorter than terminal palpomere, provided with 1 very long seta; terminal palpomere subcylindrical, rounded at apex, bearing group of apical sensilla; hypopharynx (Fig. 972) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and subparallel hypopharyngeal rods; membranous anterior part covered densely with minute setae.

Thorax about $0.35 \times$ as long as body length, widest across metathorax; prothorax about $2.20 \times$ as wide as long, widest near posterior third, $1.65 \times$ longer than mesothorax and $1.80 \times$ longer than metathorax; protergum bearing two large notal plates and small lateral projections; meso- and metatergum about $4.3\text{--}4.6 \times$ as wide as long, each with a pair of moderately large, tergal plates (much smaller than those on prothorax) and with lateral lobes covered with fan-like setae; ecdysial suture distinct on pro- and mesotergum and at least partially on metatergum. Obvious glands absent.

Legs (Figs 975, 976) moderately long and stout, covered with comparatively long, stout, pointed setae, and coxa provided also with sparse frayed setae; coxae moderately widely separated at their bases, with a few pointed setae and a few fan-shaped setae; trochanter elongate, somewhat triangular with 7 short and one long, mesal setae; femur elongate, about $3 \times$ as long as wide, with numerous short setae, 2 moderately long mesal setae and 1 ventral pore; tibiotarsus about as long as femur, narrowing towards apex, bearing numerous, short setae; claw slender with single seta.

Abdomen widest across segment 3. Segments A1–7 similar in shape; terga bearing 2 pairs of dark (more setose) notal plates (lateral plates smaller than medial ones) and with dorsolateral lobe on each side; pleural regions with similar projections – all covered with frayed setae (Fig. 962). A8 distinctly narrower than preceding segments, provided with a pair of median, setose tubercles, situated near posterior margin. A9 small, emarginate posteriorly. Segment 10 ventral.

Spiracles very small, annular, surrounded with sclerotized ring, not raised on tubes, located in folds beneath tergal lobes.

Material examined. *Aphorista morosa* LeConte: Ariz: Pima Co. Sta. Catalina Mts, Mt. Bigelow, 8300', 27.VIII.74, 3690, JFL und. Conifer bark (*Auricularia* & slime molds) (15: ANIC) – associated with adults.

Archipines Strohecker

(Figs 977–993)

Diagnosis. The larva of *Archipines* is similar to *Eumorphus*, *Encymon* and *Ancylopus*, which are oval or elongate and have dehiscent processes on abdominal

terga and pleura, but possessing the distinctly emarginate tergum 9, *Archipines* resembles *Aphorista* and *Mycetina*, and having 1-segmented labial palp it resembles *Eumorphus* and *Achuarmychnus*. Among all these genera *Archipines* is most similar to *Achuarmychnus*, sharing also the prostheca present as two widely separated and fixed parts. *Archipines* larva however can be distinguished from all of these genera by having the mandible with acute apex, provided with long spine, the mala covered with two kinds of setae at apex, and the claw with stout, rounded apically seta.

Description of mature larva. Length 3.50 mm; head width 1.25 mm; width of thorax 2.50 mm; width of abdomen 2.80 mm. Body (Fig. 977) ovate, flattened dorsoventrally with lateral, pleural and tergal, turgid, large processes (tergal processes deciduous – easily breaking off, leaving scars); widest across abdominal segment 2, gradually narrowing posteriorly, constricted between segments, without urogomphi. Dorsum yellowish brown, well sclerotized; venter lighter, slightly feebler sclerotized than dorsum; mola dark brown. Dorsal vestiture moderately dense, consists of long, erect, branched (easily braking off) setae (Fig. 984) born on conical, truncate apically tubercles, and very fine, simple pubescence covering fine microsculpture on basal parts of processes.

Head (Fig. 978) protracted, hypognathous with mouthparts directed ventrally, not visible from above, moderately flattened dorsoventrally; $0.7 \times$ as long as wide and about $0.5 \times$ as wide as prothorax. Stemmata 4 on each side, hemispherical; one positioned outwardly and three posteriorly to antennal insertion. Epicranial stem short but very distinct; frontal arms long, V-shaped. Frons broad, with 3 pairs of pores posteriorly, and moderately densely covered with setal tubercles near clypeus. Frontoclypeal suture more or less distinct, weakly arcuate. Clypeus transverse, submembranous. Labrum (Fig. 982) free, with anterior margin broadly, shallowly emarginate; $0.45 \times$ as long as wide, with 3 pairs of long, stout setae (one pair positioned in central area, second directed mesally, near anterior angles, third pair on outer edge) and 3 pairs of short setae and two pores along anterior margin. Epipharynx (Fig. 983) membranous with two oblique rows of stout, moderately long setae directed inwardly and 3 pairs of pores in central area. Antenna (Figs 979, 980) 3-segmented, more than $0.3 \times$ as long as head; inserted in large, circular membrane, distant from mandibular articulations. Antennomere 1 short with 4 pores; antennomere 2 longest, $3.8 \times$ as long as antennomere 1 and $2.5 \times$ as long as antennomere 3, with 2 mesal setae near apex and 1 pore near outer edge in apical part; sensory appendage (Fig. 980) situated ventro-medially, about $0.5 \times$ as long as antennomere 3, with elongate, cylindrical, stout process in mid length, near antennomere 3 and a few apical setae and membranous sensilla; antennomere 3 weakly curved outwardly in mid length, rounded at apex, with

4 apical processes (one pointed, two cylindrical and one rounded apically) and a few fine hairs. Mandible (Fig. 981) broad, triangular with acute apex provided with long, stout spine directed mesally; prostheca large, divided in two separated parts – apical part covered with long spines and basal, membranous lobe; ventral accessory process absent; mola large, transversely ridged; outer mandibular edge with one stout seta. Maxillolabial complex retracted. Maxilla (Figs 985, 986) with well-developed articulating area, with cardo semi-oval and stipes long-oval. Mala about $2 \times$ as long as wide, elongate apically into narrow, rounded lobe covered with tuft of long setae thickened apically on one side (Fig. 987); rest of apical margin (from apex toward palp) with symmetrically thickened apically long setae (Fig. 988); outer edge of stipes (between palp and cardo) with three long, simple, pointed setae; mesal edge with single, ventral pore. Maxillary palp 3-segmented based on short membranous palpifer, bearing one, very long seta; palpomere 1 very short with two pores, palpomere 2 longer than wide with 3 setae and fine pubescence, terminal palpomere more than $7 \times$ as long as 1^{st} and almost $2 \times$ as long as 2^{nd} , tapering towards apex and rounded, bearing 2 setae, 5 pores and a group of sensilla at apex. Labium (Fig. 989) concave ventrally, as to be folded with palpi directed backwardly; with mentum and submentum fused; prementum short, transverse with medial, triangular sensory area; ligula membranous, short, deeply emarginate medially at apex, bearing 6 pairs of moderately long and 1 pair of very long, pointed setae along apical margin; labial palp 1-segmented arising from membranous palpiger; palp somewhat conical, rounded at apex with one subapical and a few apical sensilla; hypopharynx (Fig. 990) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and divergent posteriorly hypopharyngeal rods; anterior membranous parts with a few pairs of oblique rows of minute hairs directed mesally.

Thorax about $0.3 \times$ as long as body length, widest across mesothorax; prothorax as long as meso- and metathorax together; each tergum strongly transverse, sclerotized and divided by pale longitudinal line. Pro- and mesothorax with large, lateral, pleural and tergal lobes; metathorax with only pleural lobes. Obvious glands absent.

Legs (Figs 992, 993) slender, comparatively long; all pairs of subequal length with coxae rather widely separated, covered with numerous pointed setae. Trochanter weakly triangular with 1 spine, 4 setae and 3 pores; femur cylindrical with 2 pores, 1 spine and 1 seta; tibiotarsus distinctly narrower and slightly longer than femur, flattened medially and bearing numerous stout, pointed setae on inner edge; claw long with single seta.

Abdomen widest across segment 2, bearing largest tergal processes; A1 longest, A2–3 and A7–8 slightly shorter than A1, subequal; A4–6 equal in length, shortest. A1–8 bearing pleural, not dehiscent and tergal dehiscent

processes as shown on Fig. 991 (most of abdominal tergal processes broken off, leaving large scars); each tergite between processes covered with numerous long setae. A7–8 weakly arcuate; A9 emarginate medially with apical setae; segment 10 posteroventral, weakly emarginate. Spiracles annular, not raised on tubes, situated between tergal and pleural processes.

Material examined. *Archipines championi* (Gorham): Rincon de Osa, 20–26.VI.2001, J.F. Lawrence, dead banana leaves (2: ANIC) – associated with adults.

Encymon Gerstaecker

(Figs 994–1009)

Diagnosis. The larva of *Encymon* seems to be related with *Eumorphus* and *Ancylopus*. The body elongate with lateral, long, branch-like, at least subacute apically, dehiscent thoracic and abdominal processes, the apex of maxillary mala with 4 rows of hook-like setae on ventral surface and the tergite of abdominal segment 1 with gland openings are shared by these larvae. *Encymon* however can be separated from both larvae in having the antenna with antennomere 2 more than $20.0 \times$ longer than antennomere 1. Moreover it differs from *Ancylopus* larva by having the head not bulged behind antennal fossae, the body processes more acute apically and the abdominal segments lacking tergal plates, while the body processes provided with larger, setose tubercles and the pleural body processes being also deciduous separate it from *Eumorphus* larva. The gland openings present on the tergite of abdominal segment 1 is shared also with *Amphisternus* larva, but the body processes in *Amphisternus* being not dehiscent, shorter, blunt or rounded at apex, and the mala differently setose, separate both genera.

Description of mature larva – first description for the genus. Length 6.50–7.00 mm; head width 1.55–1.65 mm; width of thorax 2.15–2.50 mm; width of abdomen 2.40–2.70 mm (width of body parts excluding processes). Body (Fig. 994) long-oval, moderately flattened dorsoventrally with lateral, pleural and tergal, elongate, somewhat pointed apically, large, deciduous processes, easily breaking off, leaving scars; body widest across abdominal segment 1 (excluding processes), weakly narrowing anteriorly and posteriorly; short urogomphi present. Dorsum light brown, moderately sclerotized; venter slightly lighter, feebler sclerotized than dorsum; mouth frame, mandibles and claw dark brown. Body vestiture moderately dense, consists of pointed setae of different length, arising from very small tubercles, and only body processes provided with large tubercles (Fig. 997).

Head (Figs 995, 996) protracted, visible from above, hypognathous with mouthparts directed ventrally; moderately flattened dorsoventrally; about $0.70 \times$ as long as wide and slightly narrower than prothorax; provided

with 4 pairs of long setae anteriorly and moderately densely setose posteriorly. Epicranial stem and median endocarina absent; frontal arms long, U-shaped. Hypostomal rods very long, weakly arcuate and convergent posteriorly. Stemmata 4 per side, hemispherical; all stemmata moderately close together and situated postero-ventrally to antennal base – 3 stemmata positioned in straight line and 1 stemmata ventrally to anterior one. Frontoclypeal suture distinct and straight. Clypeus transverse, submembranous, bearing a pair of long setae. Labrum (Fig. 1007) free, about $0.50 \times$ as long as wide, with membranous, moderately large anterior part; anterior margin of both – sclerotized and membranous parts – emarginate medially; membranous part provided with 3 pairs of setae and a few fine setae on anterior margin; sclerotized part with 2 pairs of setae on each side anteriorly, and 1 pair of moderately long setae positioned in central area, and 1 pore between them. Epipharynx (Fig. 1008) submembranous with a pair of antero-lateral and a pair of postero-medial patches of inwardly directed, short setae, and 3 long, stout, blunt apically setae situated on both sides of anterior margin. Antenna (Figs 998, 999) 3-segmented, long and moderately slender, at least $1.5 \times$ longer than head; situated in circular membrane; distant from mandibular articulations. Antennomere 1 very short without setae or pores; antennomere 2 very long, $25.0 \times$ as long as antennomeres 1 and 3, densely covered with long, pointed setae; sensory appendage (Fig. 999) situated apically, about as long as antennomere 3, subcylindrical with narrow, blunt apical process; antennomere 3 with three apical, pointed setae and long, apical, pointed process. Mandible (Figs 1001, 1002) very broad, triangular with two blunt apical teeth and incisor edge with two or three, small and blunt subapical teeth; ventral accessory process absent; protheca moderately large, with apical part sclerotized and basal part membranous provided with small denticles; mola large, moderately coarsely, transversely ridged; outer edge with 4 stout setae; ventral surface with 1 pore near protheca and 1 long, pointed seta near outer edge. Maxillolabial complex retracted. Maxilla (Figs 1003, 1004) with well developed articulating area; cardo triangular; stipes elongate with 1 ventral seta in central area and 1 seta on outer edge, beyond palp. Mala about $3 \times$ as long as wide, produced triangularly into subacute apex; ventral apical surface covered with 4 oblique rows of long, curved apically setae; dorsal apical surface with numerous fine setae and 7 inwardly directed long, stout and pointed, subapical spines near inner edge. Maxillary palp 3-segmented based on large, membranous palpifer provided with long stout seta on outer edge; palpomere 1 shortest with 1 ventral pore and 1 ventral seta; palpomere 2 with 1 ventral pore and 1 seta on outer edge; terminal palpomere about $1.35 \times$ as long as palpomere 2 and about $3.0 \times$ as long as palpomere 1, cylindrical and rounded at apex, bearing 2 ventral setae and group of

sensilla at apex. Labium (Fig. 1005) with distinct suture between mentum and submentum; prementum with ligula widely rounded apically with 3 pairs of setae anteriorly and one pair of long setae medially; mentum with numerous setae anteriorly; labial palp 2-segmented with palpigers distant from each other; palpomere 1 large, distinctly widening anteriorly, longer and much wider than terminal palpomere, densely setose; terminal palpomere subcylindrical, rounded apically, with group of apical sensilla; hypopharynx (Fig. 1006) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and long, parallel hypopharyngeal rods; anterior submembranous part with lateral patches of inwardly directed, moderately long setae.

Thorax about $0.3 \times$ as long as body length, widest across metathorax; prothorax slightly shorter than meso- and metathorax combined; each tergum strongly transverse, sclerotized, meso- and metatergum with small lighter notal plates, and each tergum divided by pale longitudinal line. Long, lateral, tergal dehiscent processes present on each segment; pleural processes absent. Obvious glands absent.

Legs (Fig. 1009) very long and rather slender; all pairs of subequal length; coxae widely separated, covered with numerous short, pointed setae. Trochanter somewhat triangular with 5 long setae on inner edge and 1 seta on outer edge; femur about $4.30 \times$ as long as wide, subcylindrical, with a few short setae on outer edge and more densely setose on inner edge, additionally with 1 very long seta in mid length; tibiotarsus longest, distinctly narrower and $1.35 \times$ longer than femur, bearing numerous stout, pointed, moderately short setae; claw slender with single, short seta.

Abdomen widest across segment 1 and gradually narrowing posteriorly; segments A2-7 bearing lateral long, dehiscent, tergal and pleural processes (in Fig. 994 almost all processes broken off); A1 with lateral, repugnatorial gland openings, each accompanying with tergal process modified into short, rounded apically lobe covered with long spines (Figs 994, 1000); A8 slightly shorter than preceding ones, provided only with pleural processes. Segment 9 short with distinct urogomphi; segment 10 ventral. Spiracles annular, not raised on tubes.

Material examined. *Encymon immaculatus* (Montruzier), Finch Hatton George, W Mackay, N.Q. 29.I.1975, B.K. Cantrell (2: ANIC – associated with adults).

***Eumorphus* Weber**
(Figs 1010–1027)

Diagnosis. The larva of *Eumorphus* is most similar to *Encymon* and *Ancylopus* by having the body elongate with lateral, long, branch-like, at least subacute apically, dehiscent thoracic and abdominal processes, the apex of maxillary mala with 4 rows of hook-like setae on

ventral surface and the tergite of abdominal segment 1 with gland openings. The head not bulged behind antennal fossae and the body processes more acute apically distinguish *Eumorphus* from *Ancylopus* while the pleural body processes being not deciduous and the antennomere 2 less than $20.0 \times$ as long as antennomere 1 separate it from *Encymon*. The tergite of abdominal segment 1 with gland openings is shared also with *Amphisternus* larva, but the different body processes (shorter, blunt or rounded at apex and not dehiscent, in *Amphisternus*), and the mala differently setose, separate both genera. The double hypostomal rods in *Eumorphus* are shared with *Lycoperdina*. *Eumorphus* however differs from *Lycoperdina* by mentioned above characters and by having the head hypognathous with the antennal insertions distant from mandibular articulations.

Description of mature larva. Length 10.00 mm (11.50 mm including urogomphi); head width 3.00 mm; width of thorax 3.80 mm; width of abdomen 4.25 mm (width of body parts excluding processes). Body (Fig. 1010) long-oval, flattened dorsoventrally with lateral, pleural and tergal, elongate, somewhat pointed apically, large processes (tergal processes deciduous – easily breaking off, leaving scars); body, including processes, widest posteriorly, across abdominal segments 4 and 5, weakly narrowing anteriorly towards metathorax and scarcely narrowing towards A7, thence strongly narrowing posteriorly; long urogomphi present. Dorsum light brown, well sclerotized; venter slightly lighter, moderately sclerotized; mola dark brown. Dorsal vestiture moderately dense, consists of short, frayed setae arising from small tubercles and simple, short and moderately long setae on anterior part of head; ventral surface comparatively densely covered with simple, short setae; body processes and legs bearing long, pointed setae arising from small tubercles (Figs 1018, 1019, 1026).

Head (Figs 1011, 1012) protracted, visible from above, hypognathous with mouthparts directed ventrally; moderately flattened dorsoventrally; $0.55 \times$ as long as wide and about as wide as prothorax; covered with fan-shaped setae posteriorly and simple, shorter and longer setae anteriorly. Epicranial stem short but distinct, frontal arms long, U-shaped. Median endocarina absent. Hypostomal rods double, long and short, subparallel. Stemmata 4 per side, hemispherical; 2 stemmata close together and situated posteriorly to antennal base, 1 situated far posteriorly to both of them, and 1 positioned antero-ventrally to antennal insertion. Frontoclypeal suture distinct and straight. Clypeus transverse, submembranous, bearing few pointed setae. Labrum (Fig. 1020) free, about $0.44 \times$ as long as wide, with membranous, moderately large anterior part; anterior margin truncate or very shallowly emarginate, provided with 2 pairs of setae and 1 pair of pores; sclerotized part with 6 long, stout setae on each side anteriorly, and 1 pair very long and 3 pairs of moderately long setae positioned in central area. Epipharynx

(Fig. 1021) membranous with a pair of anterior and a pair of central patches of inwardly directed, short setae, and 2 pairs of pores anteriorly and posteriorly to small central, cross-shaped sclerotization. Antenna (Figs 1013, 1014) 3-segmented, comparatively long and slender, about $0.55 \times$ as long as head; situated in large, circular membrane; partially retracted into antennal insertions; distant from mandibular articulations. Antennomere 1 short with 2 dorsal setae, 5 dorsal pores and 1 ventral pore; antennomere 2 longest, $4.1 \times$ as long as antennomere 1 and about $14.0 \times$ as long as antennomere 3, with 1 dorsal and 3 ventral pores and 3 very long subapical setae; sensory appendage (Fig. 1014) situated apically, about as long as antennomere 3, subcylindrical with narrow, blunt apical process; antennomere 3 with 3 apical, pointed setae and 1 minute, rounded apically process. Mandible (Figs 1015, 1016) very broad, triangular with blunt apex and incisor edge somewhat chisel-shaped lacking subapical teeth; prostheca moderately large, membranous with additional submembranous process denticulate on its inner edge; mola large, finely ridged transversely; outer edge with 4 stout setae. Maxillolabial complex retracted. Maxilla (Figs 1022, 1023) with well-developed articulating area; cardo triangular; stipes elongate with 5 ventral, long setae near outer edge, beyond palp; mala about $3 \times$ as long as wide, produced into subacute apex, with ventral surface covered with four, oblique rows of long setae, somewhat curved apically and with numerous fine setae on apical-dorsal surface, and dorsal surface below apex provided with elongate row of nine, long, pointed spines, near inner edge. Maxillary palp 3-segmented based on large, membranous palpifer; palpomere 1 with 2 pores and 1 ventral and 1 dorsal setae; palpomere 2 with 1 dorsal, 1 ventral and 4 outer setae and 1 ventral pore; terminal palpomere about $1.7 \times$ as long as 2 and over $3 \times$ as long as palpomere 1, cylindrical and rounded at apex, bearing 1 ventral and 1 dorsal setae and group of sensilla at apex. Labium (Fig. 1024) somewhat pentagonal with mentum and submentum fused; prementum densely setose without distinct ligula, truncate anteriorly, with right-angled anterior angles; labial palpi 1-segmented, rounded apically, each with two pores and group of apical sensilla, situated in large, membranous palpifers distant from each other; hypopharynx (Fig. 1025) with well developed, large sclerotized parts consisting of large hypopharyngeal sclerome, bracon and parallel hypopharyngeal rods; anterior submembranous part with seven pairs of obliquely directed rows of moderately long setae.

Thorax about $0.4 \times$ as long as body length, widest across metathorax; prothorax as long as meso- and metathorax combined; each tergum strongly transverse, sclerotized, with lighter notal plates, and divided by pale longitudinal line. Long, lateral, tergal dehiscent processes present on each segment. Obvious glands absent.

Legs (Figs 1026, 1027) long and rather slender; all pairs of subequal length with coxae widely separated, covered

with numerous short and a few long pointed setae. Trochanter somewhat triangular with 1 very long, 1 slightly shorter and a few short setae; femur subcylindrical, slender at base, densely setose, with 1 very long seta on inner edge; tibiotarsus longest, distinctly narrower and slightly longer than femur, scarcely flattened medially and bearing numerous stout, pointed, short setae; claw rather slender with single, comparatively long seta.

Abdomen widest across segment 5 and posteriorly to it, bearing longest tergal processes; segments A1–7 subequal in length, A8 slightly shorter. A1 with lateral gland openings (Fig. 1017) and modified tergal process (very small, covered with fan-shaped setae). Segments A1–8 bearing pleural, not dehiscent processes and A2–8 bearing tergal dehiscent processes as shown on Fig. 1010 – many of abdominal tergal processes broken off leaving scars. A9 short with long urogomphi; A10 ventral. Spiracles annular, not raised on tubes, located in folds between tergal and pleural lobes.

Material examined. *Eumorphus* sp. Borneo, Mt. Kinabalu at Liwagu River, 17.V.1987, 1200 m, mushrooms on rotting fallen trees, A. Smetana, 857 (4: ANIC). *Eumorphus* sp., Malaysia: Selangor Lima Blas Estates, 15.I.1975, 3744, JFL (J. Fleagle), *Ganoderma* sp. (3: ANIC). *E. quadriguttatus pulchripes*, Assam, Garo Hills, above Tura. 3500–3900 ft. July–Aug. 1917, S. Kemp. Coll. (3: BMNH).

Lycoperdina Latreille

(Figs 1028–1041)

Diagnosis. The larva of *Lycoperdina* is very distinctive among known larvae of Lycoperdininae by its body provided with paired acute, dorsal processes and the head prognathous with the antennal sockets placed close to the mandibular articulations. The double hypostomal rods in *Lycoperdina* are shared with *Eumorphus*, but the characters mentioned above separate easily the larvae of both genera.

Description of mature larva. Length 9.40 mm; head width 1.45 mm; width of thorax 2.95 mm; width of abdomen 3.40 mm. Body (Fig. 1028) elongate, weakly dorsoventrally flattened with dorsolateral and lateral, pleural and tergal, small verrucae, and with paired dorsal spines along midline; widest at middle (across abdominal segment 3), gradually tapering anteriorly and posteriorly; with urogomphi. Dorsum yellowish brown, well sclerotized; venter lighter, slightly feebler sclerotized than dorsum; mola dark brown. Dorsal vestiture consisting of simple, moderately dense, short and suberect setae; ventral surfaces sparsely pubescent; body processes and legs covered with longer setae arising from very small tubercles.

Head (Figs 1029, 1030) protracted, visible from above, prognathous; transversely-oval in dorsal view

and somewhat triangular in anterior view; about $0.65 \times$ as long as wide and $0.65 \times$ as wide as prothorax. Epicranial stem absent, frontal arms long, U-shaped. Median endocarina absent. Hypostomal rods present, paired (long and short). Stemmata 4 per side, hemispherical; 1 ventral to antennal insertion, remaining stemmata positioned posteriorly to first one (almost in straight line). Frontoclypeal suture distinct, and arcuate. Clypeus transverse, submembranous. Labrum (Fig. 1037) free, with anterior margin truncate; nearly 2 times as wide as long, with 5 pairs of long, stout setae (two pairs positioned on sides near anterior margin, two pairs positioned on lateral edges near mid length and fifth pair positioned in central area). Epipharynx (Fig. 1038) membranous with 3 stout spines on each side of anterior margin and with a few oblique rows of stout, short spines anteriorly and 2 pairs of pores in central area. Antenna (Fig. 1034) 3-segmented, very short, situated in large, circular membrane, inserted near mandibular articulations. Antennomere 1 with 1 ventral and 2 dorsal pores; antennomere 2 longest, $2.0 \times$ as long as antennomere 1 and almost $3.0 \times$ as long as antennomere 3, with 1 dorsal pore, and 1 short dorsal, and 1 short ventral setae – each near apex; antennomere 3 about as long as sensory appendage, subcylindrical with truncate apex and 6 apical processes; sensory appendage elongate, tapering with subacute apex. Mandible (Fig. 1033) short and broad, with truncate apex; incisor lobe without subapical ridges or teeth; prostheca moderately large, membranous with obtuse, submembranous accessory process; mola well developed, large, finely ridged and tuberculate; outer edge with one stout seta. Maxillolabial complex retracted. Maxilla (Figs 1035, 1036) with well-developed articulating area; cardo somewhat pentangular with 1 seta; stipes elongate with ventral surface provided with 2 setae proximad and 1 seta near base; mala about $1.5 \times$ as long as wide, membranous, covered with dense fringe of long setae ventrally, many short spines dorsally, 6 subapical stout spines surrounding mesal edge and one stout spine below them on dorsal surface. Maxillary palp 3-segmented based on short membranous palpifer; maxillary palpomere 1 in form of sclerotized, incomplete ring provided with two ventral pores, palpomere 2 slightly narrower and about as long as palpomere 1, terminal palpomere elongate, subcylindrical, almost as long as palpomeres 1 and 2 combined, provided with long dorsal spine and bearing 8 apical sensory processes. Labium (Fig. 1039) with rather distinct suture between mentum and submentum; prementum short, submembranous at base, with ligula lobed at sides and setose; palpi 2-segmented with bases distant from each other; palpomere 1 in form of sclerotized, reduced medially ring; terminal palpomere elongate, over $2 \times$ longer than palpomere 1, subcylindrical, somewhat rounded at apex with 1 subapical campaniform sensillum and a few apical sensilla; hypopharynx (Fig. 1040)

with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and slightly convergent posteriorly directed hypopharyngeal rods; each side of anterior part of hypopharynx with a few oblique rows of stout, short setae.

Thorax about $0.27 \times$ as long as body length, widest across metathorax; prothorax about $2 \times$ as wide as long, widest posteriorly, slightly shorter than meso- and metathorax combined; provided with two large notal plates, each somewhat depressed centrally; meso- and metathorax about $4 \times$ as wide as long, each with two moderately large, tergal plates (much smaller than those on prothorax); ecdysial suture absent. Terga lacking dorsal tubercles or sublateral lobes; obvious glands absent.

Legs (Fig. 1041) short and stout, covered with comparatively long, stout setae, increasing in size posteriorly; coxae comparatively widely separated at their bases, covered with numerous setae; trochanter somewhat triangular with 4 pores and 6 setae ventrally, and 2 pores and 3 setae dorsally; femur elongate, about twice as long as wide, with 1 ventral and 2 dorsal pores, and with 9 ventral, and 3 dorsal setae; tibiotarsus about as long as femur, slightly narrowing towards apex, bearing 4 ventral and 3 dorsal setae; claw moderately stout with single seta.

Abdomen widest across segment 3. Segments A1–7 about $4\text{--}5 \times$ as wide as long, and A8–9 about $3 \times$ as wide as long. Segments A1–8 bearing small lateral, pleural, setose processes/ tubercles; A1–9 with dorsal acute (Fig. 1032), and dorsolateral, rounded apically (Fig. 1031), tergal processes, becoming approximate posteriorly. Dorsal acute processes increasing in size posteriorly, and on A9 forming apparent urogomphi. Segment 10 posteroventral. Spiracles annular, not raised on tubes.

Material examined. *Lycoperdina ferruginea* LeConte. Rainbow Falls Tr. 2500–3800' G. Smoky Mt. N.P. Tenn. May 22, 1972, Lot 3352, JFL, *Lycoperdon* (18: ANIC); *L. ferruginea*, H.E. Hinton Coll, B.M. 1977–248 (5: BMNH); *L. bovistae*, H.E. Hinton Coll, B.M. 1977–566 (BMNH).

Mycetina Mulsant

(Figs 1042–1057)

Diagnosis. The larva of *Mycetina* is most similar to *Aphorista* in having the body with short thoracic and abdominal lateral, tergal lobes, vestiture of specialized fan-shaped setae, the tergal plates with weak protuberances, the tergum 9 emarginate and the labrum with anterior margin multidenticulate. *Mycetina* however differs from *Aphorista* by having the thoracic segments 2 and 3 with 2 pairs of tergal protuberances, the frayed setae longer, the antennal sockets placed distinctly beyond mid length of head and the caudal notch on the abdominal tergite 9 deeply emarginate.

Description of mature larva. Length 5.20 mm; head width 1.30 mm; width of thorax 2.60 mm; width of

abdomen 3.00 mm. Body (Fig. 1042) broadly-ovate, somewhat onisciform, constricted between segments, weakly dorsoventrally flattened, with lateral pleural and tergal, small processes and small verrucae; widest at middle (across abdominal segment 2), gradually, weakly tapering anteriorly and posteriorly; without urogomphi. Dorsum greyish yellow with venter slightly paler, feebler sclerotized than dorsum; mandibles, mouth frame, claw and frayed setae brown. Dorsal vestiture consisting of frayed (fan-shaped) setae (Fig. 1049), long hairs and few pointed setae; ventral surfaces covered with many simple minute setae, and a few long pointed setae; body processes provided with modified setae and legs covered with short and long, pointed setae arising from very small tubercles.

Head (Figs 1043, 1044) protracted, hypognathous, triangular, moderately flattened dorsoventrally, partially visible from above; about $0.70 \times$ as long as wide and about $0.60 \times$ as wide as prothorax; covered mainly with fan-shaped setae and a few long, pointed setae anteriorly. Epicranial stem very short but distinct, frontal arms long, U-shaped. Median endocarina absent. Hypostomal rods present, long and weakly divergent posteriorly. Stemmata 4 per side, hemispherical; 2 stemmata close together and situated posteriorly to antennal base, 1 situated ventrally and 1 antero-dorsally to antennal insertion. Frontoclypeal suture distinct and straight. Clypeus transverse, bearing 3 pairs of setae. Labrum (Fig. 1053) free, with anterior margin bearing 16 obtuse/rounded denticles, somewhat asymmetrically positioned between halves; about 2 times as wide as long, with 4 setae near anterior margin, a pair of long, pointed setae positioned centrally, 2 pairs of long, pointed setae on each side and three pores positioned transversely in central area. Epipharynx (Fig. 1054) membranous; sides of anterior margin provided with 2 long, directed medially, pointed setae; median area with three pairs of sensilla and 1 pair of pores positioned posteriorly to sensilla; lateral and posterior areas covered with obliquely directed, minute spinules. Antenna (Figs 1045, 1046) rather short and slender, 3-segmented, partially retracted in antennal insertions, situated in large, circular membrane, distant from mandibular articulations. Antennomere 1 short with single ventral pore; antennomere 2 longest, about $2.7 \times$ as long as antennomere 1 and almost $3.0 \times$ as long as antennomere 3, with 3 long, subterminal setae and one campaniform sensillum; antennomere 3 slightly shorter than sensory appendage, subcylindrical with 3 long, apical setae, 1 short subapical seta and 1 apical process; sensory appendage elongate, swollen at base and distinctly narrowing apically, with pointed apex. Mandible (Figs 1047, 1048) broad, triangular with pointed apical tooth; incisor edge smooth and sharp lacking subapical ridges or teeth; ventral accessory process absent; prosthema moderately large, hyaline without setae; mola well developed, large, prominent with mesal surface arcuate,

and transverse rows formed by fine asperites; outer edge with 2 long, stout setae; dorsal surface with single campaniform sensillum. Maxillolabial complex retracted. Maxilla (Figs 1050, 1052) with well-developed, narrow articulating area; cardo somewhat triangular with 1 seta; stipes elongate with 2 setae proximad and 2 seta near base of palp. Mala at least $2 \times$ as long as wide, membranous, with apex covered with dense fringe of long setae dorsally, and many stout, moderately long spines ventrally; 4 subapical, stout spines near mesal margin, on dorsal surface present (Fig. 1050). Maxillary palp 3-segmented based on large membranous palpifer; terminal palpomere longest, about $2 \times$ as long as palpomere 1 and $1.5 \times$ as long as palpomere 2; palpomere 1 with single ventral pore, palpomere 2 with two ventral pores and long seta, terminal palpomere (Fig. 1051) provided with short mesal seta, one pore on outer edge near apex and bearing a group of apical sensory processes. Labium (Fig. 1055) with prementum short, wider than long, provided with two long setae; ligula membranous, widely rounded at apex, with one pair of apical setae; postmentum large, well developed; mentum and submentum fused; palpi 2-segmented, subequal in length, with bases distant from each other; palpomere 1 with one long, inner seta and one short, outer seta; terminal palpomere subcylindrical, rounded at apex with 2 pores and a few apical sensilla; hypopharynx (Fig. 1056) with well developed, sclerotized parts consisting of large hypopharyngeal sclerome, bracon and subparallel hypopharyngeal rods; membranous anterior part with dense obliquely directed minute setae.

Thorax about $0.40 \times$ as long as body length, widest across meso- and metathorax; prothorax about $2.50 \times$ as wide as long, widest near mid length, $1.33 \times$ longer than mesothorax and $1.66 \times$ longer than metathorax; protergum bearing dorsal protuberances and lateral projections; meso- and metatergum, each with 4 rounded verrucae and with lateral lobes, covered with fan-like setae; ecdysial suture distinct on pro- and mesotergum. Obvious glands absent.

Legs (Fig. 1057) relatively short and stout, covered with comparatively long, stout, pointed setae, and only coxa provided with sparse frayed setae; coxae moderately widely separated at their bases, with numerous pointed setae and few fan-shaped setae; trochanter elongate, somewhat triangular with 4 short and 1 long, mesal setae; femur elongate, about $3 \times$ as long as wide, with numerous short setae, 1 long mesal seta and 1 ventral pore; tibiotarsus about as long as femur, narrowing towards apex, bearing numerous, rather short setae; claw slender with single seta.

Abdomen widest across segment 2. Segments A1–8 similar in shape; terga bearing similar verrucae as those on thorax and with dorsolateral lobe on each side; pleural regions with similar projections – all covered with fan-shaped setae. A9 small, deeply emarginate

posteriorly. Segment 10 ventral. Spiracles very small, annular, surrounded with sclerotized ring, not raised on tubes, located in folds beneath tergal lobes.

Material examined. *Mycetina perpluchra* (Newm.), Mass: Eastabrook Wds., Concord, Middlesex Co. July 4, 1974, A. Newton, und. Bark (3: ANIC, associated with adults).

Endomychidae Leach

New synonym and lectotype designation

Evolocera championi Sharp, 1891 (= *Adamia mexicana* Tomaszewska, 2000).

Evolocera championi Sharp, 1891 (= *Adamia mexicana* Tomaszewska, 2000) – **new synonym**, based on the examination of the type material: Lectotype of *E. championi* – present designation "*Evolocera championi*, types. D.S./ type/ San Juan, Vera Paz. Champion/ B.C.A. Col. II. 1. *Evolocera championi*, Sharp" (BMNH); paralectotypes: same data and on the same card (left specimen) as lectotype (right specimen) (BMNH); same and syntype (BMNH). Holotype of *Adamia mexicana*: "Tezonapa, Veracruz, Mex. 8.VIII.41/ Col. & pres. by Henry S. Dybas" (FMNH); paratypes: ♂, "Mex. S.L. Potosi Palitla. 5 mi, N. of Tamazunchale. 22.XII.1948/ H.B. Leech Collector" (MIZ); ♀, "Mex. S.L.P. Quinta Chila, Tamazunchale, 20.XII.1948/ H.B. Leech Collector" (FMNH-dissected).

As a consequence, *Evolocera* Sharp, previously classified in Merophysiinae, is moved here to Eupsilobiinae.

PHYLOGENETIC ANALYSIS

Methods

In order to examine relationships of Lycoperdininae genera and the placement of the subfamily in Endomychidae adult and available larval data were examined and subjected to cladistic analyses.

To test the resolution provided by the limited larval character set, the analyses were performed first using adult characters only and then using the combined larval/ adult dataset. Sixty nine morphological characters were scored in 69 taxa for the phylogenetic estimate based on adult morphology (Table 3). The adult matrix was subsequently combined with twenty seven larval characters coded for 33 taxa and the combined data matrix was jointly analysed with missing larval data (Table 4) or with taxa that larvae were unknown deleted from the matrix (Table 5). Missing data were coded as "?". All characters were always equally weighted and unordered, and character polarities were determined in the context of the phylogenetic analysis. All autapomorphies of terminal taxa are included in the analyses with notion that they will be clearly available for further analyses and their influence of the cladogram characteristics is of no importance.

Phylogenetic relationships were reconstructed using computer software to find most parsimonious

trees. Hennig86 (Farris 1988) and NONA version 2.0 (Goloboff 1999) were used for heuristic searches. Character data were edited, cladograms prepared and character optimisations conducted using WinClada, version 1.00.08 (Nixon 2002). Ambiguous optimisations were mostly resolved using accelerated transformation (ACCTRAN) which favours reversals over parallelisms to explain homoplasy (Farris 1970) and therefore maximises homology.

The following analyses were performed:

(a) heuristic search (NONA) according to the following command sequence: "**hold 10000; hold/10; mult *100**" (hold 10,000 in memory; hold 10 starting trees in memory; perform TBR branch swapping on 100 random addition replicates);

(b) ratchet (or island hopper; NONA) as described by Nixon (1999) with 1000 iterations (ambiguity = polytomous, 20% constrained nodes, 10 characters to sample and 10 trees to hold per iteration);

(c) successive approximation weighting (Hennig86; Farris 1988) using multiple commands sequence "**mh* bb* xsteps w cc**".

Bootstrap analysis (Felsenstein 1985) using 1000 resampling replicates (calculated in WinClada with settings: number of replications = 1000, no. research replications = 10, no. trees per replication = 10) was used to study the level of character support in the dataset for hypothesized clades.

The jackknife analysis (Farris et al. 1996) using 1000 replicates (settings identical to those for bootstrap above) was used to examine the effect of taxon sampling on hypothesized clades. The latter values are not presented on cladograms because their values are almost identical to the bootstrap ones.

Because of limited application of bootstrap values for morphological characters alone a support for clades was tested further by calculating Bremer support values (Bremer 1988, 1994) in NONA using the following commands: "**mult*25; max*; hold 15000; sub 10; find*; bs**".

Taxa used in analysis

Outgroups. Characters states were polarized using outgroup comparison (Nixon and Carpenter 1993). Based on the sister group relationships between Endomychidae and Coccinellidae which were extensively tested in my former paper (Tomaszewska 2000), two coccinellid genera *Sticholotis* Crotch (*S. quadrimaculata* (Blackburn)) and *Rhyzobius* Stephens (*Rhyzobius ventralis* (Lea)) were chosen as closely related outgroups. Both genera belong to basal clades in Coccinellidae and have relatively unmodified adult and larval morphology allowing direct character homology tests between outgroup and ingroup taxa. Corylophid genus *Holopsis* Broun (*Holopsis* sp. from Tasmania), and a cerylonid genus *Hypodacnella* Šlipiński (*Hypodacnella euxestoides*

Ślipiński) were chosen and used in present analyses as more distantly related outgroups.

Ingroup. The principal ingroup in the present analyses consists of the subfamily Lycoperdininae, with its all genera as the terminal taxa, with representative

members of remaining currently recognized endomychid subfamilies: Danascelinae, Xenomycetinae, Endomychinae, Anamorphinae, Merophysinae, Lycoperdininae, Stenotarsinae, Epipocinae, Eupsilobiinae, Pleganophorinae, Mycetaeinae, Leiestinae (Tomaszewska 2000).

Table 1. Taxa of **Endomychidae** (excluding Lycoperdininae) directly examined or characters coded based on published descriptions.

(*) Among Merophysinae the only *Holoparamecus* and *Coluocera* larvae are known. Therefore in combined data matrices, in case of *Displotera* and *Merophysia* used in adult data, as larval characters were coded those of closely related *Coluocera*.

Subfamily	Genus	Species Adult (A) and/or larva (L) studied	Larval material studied and additional (or only) published, larval descriptions used
Danascelinae	<i>Danascelis</i>	<i>D. elongata</i> Tomaszewska (A)	larva unknown
	<i>Hadromyachus</i>	<i>H. chandleri</i> Bousquet and Leschen (A)	larva unknown
Eupsilobiinae	<i>Eidoreus</i>	<i>E. minutus</i> Sharp (A)	larva unknown
	<i>Microxenus</i>	<i>M. laticollis</i> Wollaston (A)	larva unknown
	<i>Evolocera</i>	<i>E. championi</i> Sharp (A, L)	NZAC
Mycetaeinae	<i>Mycetaea</i>	<i>M. subterranea</i> (Fabricius) (A, L)	ANIC, BMNH, Böving and Craighead (1931), Lawrence (1991)
	<i>Agaricophilus</i>	<i>A. reflexus</i> Motschulsky (A, L)	Mamaev (1977)
Leiestinae	<i>Leiestes</i>	<i>L. seminiger</i> (Gyllenhal) (A, L)	ANIC, Burakowski and Ślipiński (2000)
		<i>P. pulchella</i> Newman (A, L)	ANIC, Burakowski and Ślipiński (2000)
	<i>Phymaphora</i>	<i>P. californica</i> Horn (A)	larva unknown
		<i>Rhanidea</i>	<i>R. unicolor</i> (Ziegler) (A, L)
Merophysinae	<i>Holoparamecus</i>	<i>H. caularum</i> Aubé (A)	larva unknown
		<i>H. sp.</i> from Burma (A)	larva unknown
		<i>Holoparamecus sp.</i> (L)	Lawrence (1991)
	<i>Merophysia</i>	<i>Merophysia sp.</i> from Rhodes (A)	larva unknown
	<i>Displotera</i>	<i>D. beloni</i> (Wasmann) (A)	larva unknown
	<i>Coluocera</i> *	<i>C. formicaria</i> Motschulsky (L)	Silvestri (1912)
Anamorphinae	<i>Bystus</i>	<i>B. decorator</i> Leschen and Carlton (A, L)	NZAC, Leschen and Carlton (1993)
		<i>Bystus sp.</i> from Honduras (L)	NZAC
	<i>Mychothenus</i>	<i>M. asiaticus</i> Sasaji (A, L)	Sasaji (1978a)
	<i>Symbiotes</i>	<i>S. gibberosus</i> (Lucas) (A, L)	BMNH
<i>S. latus</i> Redtenbacher (A)		larva unknown	
Pleganophorinae	<i>Trochoideus</i>	<i>T. desjardinsi</i> Guérin (A, L)	ANIC
		<i>T. dalmani</i> Westwood (L)	NMNH
		<i>T. termitophilus</i> Roepke (L)	Kemner (1924)
<i>Pleganophorus</i>	<i>P. bispinosus</i> Hampe (A)	larva unknown	
Xenomycetinae	<i>Xenomycetes</i>	<i>X. morrisoni</i> Horn (A, L)	ANIC, Tomaszewska (2004)
		<i>X. lawersi</i> Hatch (L)	Johnson (1986)
Endomychinae	<i>Bolbomorphus</i>	<i>B. sexpunctatus</i> Arrow (A)	larva unknown
		<i>B. gibbosus</i> Gorham (A)	larva unknown
		<i>B. mediojunctus</i> (Pic) (A)	larva unknown
		<i>B. theryi</i> Gorham (A)	larva unknown
	<i>Cyclotoma</i>	<i>C. cingalensis</i> (Gorham) (A)	larva unknown
		<i>C. conica</i> Tomaszewska (A)	larva unknown
		<i>C. quinquepunctata</i> Arrow (A)	larva unknown
		<i>C. testudinaria</i> Mulsant (A)	larva unknown
	<i>Endomychus</i>	<i>E. coccineus</i> (Linnaeus) (A, L)	BMNH, Böving and Craighead (1931)
		<i>E. armeniacus</i> Motschulsky (A)	larva unknown
		<i>E. thoracicus</i> Charpentier (A)	larva unknown
		<i>E. biguttatus</i> Say (A, L)	ANIC, Lawrence (1991), Leschen and Carlton (1988)
		<i>E. divisus</i> Arrow (A)	larva unknown
		<i>E. punctatus</i> Arrow (A)	larva unknown
<i>E. gorhami</i> (Lewis) (A)	Hayashi and Nakamura (1953)		

Subfamily	Genus	Species Adult (A) and/or larva (L) studied	Larval material studied and additional (or only) published, larval descriptions used
Stenotarsinae	<i>Saula</i>	<i>S. ferruginea</i> Gerstaecker (A)	larva unknown
		<i>Saula</i> sp. from China (A)	larva unknown
		<i>S. japonica</i> Gorham (A)	Sasaji (1978b)
	<i>Stenotarsus</i>	<i>S. nobilis</i> Gerstaecker (A)	larva unknown
		<i>Stenotarsus</i> spp. from Cameroon and Ecuador (A)	larvae unknown
		<i>S. commodus</i> Blackburn (A, L)	ANIC, McHugh and Pakaluk (1997)
		<i>Stenotarsus</i> sp. from Madagascar (L)	FMNH
	<i>Stenotarsus pisoniae</i> Lea (L)	McHugh and Pakaluk (1997)	
	<i>Stenotarsus</i> sp. from Venezuela (L)	BMNH	
Epipocinae	<i>Anidrytus</i>	<i>Anidrytus</i> spp. from Mexico and Costa Rica (A)	larvae unknown
		<i>Anidrytus</i> sp. from Guyana (L)	McHugh and Pakaluk (1997)
	<i>Epipocus</i>	<i>E. tibialis</i> (Chevrolat) (A)	larva unknown
		<i>E. mutilatus</i> Gerstaecker (A)	larva unknown
		<i>Epipocus</i> sp. from Mexico (A, L)	ANIC
	<i>Epipocus</i> sp. from Honduras (L)	McHugh and Pakaluk (1997)	

Table 2. The larvae of *Lycoperdininae* examined or included in the analyses based on the published data.

Genus	Species	Larval material studied and additional (or only) published, larval descriptions used
<i>Achuarmychnus</i>	<i>A. carltoni</i> Tomaszewska et Leschen	MIZ, RALC
<i>Acinaces</i>	<i>Acinaces</i> sp. from Canal Zone, Panama	ANIC
<i>Amphisternus</i>	<i>A. verrucosus</i> Gorham	BMNH
<i>Amphix</i>	<i>A. vestitus cinctus</i> (Fabricius)	ANIC
	<i>Amphix</i> sp. from Peru	FMNH
	<i>A. laevigatus</i> (Gerstaecker)	Böving and Craighead (1931)
<i>Ancylopus</i>	<i>A. melanocephalus</i> (Olivier)	Hayashi and Nakamura (1953)
<i>Aphorista</i>	<i>A. morosa</i> LeConte	ANIC, Lawrence (1991)
	<i>A. vittata</i> (Fabricius)	Böving and Craighead (1931)
<i>Archipines</i>	<i>A. championi</i> (Gorham)	ANIC, Tomaszewska (2002b)
<i>Encymon</i>	<i>E. immaculatus</i> (Montruzier)	ANIC
	<i>Encymon</i> sp. from New Guinea	FMNH
<i>Eumorphus</i>	<i>Eumorphus</i> sp. from Borneo	ANIC
	<i>Eumorphus</i> sp. from Malaysia	ANIC
	<i>E. quadriguttatus pulchripes</i> Gerstaecker	BMNH, Bugnion (1909)
<i>Lycoperdina</i>	<i>L. ferruginea</i> LeConte	ANIC, Pakaluk (1984)
	<i>L. mandarinae</i> Gerstaecker	Hayashi and Nakamura (1953)
	<i>L. dux</i> Gorham	Hayashi and Nakamura (1953)
	<i>L. succincta</i> (Linnaeus)	Böving and Craighead (1931)
<i>Mycetina</i>	<i>M. perpulchra</i> (Newman)	ANIC
	<i>M. cruciata</i> (Schaller)	Burakowski (1997)

All 38 known genera of *Lycoperdininae* were examined and included in the analyses. The detailed lists of the adult species examined for each genus is listed in "material examined" below each generic description. The larvae of *Lycoperdininae* used in the analyses are listed in Table 2.

Characters and discussion

The character states within each character are unordered. Thus the character state 0 not necessarily means

plesiomorphic condition and the relative order of character states should not be regarded as a hypothesis of transformation direction or polarity.

Adult characters

0. Body: glabrous or covered with one kind of setae (0); covered densely with two kinds of setae (1).

The body vestiture double, consisting of suberect setae originating from the punctures and very long, erect spines placed on small tubercles. This is a unique

character for Australian genera *Daulis* and *Daulotypus* (Figs 12, 37, 38, 869, 870).

1. Occipital file: absent (0); present (1).

The cephalic stridulatory area (occipital file) on the head is a unique character for the subfamily Lycoperdininae, although sometimes small or strongly reduced to obsolete in some species of *Trycherus*, *Microtrycherus* and *Chetryrus* (Fig. 1).

2. Fronto-clypeal suture: absent (0); present (1).

The fronto-clypeal suture is absent in Coccinellidae and in *Holopsis*. All members of Endomychidae have a distinct fronto-clypeal suture. It occurs also in more distantly related *Hypodacnella* (state 1).

3. Gular sutures: well developed, separated (0); confluent or absent (1).

The well developed and widely separated gular sutures (state 0) occurs in outgroups, in most subfamilies of Endomychidae and in some Lycoperdininae (*Achuarmychnus*, *Aphorista*, *Brachytrycherus*, *Dapsa*, *Hylaia* and *Lycoperdina*). Most of the Lycoperdininae and Epipocinae have the gular sutures confluent (Figs 2, 4, 5) or sometimes indistinct or absent.

4. Head with antennal grooves: absent (0); present (1).

Most members of Endomychidae do not possess antennal grooves on the ventral surface of the head. This character occurs in almost all outgroups (absent in *Sticholotis*), in some Merophysiinae (*Merophysia* and *Displotera*), and in Eupsilobiinae.

5. Antenna: 9–11 segmented (0); 4–5 segmented (1).

The 4–5 segmented antenna is characteristic for Pleganophorinae (with 7 segments in females of some species of *Trochoideus*).

6. Terminal antennomere: only setose (0); with eversible vesicles (1); with apical sensilla (2).

The terminal antennomere possessing apical sensilla is characteristic for Lycoperdininae *Achuarmychnus* and *Archipines* (Figs 20, 27) (state 2), while eversible vesicles occur in distantly related *Holopsis* (state 1).

7. Male antennomere 9 with tuft of long setae arising from deep concavity on inner edge: absent (0); present (1).

This character occurs only in *Danascelis* (Danascelinae) in present analysis.

8. Mandibular mola: well developed (0); reduced or absent (1).

The well developed mandibular mola is characteristic for some outgroups and all members of Endomychidae. It is reduced or absent in Coccinellidae.

9. Mandibular prosthema: reduced or absent (0); well developed, setose (1); well developed with setae and apical, sclerotized, elongate projections (2).

The large, membranous, more or less setose mandibular prosthema occurs in most Endomychidae and Cerylonidae (*Hypodacnella*) (state 1), while it is reduced or absent in Coccinellidae and *Holopsis* (state 0). Among Endomychidae, some Merophysiinae (*Displotera* and

Merophysia) have the prosthema provided additionally with elongate, sclerotized projections (state 2).

10. Labrum with basal margin: flat (0); with raised median ridge, triangularly produced anteriorly (1).

The basal margin of labrum provided with raised median ridge, that is produced anteriorly occurs only in some Lycoperdininae: *Ancylopus*, *Avencymon*, *Callimodapsa*, *Cymones*, *Haploscelis*, *Indalmus*, *Malindus*, *Microtrycherus*, *Parindalmus* and *Trycherus* (Figs 63, 66, 70, 71, 81, 83, 85, 86, 88, 90).

11. Labrum: with sides subparallel, weakly rounded at sides or expanded antero-laterally (0); strongly produced laterally into rounded lobes (1).

The outgroups, almost all subfamilies of Endomychidae, and most of Lycoperdininae have labrum with sides subparallel or at most expanded and rounded antero-laterally. The labral sides produced laterally into rounded lobes are present only in *Saula* (Stenotarsinae) and some Lycoperdininae (*Archipines*, *Daulis*, *Daulotypus*) (Figs 65, 74, 75).

12. Maxillary lacinia with apex: bearing at most a patch of simple setae or spines (0); bearing numerous stout, somewhat S-shaped setae (1).

The tuft of S-shaped setae on an apex of maxillary lacinia is an unusual character found only in some Lycoperdininae: *Amphisternus*, *Amphistethus*, *Brachytrycherus*, *Ohtaius*, *Spathomeles* and *Stictomela* (Figs 180, 182, 196, 229, 238, 240).

13. Lacinia with mesal and dorsal surfaces: without hairs or covered with more or less irregularly arranged pubescence/spines (0); with inwardly directed teeth (1); with regular rows of setae and/or spinulae (2).

The regular rows of setae/spinulae covering mesal and dorsal surfaces of maxillary lacinia are characteristic for Lycoperdininae (Figs 178, 180, 188, 196, 204) (state 2); the lacinia of *Holopsis* has mesal teeth (state 1) while the rest of Endomychidae and rest of outgroups have character state 0.

14. Terminal maxillary palpomere subcylindrical or somewhat flattened dorso-ventrally (0); flattened laterally along apical half (1).

The terminal maxillary palpomere that is distinctly flattened laterally occurs only in *Cacodaemon* (Fig. 197), in present analysis.

15. Labium with prementum: shorter than wide (0); distinctly longer than wide (1).

The elongate prementum is a unique character for Endomychinae (*Bolbomorphus*, *Cyclotoma* and *Endomychnus* in present data set).

16. Labium with ligula: distinct, membranous or submembranous – most often lobed at sides (0); ligula indistinct – whole prementum evenly sclerotized (1).

The labium with prementum entirely sclerotized without membranous ligula is characteristic for Endomychinae (except for *Endomychnus*). All remaining Endomychidae and the outgroups have at least small membranous ligula, which is most often lobed at sides.

17. Mentum: flat or with large, raised triangular area or transverse ridge (0); with small, triangular, setose tubercle placed medially (1).

The mentum provided with small, setose, tubercle in the central area is a unique character for Mycetainae.

18. Mentum widest beyond mid length (0); expanded and widest anteriorly (1).

This character occurs only in Coccinellidae and some Lycoperdininae, *Mycetina* and *Pseudindalmus* (Figs 271, 275). The remaining Endomychidae and the rest of outgroups have mentum widest beyond mid length, or with sides subparallel.

19. Labial palp: distinctly 3-segmented (0); 2-segmented (1); appearing 2-segmented, with palpomeres 1 and 2 fused (2).

The labial palp 3-segmented occurs throughout Endomychidae, Coccinellidae and *Hypodacnella* while 2-segmented palp occurs in *Holopsis*. The palpomeres 1 and 2 fused, and the palp appearing 2-segmented is a unique character for *Parindalmus* (Fig. 273).

20. Labial palp with palpomere 2: simple, elongate subcylindrical or transverse (0); bulbous (1); semilunar (2); oval, inflated (3).

Oval and inflated labial palpomere 2 (state 3) is characteristic for Merophysiinae (*Holopamecus*, *Displotera* and *Merophysia*). The interesting semilunar shape of the labial palpomere 2 is unique for *Acinaces* (Fig. 249) (state 2), while bulbous palpomere 2 is found in *Hypodacnella* (state 1). The remaining Endomychidae, Coccinellidae and *Holopsis* have palpomere 2 transverse or elongate and subcylindrical.

21. Tentorium with corpotentorium: absent (0); present, without median process (1); present with median process (2).

The distinct corpotentorium possessing long median process is characteristic for *Hypodacnella*. In most Endomychidae the corpotentorium is present but without the median process. In the remaining outgroups and Merophysiinae the corpotentorium is absent.

22. Tentorium with anterior arms: separated (0); meeting medially (1).

Most outgroups and Anamorphinae have the anterior tentorial arms separated (state 0). *Holopsis* and Endomychidae (excluding Anamorphinae) have the anterior arms meeting medially.

23. Anterior margin of pronotum with stridulatory membrane: absent (0); present, sometimes reduced (1).

The stridulatory membrane on anterior margin of the pronotum is a unique character for Lycoperdininae (Figs 284, 292) although different degrees of reduction of this structure are observed in *Amphix*, *Trycherus* and *Chetryrus*. The membrane is entirely obsolete in some species of *Microtrycherus* and all species of *Beccariola* (Figs 8, 308).

24. Pronotum with anterior angles: simple (0); strongly thickened and raised (1).

The anterior angles of the pronotum, which are widely bordered, thickened and raised, occur only in *Amphistethus* and *Spathomeles* (Figs 286, 350). The remaining Endomychidae and members of outgroups have character state 0.

25. Pronotum with lateral margins smooth or finely crenulate/ denticulate (0); coarsely and sparsely denticulate (1).

The different degrees of crenulation and/or denticulation of lateral margins of the pronotum (always rather fine) are observed within some Endomychidae and outgroups. The coarsely, although rather sparsely crenulate sides of the pronotum is unique for Lycoperdininae genera *Daulis* and *Daulotypus* (Figs 314, 316).

26. Base of pronotum: with at most single fovea on each side (0); with paired foveae on each side (1).

Paired foveae on each side of the pronotum occur only in Danascelinae (*Danascelis* and *Hadromychnus*).

27. Pronotum of female with lateral sulci: separated or absent (0); extending arcuately towards middle of disc and connected medially (1).

This interesting structure occurs only in *Ancylopus* (Fig. 292) in present analysis.

28. Pronotum with prebasal tubercles and/or carinae: absent (0); present (1).

This character occurs only in some Merophysiinae (*Holopamecus*), in present data set.

29. Procoxal cavities: transverse (0); round or oval (1).

The procoxal cavities transverse occur in *Holopsis*. Endomychidae and *Hypodacnella* have the procoxal cavities round, while Coccinellidae have the procoxal cavities oval in outline.

30. Procoxal cavities: open outwardly (0); closed outwardly (1).

The closed outwardly procoxal cavities are characteristic for *Hypodacnella* (Cerylonidae) in present analysis.

31. Prosternal process rounded, truncate or weakly emarginate at apex (0); excised apically with subacute lateral lobes (forked) not extending beyond front coxae (1); deeply excised at apex with at least weakly rounded lateral lobes extending beyond coxae (2).

The members of outgroups and almost all Endomychidae except for some Lycoperdininae have character state 0. The prosternal process forked, extending at most to hind margin of front coxae is characteristic for *Beccariola*, *Cymbachus*, *Dryadites* and *Sinocymbachus* (state 1) (Figs 309, 311, 319, 349), while prosternal process extending beyond coxae, deeply excised at apex with at least weakly rounded lateral lobes, occurs in *Amphisternus*, *Amphistethus* and *Cacodaemon* (state 2) (Figs 285, 287, 297).

32. Prosternum with antennal grooves: absent or poorly developed (0); present (1).

The distinct, comparatively deep antennal grooves on prosternum occur in some Merophysiinae (*Displotera* and *Merophysia*). The remaining Endomychidae and

the remaining outgroups have the prosternum without antennal grooves, although weak grooves was observed in *Hypodacnella* (Cerylonidae) (state 0).

33. Procoxal cavity with small oval slit antero-laterally: absent (0); present (1).

Small, oval slits present in antero-lateral part of procoxal cavities are characteristic for Leiestinae, Mycetaeinae and some Pleganophorinae (*Pleganophorus*). All remaining Endomychidae and the outgroups have character state 0.

34. Mesoventrite with sides of intercoxal process: subparallel throughout its length (0); expanded laterally before apex and overlapping part of coxae (1).

The outgroups and most Endomychidae have intercoxal process of mesoventrite with sides subparallel or even convergent posteriorly. The intercoxal process with apex expanded laterally and overlapping part of coxae (state 1) is found only in some Lycoperdininae: *Amphisternus*, *Amphistethus*, *Gerstaeckerus*, *Ohtaius*, *Spathomeles* and *Stictomela* (Figs 358, 359, 378, 384, 389, 391).

35. Intercoxal process of mesoventrite: almost flat or with concavities and/or tubercles (0); with at least single, median carina or multicarinate (1).

An intercoxal process of mesoventrite, possessing a distinct elongate, median ridge extending at least along anterior half length of process, or complete, occurs in Danascelinae, *Xenomycetes* and some Lycoperdininae (*Aphorista*, *Dapsa*, *Hylaia* and *Lycoperdina*) (Figs 362, 371, 380, 386). The outgroups and remaining Endomychidae have character state 0.

36. Intercoxal process of mesoventrite without or with weakly defined borders, or defined as rectangular or somewhat irregular in shape (0); trapezoidal in shape (1); transversely pentagonal (2); boat-shaped defined by strong carinae (3).

The intercoxal process of mesoventrite distinctly trapezoidal in shape (Figs 383, 393) is unique for *Mycetina* and *Pseudindalmus* in present analysis. At least weakly transversely pentagonal intercoxal process of mesoventrite occurs in some Lycoperdininae (*Acinaces*, *Amphix*, *Beccariola*, *Cymbachus*, *Dryadites*, *Haploscelis* and *Sinocymbachus*) (Figs 357, 360, 365, 374, 375, 379, 390). The boat-shaped intercoxal process is characteristic for Leiestinae.

37. Mesocoxal cavity: open outwardly (0); closed outwardly (1).

The mesocoxal cavity open outwardly occurs in Coccinellidae and most of Endomychidae (state 0), while the lateral mesocoxal closure occurs in *Hypodacnella*, *Holopsis* and Pleganophorinae, Merophysiinae, and Anamorphinae (state 1).

38. Mesotrochantin: exposed (0); concealed (1).

The concealed mesotrochantin occurs in the outgroups and in some endomychid subfamilies: Leiestinae, Mycetaeinae, Anamorphinae, Merophysiinae and Pleganophorinae (state 1). The remaining subfamilies of Endomychidae have the mesotrochantin exposed (state 0).

39. Intercoxal process of metaventrite with anterior

margin: at most finely bordered and almost flat (0); widely bordered and raised or intercoxal process convex (1).

The anterior margin of intercoxal process at least moderately widely bordered and raised or almost unbordered but entire process convex, is characteristic for most Lycoperdininae (*Amphisternus*, *Amphistethus*, *Ancylopus*, *Avencymon*, *Brachytrycherus*, *Cacodaemon*, *Callimodapsa*, *Chetryrus*, *Cymones*, *Dryadites*, *Encymon*, *Eumorphus*, *Gerstaeckerus*, *Haploscelis*, *Indalmus*, *Malindus*, *Microtrycherus*, *Ohtaius*, *Parindalmus*, *Platindalmus*, *Spathomeles*, *Stictomela* and *Trycherus* (Figs e.g. 358, 359, 367). The members of outgroups and remaining Endomychidae have intercoxal process of metaventrite finely bordered or unbordered and almost flat (state 0).

40. Elytron: with basal edge simple (0); thickened and raised (1).

The elytron with basal edge simple occur in the outgroups and in most of the Endomychidae (state 0). The thickened and raised basal margin of the elytron is characteristic for some Lycoperdininae (*Amphisternus*, *Amphistethus*, *Ancylopus*, *Avencymon*, *Brachytrycherus*, *Cacodaemon*, *Gerstaeckerus*, *Malindus*, *Ohtaius*, *Parindalmus*, *Spathomeles* and *Stictomela*) (Figs 10, 13).

41. Elytra with tubercles and/or spines: absent (0); present (1).

The elytra within outgroups and Endomychidae usually have smooth surface, with at most, humeri more or less prominent. The presence of distinct, large tubercles and/or spines on the elytra is a unique character for some Lycoperdininae (*Amphisternus*, *Amphistethus*, *Cacodaemon*, *Spathomeles* and *Stictomela*) (Figs 9–11, 13, 14, 849, 850, 859–861, 897, 898).

42. Elytra widest: near basal third or mid length (0); beyond mid length (1).

The elytra widest beyond mid length is found only in *Callimodapsa*, *Cymones*, *Indalmus*, *Malindus* and *Parindalmus* (Figs 862, 866, 881, 885, 891).

43. Dorsal surface of fore femur with oval slit apically: absent (0); present (1).

This interesting character occurs only in *Haploscelis* (Fig. 529) in present analysis.

44. Tarsi: 3- or 4-segmented with segments simple (sometimes weakly lobed) (0); pseudotrimerous (1).

The simple 3- or 4-segmented tarsi are present in *Hypodacnella* and some endomychid subfamilies: Danascelinae, Eupsilobiinae, Mycetaeinae, Leiestinae, Merophysiinae, Anamorphinae, Pleganophorinae and *Xenomycetinae* (state 0). The pseudotrimerous tarsi occur in Coccinellidae, Corylophidae and most Endomychidae (state 1).

45. Femora with grooves: deep and long throughout or almost so (0); shallow and reaching at most half length of femur (1).

The outgroups have the femora possessing long and deep grooves to receive tibiae in repose; among Endomychidae this character was found only in *Eidoreus*

(state 0); the remaining Endomychidae have the grooves short and if longer, then they are shallow (state 1).

46. Abdomen with: 7 pairs of functional spiracles (0); 5 pairs of functional spiracles (1).

In Endomychidae and Coccinellidae occur 5 pairs of abdominal spiracles. The remaining outgroups have 7 pairs of functional spiracles on the abdomen.

47. Ventrite 5 in male with prominently elevated, elongate, median tubercle with additional cone-shaped tubercle on each side: absent (0); present (1).

This character occurs only in *Xenomycetes*.

48. Tergite 8 with apex: simply pubescent or at most with tuft of long setae in one sex (0); apex of tergite 8 with with tuft of long setae in both sexes (1).

The tuft of long setae on an apex of the tergite 8 of both sexes occurs in *Cymbachus* and *Sinocymbachus* (state 1) (Figs 630, 646). The outgroups and almost all Endomychidae have apex of the tergite 8 simply pubescent. Rarely (e.g. in *Acinaces*) similar tuft of setae occurs in one sex.

49. Male sternite 8 undivided, sclerotized or partially membranous (0); in two lateral, sclerotized parts connected medially by narrow membranous belt (1); in two lateral parts without membranous connection (2).

Most Endomychidae and the outgroups have character state 0. The male sternite 8 in form of two lateral sclerotized parts with median membranous connection is found only in some African genera of Lycoperdininae: *Chetryrus*, *Haploscelis* and *Microtrycherus* (Figs 637, 651, 654) (state 1), while the sternite divided in two separated parts (without median membrane) is a unique character for Oriental *Pseudindalmus* (Fig. 641) (state 2).

50. Sternite of male genital segment: with lateral and apical edges simple or sternite divided in two plates or reduced (0); sclerotized plate with lateral edges deeply asymmetrically incurved (1); with apical edge at least weakly emarginate or sinuate (2).

The character state 0 occurs in most Endomychidae and in the outgroups. The members of Epipocinae have the sternite of the male genital segment with at least lateral edges deeply asymmetrically incurved (state 1), while in almost all Lycoperdininae (except for *Daulis*) the only apical edge is more or less distinctly modified (Figs e.g. 663, 667, 691, 717) (state 2). This character is coded as polymorphic in *Daulis* (states 0 and 2).

51. Tegmen: well developed with trilobed phallobase (0); reduced, encircling median lobe in apical half length or almost throughout, loosely joined with median lobe or tegmen absent (1); strongly reduced to simple, short ring encircling median lobe in half length, with long, membranous, flat strut (2); reduced, strongly sclerotized, encircling and compactly joined with basal part of median lobe (3).

The trilobed phallobase, comprises basal piece, basal lobe and parameres is characteristic for Coccinellidae (state 0). The remaining outgroups and most members

of Endomychidae have the aedeagus with tegmen more or less well developed (but with phallobase lacking basal lobe and parameres often absent) encircling the median lobe in about mid length or near apex, or sometimes the tegmen is large and encircling median lobe almost throughout (state 1). The reduced, short ring but with long, membranous, flat strut occurs in Stenotarsinae, Endomychinae and Danascelinae (state 2). Almost all Lycoperdininae (except for *Achuarmychnus*, *Daulis* and *Daulotypus*) and Epipocinae have the tegmen small strongly sclerotized, with strut strongly reduced to obsolete, encircling and compactly joined with basal part of median lobe (state 3).

52. Median lobe: almost straight or curved (0); coiled apically (1).

This character is unique for Eupsilobiinae in present analysis.

53. Median lobe: smooth along basal part (0); curled along $\frac{1}{2}$ of basal length (1).

This character is unique for most Endomychinae (excluding *Endomychnus*).

54. Median lobe with T-shaped capsule at base: absent (0); present (1).

The T-shaped capsule at the base of median lobe is a usual feature within Coccinellidae, and occurs in endomychid Eupsilobiinae (state 1); the remaining outgroups and remaining Endomychidae have the median lobe simple at base.

55. Ejaculatory duct of median lobe: unmodified (0); provided with large, bobbin-shaped gland (1).

This interesting structure was observed only in some Stenotarsinae (*Saula* and *Danae*).

56. Female abdominal segment 8 free (0); at least sternite 8 solidly connected or entirely fused to coxites (1).

The only Lycoperdininae (except for *Achuarmychnus*, *Archipines*, *Daulis* and *Daulotypus*) have at least sternite 8 (sometimes also tergite) fused to the coxites. The rest of Endomychidae and outgroups have the female abdominal segment 8 loosely connected with genital segments.

57. Female segment 7 free (0); at least 7th sternite solidly connected to genital segments (1).

This character is unique for *Eumorphus* and *Platindalmus* (Fig. 839).

58. Ovipositor with stiff, inflated, infundibulum-like structure between bursa copulatrix and sperm duct: absent (0); present (1).

This structure is unique for Eupsilobiinae in present analysis.

59. Ovipositor with coxites: well developed (0); reduced (1).

The strongly reduced coxites are characteristic for some Lycoperdininae (*Archipines*, *Daulis* and *Daulotypus*) (state 1) (Figs 815, 825, 826).

60. Coxites: separated (0); fused (1).

The outgroups and most Endomychidae have the ovipositor with coxites separated (state 0). The fused coxites

are unique for Lycoperdininae, except for *Achuarmychus*, *Ancylopus*, *Archipines*, *Daulis*, *Daulotypus* and *Mycetina*. *Ancylopus* and some species of *Mycetina* have however the coxites partially connected, (e.g. by submembranous connection).

61. Base of coxites simple or weakly emarginate (0); deeply excised (1).

This character is unique for Stenotarsinae (*Danae*, *Saula* and *Stenotarsus*).

62. Spermatheca with accessory gland: present (0); absent (1).

A simple spermatheca lacking accessory gland is characteristic for *Chetryrus*, *Microtrycherus* and *Trycherus* (Figs 821, 837, 846).

63. Sperm duct attachment: directly to spermatheca (0); to broad connection between spermatheca and accessory gland (1).

This unusual character was found only in Endomychinae (except for *Endomychus*) and in *Stenotarsus* (Stenotarsinae).

64. Spermatheca uniformly membranous or sclerotized (0); membranous with large, nodulus-like structure or at least with small weakly sclerotized ring at base (1).

The spermatheca is usually uniformly membranous or sometimes weakly sclerotized throughout Endomychidae. However, a weakly sclerotized ring at base of the spermatheca is found in Lycoperdininae: *Amphistethus*, *Spathomeles* and *Stictomela* (Figs 812, 844, 845), and larger, nodulus-like structure is present in *Amphisternus* and *Cacodaemon* (Figs 809, 819) (state 1). The remaining Endomychidae and the outgroups have character state 0.

65. Outlet of sperm duct situated on- or near apex of bursa copulatrix (0); situated near base of bursa (1).

This character is unique for *Dryadites* (Fig. 828) in present analysis.

66. Ovipositor with apex of proctiger: widely rounded (0); acutely produced backwards (1).

The proctiger with apex acutely produced backwards is a unique character for *Lycoperdina* (Fig. 835).

67. Mandible with apical tooth: sharp or reduced (0); widely chisel-shaped (1).

The outgroups and most Endomychidae have apical mandibular tooth sharp or reduced. The mandible with apical tooth widely chisel-shaped is present in some genera of Lycoperdininae (*Amphisternus*, *Amphistethus*, *Amphix*, *Brachytrycherus*, *Cacodaemon*, *Cymbachus*, *Gerstaeckerus*, *Haploscelis*, *Microtrycherus*, *Ohtaius*, *Sinocymbachus*, *Spathomeles*, *Stictomela*) (Figs 102, 106, 108, 120, 124, 130, 144, 146, 156, 160, 170, 171, 174).

68. Male genital segment with additional, internal sclerite (somewhat V- or U-shaped): absent (0); present (1).

An additional internal sclerite present in the male genital segment was found only within Lycoperdininae (*Amphisternus*, *Amphistethus*, *Brachytrycherus*, *Cacodaemon*,

mon, *Cymbachus*, *Dapsa*, *Gerstaeckerus*, *Microtrycherus*, *Ohtaius*, *Spathomeles*, *Stictomela*) (Figs 661, 663, 667, 679, 686, 691, 701, 713, 717, 727, 729).

Larval characters (numbered continuously)

69. Stemmata pairs: 0 (0); 2 (1); 3 (2); 4 (3).

In Merophysiinae and Anamorphinae stemmata do not occur (state 0). Two pairs of stemmata are present in *Holopsis* and *Hypodacnella* among outgroups and in some Endomychidae (Eupsilobiinae, Mycetaeinae and Pleganophorinae) (state 1). Coccinellidae, Leiestinae and Xenomycetinae have 3 pairs of stemmata (state 2). 4 pairs are observed in Endomychinae, Stenotarsinae, Epipocinae and Lycoperdininae (state 3).

70. Frontal arms: absent or poorly developed (0); lyriform (1); well developed, long, V- or U-shaped (2).

Absent or poorly developed frontal arms occur in *Holopsis*, *Hypodacnella* and some members of Endomychidae (Anamorphinae, Mycetaeinae, Eupsilobiinae, Xenomycetinae) (state 0); Coccinellidae and part of Endomychidae (Leiestinae, Pleganophorinae, Merophysiinae) have the frontal arms lyriform (state 1). The well developed V- or U-shaped frontal arms occur in Lycoperdininae, Epipocinae, Stenotarsinae and Endomychinae (state 2).

71. Epicranial stem: absent (0); present (1).

The epicranial stem is present in some Lycoperdininae (*Achuarmychus*, *Acinaces*, *Aphorista*, *Archipines*, *Eumorphus* and *Mycetina*) (Figs 901, 912, 960, 978, 1011, 1043). The remaining known larvae of Endomychidae and outgroups have character state 0.

72. Antennal sensory appendage: at least as long as antennomere 3 (0); distinctly shorter than antennomere 3 (1).

The antennal sensory appendage is at least as long as antennomere 3 in the outgroups and most Endomychidae (state 0). The sensory appendage shorter than the terminal antennomere is characteristic for Leiestinae (state 1).

73. Hypostomal rods: present (0); absent (1).

The hypostomal rods are absent in *Holopsis* (Corylophidae), Stenotarsinae and Epipocinae (*Epipocus*, *Anidrytus*, *Stenotarsus*, *Saula*) among Endomychidae.

74. Labrum with apical margin simply rounded, somewhat truncate or weakly emarginate medially (0); sinuate or multidenticulate (1).

The labrum with an apical margin at least sinuate or distinctly multidenticulate was found in some Lycoperdininae: *Acinaces*, *Amphix*, *Aphorista* and *Mycetina* (Figs 920, 951, 973, 1053). The remaining Lycoperdininae, all remaining Endomychidae, and outgroups have character state 0.

75. Labrum: evenly sclerotized or submembranous (0); sclerotized with membranous apex (1).

Character state 1 occurs in *Rhizophobus* (Coccinellidae), in most Lycoperdininae (Figs 920, 936, 951) and Endomychinae (*Endomychus*). Almost all members of

the outgroups and remaining Endomychidae, including Lycoperdininae *Achuarmychnus*, *Aphorista*, *Archipines*, and *Mycetina* have character state 0.

76. Mandibular apex: well developed (0); reduced or entirely missing (1).

The mandible with the apex reduced or entirely missing is a unique character for Anamorphinae.

77. Mandibular mola: well developed (0); reduced or absent (1); replaced by membranous lobe (2).

The mandibular mola present as membranous lobe was found only in *Endomychnus*, in present data set (state 2), while mola reduced or absent is characteristic for Coccinellidae (state 1). The remaining Endomychidae and remaining outgroups have character state 0.

78. Prostheda: absent or reduced (0); modified – rigid tooth (1); well developed, at least partially membranous (2); well developed, at least partially membranous, divided in two separated parts (3).

Hypodacnella, Coccinellidae and some Endomychidae (Leiestinae, Anamorphinae, Merophysinae and Pleganophorinae) have the mandible lacking the prostheda or it sometimes may be strongly reduced. The well developed and at least partially membranous prostheda occurs in *Holopsis* and endomychid Lycoperdininae, Epipocinae, Stenotarsinae, Endomychinae and Xenomycetinae (state 2), although it is divided in two separated parts in Lycoperdininae *Achuarmychnus* and *Archipines* (Figs 907, 981) (state 3). Mycetinae and Eupsilobiinae have the prostheda modified in form of rigid process or sclerotized tooth (state 1).

79. Ventral mouthparts: protracted (0); retracted (1).

The protracted ventral mouthparts occur in *Holopsis*. The remaining outgroups and Endomychidae have the ventral mouthparts retracted (state 1).

80. Labial palpi: separated (0); conjoined medially (1).

The labial palpi conjoined medially occur only in *Xenomycetes*.

81. Maxillary cardo and stipes: articulated (0); fused/indistinct (1).

Maxillary stipes and cardo articulated occur in *Hypodacnella* and in all Endomychidae. Coccinellidae and Corylophidae have the stipes and cardo fused or indistinct (state 1).

82. Maxillary articulating area present (0); indistinct/absent (1).

Indistinct or absent maxillary articulating area is characteristic for Coccinellidae and Corylophidae in present analysis. *Hypodacnella* and Endomychidae have the articulating area well developed.

83. Maxillary mala: obtuse (0); at least weakly falciform (1).

The falciform maxillary mala is characteristic for Anamorphinae and Pleganophorinae (*Trochoideus* in present data) (state 1). The rest of Endomychidae and the outgroups have the mala more or less obtuse.

84. Maxillary mala with subapical part of ventral surface: at most setose (0); with rows of paired asperites (1); with 4 oblique rows of hook-like setae (2).

The rows of paired asperites on the ventral surface of the maxillary mala are characteristic for Epipocinae (state 1), while rows of hook-like setae occur in some Lycoperdininae (state 2) (*Ancylopus*, *Encymon* and *Eumorphus*) (Figs 1004, 1023).

85. Maxillary palpomere 1: transverse (0); longer than wide (1).

The elongate maxillary palpomere 1 is a unique character for *Amphix* in present analysis (Fig. 953).

86. Tergal plates and/or sclerotization: present (0); absent (1).

The body lacking tergal plates or sclerotization occurs only in Anamorphinae and *Achuarmychnus*.

87. Body with frayed setae: absent (0); present (1).

The frayed setae on the body occur in members of Eupsilobiinae (*Evolocera*), Mycetinae (*Mycetaea*), Xenomycetinae (*Xenomycetes*) and Lycoperdininae (*Achuarmychnus*, *Aphorista*, *Eumorphus* and *Mycetina*). The remaining Endomychidae and outgroups have character state 0.

88. Tergite of abdominal segment 1 with glandular openings: absent (0); present, simple (1); in modified tergal processes (2).

The simple glandular openings occur in larvae of Corylophidae (*Holopsis*) while these openings in form of interesting structure of modified tergal processes was found only in some Lycoperdininae genera (*Amphisternus*, *Encymon* and *Eumorphus*) (Figs 926, 994, 1000, 1010, 1017).

89. Tergite of abdominal segment 8 with paired glands: absent (0); present (1).

This character is unique for Corylophidae (*Holopsis*).

90. Lateral parascoli on abdominal terga: absent (0); present (1).

As compared with known larvae of Endomychidae and outgroups, the abdominal terga with large lateral parascoli is a unique character for Stenotarsinae (*Saula* and *Stenotarsus*).

91. Abdominal terga with dorsal, acute, paired processes: absent (0); present (1).

The character state 1 is unique for *Lycoperdina* (Figs 1028, 1032).

92. Thoracic and abdominal tergites with (at most) single lateral processes (0); with paired, lateral processes (1).

The paired lateral processes on thoracic and abdominal tergites were found only in *Amphisternus*, in present analysis (Fig. 926).

93. Apex of tibiotarsus provided with: simple setae (0); spatulate setae (1).

The presence of the spatulate setae is characteristic for Coccinellidae. The remaining outgroups have character state 0. Among Endomychidae this character was found only in *Mychothenus* (Anamorphinae).

Endomychinae	
<i>Bolbomorphus</i>	001000000100000110000110000001000000000000001110000201000000000100000
<i>Cyclotoma</i>	001000000100000110000110000001000000000000001110000201000000000100000
<i>Endomychus</i>	001000000100000100000110000001000000000000001110000200000000000000000
Stenotarsinae	
<i>Danae</i>	001000000100000000000110000001000000000000001110000200010000010000000
<i>Saula</i>	001000000101000000000110000001000000000000001110000200010000010000000
<i>Stenotarsus</i>	0010000001000000000001100000010000000000000011100002000000000010100000
Epipocinae	
<i>Anidrytus</i>	001100000100000000000110000001000000000000001110001300000000000000000
<i>Epipocus</i>	001100000100000000000110000001000000000000001110001300000000000000000
Lycoperdininae	
<i>Achuarmyachus</i>	01110002001000200000001110000010000000000000011100021000000000000000000
<i>Acinaces</i>	011100000100020000002111000001000000200000001110002300001000100000000
<i>Amphisternus</i>	011100000100120000000111000001020010000111001110002300001000100010011
<i>Amphistethus</i>	011100000100120000000111100001020010000111001110002300001000100010011
<i>Amphix</i>	011100000100020000000111000001000000200000001110002300001000100000010
<i>Ancylopus</i>	011100000110020000000111000101000000000110001110002300001000000000000
<i>Aphorista</i>	011000000100020000000111000001000001000000001110002300001000100000000
<i>Archipines</i>	011100200101020000000111000001000000000000001110002300000001000000000
<i>Avencymon</i>	011100000110020000000111000001000000000110001110002300001000100000000
<i>Beccariola</i>	011100000100020000000111000001010000200000001110002300001000100000000
<i>Brachytrycherus</i>	011000000100120000000111000001000000000110001110002300001000100000011
<i>Cacodaemon</i>	011100000100021000000111000001020000000111001110002300001000100010011
<i>Callimodapsa</i>	011100000110020000000111000001000000000100101110002300001000100000000
<i>Chetryrus</i>	011100000100020000000111000001000000000100001110012300001000101000000
<i>Cymbachus</i>	011100000100020000000111000001010000200000001110102300001000100000011
<i>Cymones</i>	011100000110020000000111000001000000000100101110002300001000100000000
<i>Dapsa</i>	011000000100020000000111000001000001000000001110002300001000100000001
<i>Daulis</i>	111100000101020000000111010001000000000000011100001000000010000000000
<i>Daulotypus</i>	111100000101020000000111010001000000000000011100001000000010000000000
<i>Dryadites</i>	011100000100020000000111000001010000200100001110002300001000100001000
<i>Encymon</i>	011100000100020000000111000001000000000100001110002300001000100000000
<i>Eumorphus</i>	011100000100020000000111000001000000000100001110002300001100100000000
<i>Gerstaeckerus</i>	011100000100020000000111000001000010000110001110002300001000100000011
<i>Haploscelis</i>	011100000110020000000111000001000000200100011110012300001000100000010
<i>Hylaia</i>	011000000100020000000111000001000001000000001110002300001000100000000
<i>Indalmus</i>	011100000110020000000111000001000000000100101110002300001000100000000
<i>Lycoperdina</i>	011000000100020000000111000001000001000000001110002300001000100000100
<i>Malindus</i>	011100000110020000000111000001000000000110101110002300001000100000000
<i>Microtrycherus</i>	011100000110020000000111000001000000000100001110012300001000101000011
<i>Mycetina</i>	011100000100020000100111000001000000100000001110002300001000000000000
<i>Ohtaius</i>	011100000100120000000111000001000010000110001110002300001000100000011
<i>Parindalmus</i>	011100000110020000020111000001000000000110101110002300001000100000000
<i>Platindalmus</i>	011100000100020000000111000001000000000100001110002300001100100000000
<i>Pseudindalmus</i>	011100000100020000100111000001000000100000001110022300001000100000000
<i>Sinocymbachus</i>	011100000100020000000111000001010000200000001110102300001000100000010
<i>Spathomeles</i>	011100000100120000000111100001000010000111001110002300001000100010011
<i>Stictomela</i>	011100000100120000000111000001000010000111001110002300001000100010011
<i>Trycherus</i>	011100000110020000000111000001000000000100001110002300001000101000000

<i>Saula</i>	0010000001010000000001100000010000000000000011100002000100000100000003200?0000210000000000100000
<i>Stenotarsus</i>	001000000100000000000110000001000000000000001110000200000000010100000320010000210000000000100000
Epipocinae	
<i>Anidrytus</i>	0011000001000000000001100000010000000000000011100013000000000000000003200100002100001000000000000
<i>Epipocus</i>	0011000001000000000001100000010000000000000011100013000000000000000003200100002100001000000000000
Lycoperdininae	
<i>Achuarmyachus</i>	01100020010002000000011100000100000000000000111000210000000000000000003210000003100000001100000000
<i>Acinaces</i>	0111000001000200000021110000010000002000000011100023000010001000000003210011002100000000000000000
<i>Amphisternus</i>	011100000100120000000111000001020010000111001110002300001000100010011320000100210000000020001000
<i>Amphistethus</i>	0111000001001200000001110000010200100001110011100023000010001000100111320000100210000000020001000
<i>Amphix</i>	011100000100020000000111000001000000200000001110002300001000100000010320001100210000010000000000
<i>Ancylopus</i>	01110000011002000000011100010100000000011000111000230000100000000000032?0001002100002000?0000000
<i>Aphorista</i>	011000000100020000000111000001000001000000001110002300001000100000000321001000210000000100000000
<i>Archipines</i>	011100200101020000000111000001000000000000011100023000000010000000003210000003100000000000000002
<i>Avenycomon</i>	011100000110020000000111000001000000000110001110002300001000100000000????????????????????????
<i>Beccariola</i>	011100000100020000000111000001010000200000001110002300001000100000000????????????????????????
<i>Brachytrycherus</i>	011000000100120000000111000001000000000110001110002300001000100000011????????????????????????
<i>Cacodaemon</i>	011100000100021000000111000001020000000111001110002300001000100010011????????????????????????
<i>Callimodapsa</i>	011100000110020000000111000001000000000100101110002300001000100000000????????????????????????
<i>Chetryrus</i>	011100000100020000000111000001000000000100001110012300001000101000000????????????????????????
<i>Cymbachus</i>	0111000001000200000001110000010100002000000011101023000010001000000011????????????????????????
<i>Cymones</i>	01110000011002000000011100000100000000100101110002300001000100000000????????????????????????
<i>Dapsa</i>	0110000001000200000001110000010000010000000011100023000010001000000001????????????????????????
<i>Daulis</i>	11110000010102000000011101000100000000000001110000100000001000000000????????????????????????
<i>Daulotypus</i>	11110000010102000000011101000100000000000001110000100000001000000000????????????????????????
<i>Dryadites</i>	011100000100020000000111000001010000200100001110002300001000100001000????????????????????????
<i>Encymon</i>	011100000100020000000111000001000000000100001110002300001000100000000320000100210000200020000000
<i>Eumorphus</i>	011100000100020000000111000001000000000100001110002300001100100000000321000100210000200120000000
<i>Gerstaeckerus</i>	0111000001000200000001110000010000100001100011100023000010001000000011????????????????????????
<i>Haploscelis</i>	011100000110020000000111000001000000200100011110012300001000100000010????????????????????????
<i>Hylaia</i>	011000000100020000000111000001000001000000001110002300001000100000000????????????????????????
<i>Indalmus</i>	011100000110020000000111000001000000000100101110002300001000100000000????????????????????????
<i>Lycoperdina</i>	01100000010002000000011100000100000100000000111000230000100010000010032000010021000000000010000
<i>Malindus</i>	011100000110020000000111000001000000000110101110002300001000100000000????????????????????????
<i>Microtrycherus</i>	01110000011002000000011100000100000000100001110012300001000101000011????????????????????????
<i>Mycetina</i>	01110000010002000010011100000100000010000000111000230000100000000000321001000210000000100000000
<i>Ohtaius</i>	011100000100120000000111000001000010000110001110002300001000100000011????????????????????????
<i>Parindalmus</i>	011100000110020000020111000001000000000110101110002300001000100000000????????????????????????
<i>Platindalmus</i>	011100000100020000000111000001000000000100001110002300001100100000000????????????????????????
<i>Pseudindalmus</i>	011100000100020000100111000001000000100000001110022300001000100000000????????????????????????
<i>Sinocymbachus</i>	011100000100020000000111000001010000200000001110102300001000100000010????????????????????????
<i>Spathomeles</i>	011100000100120000000111100001000010000111001110002300001000100010011????????????????????????
<i>Stictomela</i>	011100000100120000000111000001000010000111001110002300001000100010011????????????????????????
<i>Trycherus</i>	011100000110020000000111000001000000000100001110002300001000101000000????????????????????????

Table 6. Results of cladistic analyses of different variants of the adult and larval matrices (Tables 3–5) listing all the trees and the parameters of their strict consensus.

Variants	Heuristic searches NONA				Ratchet (island hopper) NONA				Successive weighting Hennig86			
	trees	L	CI	RI	trees	L	CI	RI	trees	L	CI	RI
I. adults	10000	123	57	91	623	123	57	91	2	123	57	91
	Strict cons.	152	54	85	Strict cons.	144	57	86	Strict cons.	124	66	91
II. adults + larvae (complete)	7680	182	65	88	189	182	65	88	2	183	65	88
	Strict cons.	208	57	84	Strict cons.	197	60	86	Strict cons.	194	61	86
III. adults + larvae (limited)	140	148	80	94	191	148	80	94	11	149	79	92
	Strict cons.	165	72	91	Strict cons.	165	72	91	Strict cons.	150	79	84

PHYLOGENY OF ENDOMYCHIDAE

The monophyly of Endomychidae and its position within Cucujoidea has been elaborated in my previous paper (Tomaszewska 2000) and it is not discussed further here. It should, however, be noticed that present analysis has not confirmed a sister relationships between Endomychidae and Coccinellidae. On generated cladograms Coccinellidae seem to be more closely related to Corylophidae than they are to Endomychidae. Much more data is needed to resolve relationships between Coccinellidae and Endomychidae. More research is needed with inclusion of the taxa of an entire Cerylonid Series and the Cucujoidea as a whole. All subfamilies of Endomychidae recognized in Tomaszewska (2000) are still recognized here as valid and are supported by a series of apomorphic characters. One of the shortcomings of my former analysis was an inability to provide strong evidence for relationships between recognized subfamily taxa. The present study was undertaken using the expanded adult data with inclusion of larval characters to shed some light on this problem.

The major clades are discussed according to a preferred cladogram (Fig. 1069), chosen as the best hypothesis that is supported by the most data (total evidence), following a successive weighting in parsimony analysis. Some cross comparisons of the results of analyses of adult and combined data are also provided.

Merophysiinae

The analysis of adult and combined characters (Figs 1064, 1069–1071, 1074) strongly suggests that Merophysiinae form a sister clade to all other endomychids. They appear to be the most plesiomorphic members of the family and are distinguished from all other Endomychidae in having tentorium without corpotentorium (# 21,0), the plesiomorphic condition occurring commonly in Coccinellidae and Corylophidae. Merophysiinae form a clearly monophyletic group (Fig. 1069), supported by adult apomorphy, labial palpomere 2, oval, inflated (# 20,3). They are also supported by

larval character: number of stemmata 0 (# 69,0), a character shared with Anamorphinae.

Pleganophorinae and Anamorphinae

Among remaining Endomychidae that are supported by adult synapomorphy: tentorium with corpotentorium present, without median process (# 21,1), Anamorphinae and Pleganophorinae – all widely distributed throughout the world, form the distinct group of closely related subfamilies. The close relationships between both subfamilies are supported by larval apomorphic feature: maxillary mala at least weakly falciform (# 83,1).

Surprisingly the morphologically uniform Anamorphinae do not appear as a monophyletic group, based on the adult data only (Figs 1058, 1064). They have, however, one larval synapomorphy (# 76,1 – mandibular apex reduced or entirely missing) and in analysis of the combined data (Figs 1069, 1073, 1074) the Anamorphinae form a distinct clade supported, in addition to the larval synapomorphy, by other larval characters, like number of stemmata 0 (# 69,0), character shared with Merophysiinae, and the body with the tergal plates and/or sclerotization absent (#86,1), character occurring also in lycoperdinine genus *Achuarmychnus*. Anamorphinae are also supported by an adult characters (# 22,0 – anterior tentorial arms separate, sharing with Coccinellidae and *Hypodacnella*).

Pleganophorinae form a monophyletic group based on an adult synapomorphy, antenna 4-5 segmented (# 5,1).

Leiestinae

Although the analysis of adult and limited combined data (Figs 1058, 1064, 1073, 1074) suggests that Leiestinae and Mycetaeinae form a sister group, supported by having the procoxal cavity provided with small, oval, antero-lateral slit (# 33,1) (occurring also in part of Pleganophorinae), the analysis of the complete, combined data does not support close affinities between both subfamilies, as shown on the preferred tree (Fig. 1069).

The Holarctic Leiestinae form a clearly monophyletic group in all analyses, and are distinguished by adult

synapomorphy (# 36,1 – intercoxal process of mesoventrite boat-shaped defined by strong carinae), and one larval synapomorphy (# 72,1 – antennal sensory appendage distinctly shorter than antennomere 3). Leiestinae are also supported by having the number of larval stemmata 3 pairs (# 69,2), character sharing with *Xenomycetes* and Coccinellidae).

Mycetaeinae

In spite of habitual differences between the only two genera of Holarctic and Afrotropical Mycetaeinae (*Mycetaea* and *Agaricophilus*), they share a clear adult synapomorphy: mentum provided with small triangular, setose tubercle placed medially (# 17,1) justifying their monophyletic status, as shown on the preferred tree (Fig. 1069). The larvae of both genera show very few affinities to each other. This may reflect their different modes of life, but may partially be due to the character coding of *Agaricophilus* larva from the quite inaccurate description by Mamaev (1977). Both genera, however, share prostheta in form of rigid tooth (# 78,1) as shown on Figs 1073, 1074 (character occurring also in Eupsilobiinae).

Eupsilobiinae

Among remaining, seven subfamilies of Endomychidae that are united by adult synapomorphy: mesotrochantin exposed (# 38,0), the Eupsilobiinae form a very distinct, monophyletic group, although without clear relationships to any other subfamilies.

The single known larva of Eupsilobiinae (*Evolocera*) shares prostheta in form of rigid tooth (# 78,1) with Mycetaeinae. Eupsilobiinae form, however, a well defined, monophyletic group based on adult synapomorphies, like median lobe coiled apically (# 52,1) and ovipositor with stiff, inflated, infundibulum-like structure between bursa copulatrix and sperm duct (# 58,1). Other characters, like head with antennal grooves (# 4,1) occurs also in almost all outgroups and in Merophysinae, and the median lobe provided with T-shaped capsule at base (# 54,1) characteristic for Eupsilobiinae occurs also in Coccinellidae.

Xenomycetinae and Danascelinae

An interesting and intriguing result of the present analyses is the placement of the monogeneric, Nearctic Xenomycetinae near the Holarctic Danascelinae. The relationship of *Xenomycetes* to any other subfamily and its placement within Endomychidae has remained unclear so far. In the analysis of Tomaszewska 2000, the tarsi of *Xenomycetes* were coded as pseudotrimerous, which resulted in its grouping with Endomychinae, Stenotarsinae, Epipocinae and Lycoperdininae. After an extensive study of Endomychidae I realized that the tarsi of *Xenomycetes* are somewhat intermediate and I coded them as simple in

the present analysis. This change resulted in a much closer relationships of *Xenomycetes* to Danascelinae than to “higher Endomychidae”. Their sister-group relationship is based on the intercoxal process of mesoventrite with at least single, median carina or multicarinate (# 35,1), occurring also in some Lycoperdininae.

Following the preferred cladogram, the Xenomycetinae should tentatively be considered as a sister group to Danascelinae, until more adult and larval morphological and molecular data are known.

Danascelinae form a well defined monophyletic group supported by an adult character: base of pronotum with paired foveae on each side (# 26,1). The second postulated synapomorphy for Danascelinae in the analysis of Tomaszewska (2000), remains an autapomorphy for *Danascelis* – male antennomere 9 provided with tuft of long setae growing from deep concavity on inner edge (# 7,1), as this character was not observed in the second known genus of the subfamily *Hadromychnus* (Bousquet and Leschen 2002). Danascelinae are also supported by having the tegmen strongly reduced to simple, short ring encircling median lobe in half length, with long, membranous, flat strut (# 51,2), character sharing with Endomychinae and Stenotarsinae.

Xenomycetinae form a monogeneric subfamily, supported by adult (# 47,1 – ventrite 5 in male with prominently elevated, elongate, median tubercle with cone-shaped tubercle on each side) and larval (# 80,1 – labial palpi long, conjoined medially) autapomorphies of *Xenomycetes*.

The “Higher Endomychidae” (Endomychinae, Stenotarsinae, Epipocinae and Lycoperdininae)

The group that includes Xenomycetinae and Danascelinae is a sister-taxon to four remaining endomychid subfamilies, of so-called “higher Endomychidae”. This group is united by the presence of pseudotrimerous tarsi of adults (# 44,0) (sharing with Coccinellidae and Corylophidae) and supported by larval synapomorphies – frontal arms well developed, V- or U-shaped (# 70,1) and the presence of 4 pairs of stemmata (# 69,3) (although the last character is not shown on the preferred tree).

The “higher Endomychidae”, consist of Holarctic and Oriental Endomychinae, Stenotarsinae widely distributed in warmer regions of the world, Epipocinae distributed in the Neotropical and Nearctic Regions, and Lycoperdininae occurring in all main zoogeographical regions.

The present analyses provided some evidence of the close relationships among Epipocinae, Stenotarsinae and Endomychinae. There is some degree of relationship between Epipocinae and Stenotarsinae, based on a single larval character (hypostomal rods absent – # 73,1), shared also with *Holopsis*, and both families show some affinity to Endomychinae, based on the tegmen in the form of a reduced short ring with a long, membranous, flat strut (# 50,1) (occurring also in Danascelinae while

Epipocinae have character state # 50,3). These three subfamilies form a sister group to Lycoperdininae. The adult data, however, suggest Epipocinae to be most closely related to Lycoperdininae (Fig. 1064). This relationship is supported by the gular sutures being indistinct or confluent in midline (# 3,1) and the tegmen reduced, strongly sclerotized, encircling and compactly joined with basal part of median lobe (# 51,3), but none of these appears to be very convincing synapomorphic character as shown on the preferred cladogram (Fig. 1069).

Epipocinae, with their adult synapomorphy – sternite of male genital segment well developed with lateral edges deeply asymmetrically incurved (# 50,1), and larval synapomorphy – maxillary mala with subapical part of ventral surface with rows of paired asperities (# 84,1) form a clearly defined monophyletic group.

Stenotarsinae are also well supported as a monophyletic group by an adult character – base of coxites deeply excised (# 61,1) and by a larval synapomorphy – abdominal terga with lateral parascoli (# 90,1).

Endomychinae as monophyletic group are well supported by adult synapomorphy: labium with prementum distinctly longer than wide (# 15,1). Larvae, with only *Endomychus* larva known, have their synapomorphy (mandibular mola replaced by membranous lobe – # 77,2), but do not show any distinct affinity to other subfamilies within this group. They share, however, the labrum sclerotized with a membranous apex (# 75,1) with some members of Lycoperdininae (Figs 1073, 1074).

PHYLOGENY OF LYCOPERDININAE

The monophyly of the Lycoperdininae is very well supported by the following adult characters: the presence of an occipital file on the head (# 1,1), maxillary lacinia with mesal edge and dorsal surface covered with regular rows of setae and/or spinulae (# 13,1), stridulatory membrane on anterior margin of the pronotum (# 23,1) and sternite of male genital segment well developed with apical margin at least weakly emarginate or sinuate (# 48,2) (simple in *Daulotypus* and one species of *Daulis*). Thus, as defined above the subfamily includes 38 genera distributed in all zoogeographic regions. In a contrary to my former analysis (Tomaszewska 2000) the present data do not support the fused coxites of the female genitalia as unique character for Lycoperdininae. The separated coxites occur in *Daulis*, *Daulotypus*, *Archipines* and *Achuarmychnus* that seem to represent most plesiomorphic types of the subfamily, but this character was also found in most species of more derived genera *Mycetina* and *Ancylopus*.

Generic relationships in Lycoperdininae are far from being resolved and none of the three analytical variants provided very satisfactory results.

Consequently, the relationships within the Lycoperdininae that are discussed below are based on a preferred

cladogram from the analysis of the most complete, combined data (Fig. 1069), with some cross references to the adult analysis.

The preferred cladogram indicates five evolutionary lineages within Lycoperdininae.

Daulis-group

A group comprising the Neotropical genera *Achuarmychnus* and *Archipines*, and Australian genera *Daulis* and *Daulotypus* form a distinct clade supported by a larval synapomorphy: prostheca well developed, divided into two separated parts (# 78,1), and epicranial stem present (# 71,1), character shared with some other Lycoperdininae. A highly probable scenario assumes the *Daulis*-group is the most basal clade of the subfamily. It forms a sister-group to the remaining Lycoperdininae, that are united and well supported by the female 8th abdominal segment with at least the sternite compactly connected or fused with coxites (# 56,1) and by having ovipositor with fused coxites (# 60,1).

Lycoperdina-group

This group contains *Lycoperdina*, widely distributed in Holarctic and Afrotropical Regions, Palaearctic *Hylaia* and Palaearctic and northern Oriental *Dapsa*, and is supported by intercoxal process of the mesoventrite having at least single, median carina or multicarinate (# 35,1) (occurring also in Danascelinae and Xenomycetinae). This may not be a natural group because is not supported by independent adult cladograms (Figs 1058, 1063). The adult analysis supported *Lycoperdina*-group including *Aphorista*, but this group also lacks synapomorphy.

Amphix-group

A group includes Neotropical *Amphix* and *Acinaces*, Oriental genera *Beccariola*, *Dryadites*, *Cymbachus*, *Sinocymbachus* and *Pseudindalmus*, Nearctic *Aphorista*, and *Mycetina* widely distributed in Holarctic, Oriental and Afrotropical Regions. This group is supported by larval synapomorphy: labrum with apical margin sinuate or multidenticate (# 74,1). Within this clade there are two distinct lines (although not supported by apomorphic characters). First comprising *Aphorista*, *Mycetina* and *Pseudindalmus* with *Mycetina* and *Pseudindalmus* constituting monophyletic group supported by adult synapomorphy: intercoxal process of mesoventrite trapezoidal in shape (# 36,1). Second group comprises *Acinaces*, *Amphix*, *Dryadites*, *Cymbachus*, *Sinocymbachus* and *Beccariola*. The Oriental genera among this group seem to be more derived and are well supported by a prosternal process that is forked apically and not extends beyond the front coxae (# 31,1).

Amphisternus-group

This group contains eight Oriental genera (*Gerstaeckerus*, *Brachytrycherus*, *Ohtaius*, *Spathomeles*, *Stictomela*, *Amphisternus*, *Amphistethus* and *Cacodaemon*). The

monophyly of this group is well supported by the form of the mesoventrite with the apex of the intercoxal process widened laterally, overlapping part of the coxae (# 34,1); moreover the elytra with basal margins thickened and raised (# 40,1) (occurring also in some genera of *Eumorphus*-group), the mandible with apical tooth widely chisel-shaped (# 67,1) sharing with some other Lycoperdininae, and male genital segment having additional, internal V- or U-shaped sclerite (# 68,1) occurring also in some other Lycoperdininae unite this group. It is interesting to note that this monophyletic group is similar in constitution to *Amphisternini* of Strohecker (1964), with the inclusion of *Gerstaeckerus*, which stays in a sister-group position to the remaining genera, that are well supported by apex of maxillary lacinia covered with numerous stout, S-shaped setae (# 12,1). The group containing *Stathomeles*, *Stictomela*, *Amphistethus*, *Amphisternus* and *Cacodaemon* is another monophyletic part of the *Amphisternus*-group, well defined by elytra possessing high tubercles and/or spines (# 41,1), and the base of the spermatheca with a large nodulus-like structure or at least with a small weakly sclerotized ring (# 64,1).

***Eumorphus*-group**

This group includes 14 genera – 5 of them distributed in the Oriental Region (*Avencymon*, *Encymon* (including northern Australia), *Eumorphus*, *Platindalmus*, *Parindalmus*), 7 Afrotropical genera (including Madagascar) (*Malindus*, *Callimodapsa*, *Cymones*, *Haploscelis*, *Chetryrus*, *Microtrycherus*, *Trycherus*), and *Indalmus*, and *Ancylopus* inhabiting old world tropics and subtropics. The monophyly of this large group is supported by one larval synapomorphy: subapical part of maxillary mala with 4 oblique rows of hook-like setae on ventral surface (# 84,1). Within this group, *Encymon* and the closely related genera *Eumorphus* and *Platindalmus*, form basal clades. The group of remaining genera is well supported by the basal margin of labrum with median raised ridge, triangularly produced anteriorly (# 10,1). Among this group there are two distinct lines. First monophyletic group containing African genera (*Haploscelis*, *Chetryrus*, *Microtrycherus*, *Trycherus*) is supported by adult synapomorphy: spermatheca without accessory gland (# 62,1); the second group containing *Ancylopus*, *Avencymon*, *Malindus*, *Parindalmus*, *Callimodapsa*, *Cymones* and *Indalmus* is supported by the elytra having basal edge thickened and raised (# 40,1), that is sharing with *Amphisternus*-group. Within this group, however, *Malindus*, *Parindalmus*, *Callimodapsa*, *Cymones* and *Indalmus* form a monophyletic clade supported by the elytra being widest beyond mid length (# 42,1).

BIOGEOGRAPHY

The Endomychidae are a moderately large group including mostly tropical and subtropical beetles. They

are distributed in all main zoogeographical regions, but are unknown from most of the Atlantic Islands and mid-Pacific Islands (except for the cosmopolitan species of *Eidoreus* – Eupsilobiinae, known mainly from widely scattered islands, like Cuba, Guadeloupe, Virgin Islands, Galapagos, Mascarene Islands, Seychelles, Sri Lanka, Fiji, French Polynesia, Solomon Islands and Hawaii). The larger Pacific Islands including New Guinea and New Caledonia are, however, inhabited by a limited endomychid fauna, mainly by species of Stenotarsinae, Pleganophorinae (*Trochoideus* spp.) and some Lycoperdininae.

The present distribution of particular subfamilies of Endomychidae can be summarized as follows:

- Mycetaeinae: with *Mycetaea* distributed in Holarctic Region (eastern North America and Europe) and South Africa, and *Agaricophilus* restricted to Central and south-eastern Europe;
- Leiestinae: Holarctic – North America, Europe and Japan;
- Eupsilobiinae: Central and South America, South Africa, and widely distributed species of *Eidoreus* (as indicated above);
- Pleganophorinae: with *Pleganophorus* endemic in south-eastern Europe, *Dadocerus* distributed in Oriental Region, and *Trochoideus* occurring in tropical regions throughout the world;
- Merophysinae: with plesiomorphic *Holoparamesus* known from all main zoogeographical regions, and nearly all the other genera distributed in warmer parts of the Old World, excluding Australia and Madagascar (with some species of *Displotera* known from northern South America);
- Anamorphinae: occurring in all main zoogeographical regions;
- Xenomycetinae: Nearctic – monotypic subfamily with two known species occurring in North America;
- Danascelinae: Holarctic – North America and Pakistan;
- Endomychinae: Holarctic and Oriental (with the species of most plesiomorphic *Endomychus* widely distributed in North America, Europe and Asia, including Japan and northern Orient, while the other more derived genera occur mainly in Oriental Region and south-eastern Palaearctic);
- Stenotarsinae: widely distributed throughout the world, unknown from Europe, with most speciose genus *Stenotarsus* occurring in all warmer regions of the world;
- Epipocinae: mostly Neotropical with some Nearctic species of *Epipocus*;
- Lycoperdininae: distributed in all parts of the world with maximum diversity in the Oriental Region (21 genera – 16 of them endemic), with the presumably most plesiomorphic members of the subfamily (*Achuarmychnus*, *Archipines*, *Daulis*, *Daulotypus*) occurring in South America and Australia.

The past history of the Endomychidae is poorly known. Fossils are known from Baltic amber (Eocene/Oligocene, ca. 38 MY ago [MYA]) (like *Lycoperdina* and *Mycetina*) (Strohecker 1953). The older evidence is a little speculative, but the oldest fossil endomychid with Mycetacinae-like characters was seen by R. Crowson (unpublished) in Canadian amber of upper Cretaceous age. This and the presence of Erotylidae: Languriinae fossils (see also Leschen 2003), also members of Cucujoidea, in Lebanon amber (early Cretaceous) (Crowson 1981) may suggest that Cucujoidea (Endomychidae as well) existed and were well differentiated by mid/ upper Cretaceous (ca. 110–100 MYA), before the break up of the main landmass of the Gondwana.

With the very limited fossil data, reconstructing the geological history of the family is very difficult. With very limited data from the past, and considering tentatively, widely distributed Merophysiinae as the most plesiomorphic members of Endomychidae (as shown on the preferred cladogram – Fig. 1069), it is impossible to make a hypothesis about a centre of the origin of the family, and thus the dispersal routes of the family would be highly speculative.

There is no simple answer about the closest relatives of the subfamily Lycoperdininae, but the analysis of the adult characters indicates that Lycoperdininae may probably have evolved from a common ancestor of Epipocinae-Lycoperdininae stock (as shown on the strict consensus obtained after successive weighting – Fig. 1064). This, however, is not supported by a preferred cladogram.

None of the known genera of Lycoperdininae occur exclusively on two post-Gondwanan continents, Africa and South America or South America and North America. Additionally the South American *Achuarmychnus*, *Archipines* and Australian *Daulis*, and *Daulotypus* representing plesiomorphic members of the subfamily, do not seem to be closely related either to the African or North American Lycoperdininae. The exception is Holarctic, African and Oriental *Mycetina* which shares with *Achuarmychnus* the coxites being well developed and separated, or *Lycoperdina* occurring in Holarctic Region and Africa, sharing with *Achuarmychnus* well developed gular sutures. These connections may indicate either upper Cretaceous Gondwanan origin before the break up of Gondwana, or (South American) early post Gondwanan origin of the Lycoperdininae, after the separation of Africa and South America in upper Cretaceous/ early Tertiary (95–65 MYA), with probable main dispersal routes to the north across the proto-Caribbean archipelago, that connected North and South America during middle Cretaceous but had broken just in the early Eocene (about 49 MYA) (Sanmartín and Ronquist 2004). Both models are equally possible so far.

Unfortunately the relationships within Lycoperdininae remain poorly resolved, therefore their evolutionary dispersal routes should be hypothesised very cautiously.

There seems, however, to be an easy explanation for the present distribution of most groups of the closely related genera of the subfamily. The distributional pattern of the *Lycoperdina*-group containing the Palaearctic (European) *Hylaia*, Palaearctic *Dapsa* (with some species reaching northern Orient) and *Lycoperdina* inhabiting Nearctic, Palaearctic and Africa, indicates movement between Nearctic and Palaearctic. Easy dispersal between eastern North America and Europe (Euramerica) and western North America and Asia (Asiamerica) occurred during late Cretaceous and early Tertiary. Further movement that occurred with the closure of the mid-continental Seaway of North America in the Early Tertiary facilitated interchange between Euramerican and western American fauna. The following closure of the Turgai Straits in the late Eocene facilitated movement between Europe and Asia (Noonan 1988). The Beringia land route between western North America and Asia made possible dispersal between both continents, at least until the late Eocene/ early Oligocene, before dramatic changes in climatic conditions occurred.

The dispersal via Beringia could also explain the present distribution of the *Amphix*-group, containing two Neotropical, one Nearctic, five Oriental genera of Lycoperdininae and the only *Mycetina* widely distributed in Holarctic, Orient and Africa. This group may have evolved in North America during the period of active dispersal around the northern Pacific, in the early Tertiary, with subsequent eventual dispersal of *Amphix* and *Acinaces* into South America and evolution of *Becariola*, *Dryadites*, *Cymbachus* and *Sinocymbachus* in Asia with their dispersal into Malaya during climatic cooling, that begun in the mid to late Miocene. The evolution of *Mycetina* and its closest relatives *Pseudindalmus* and *Aphorista* and the present distribution of these genera could be similarly explain, with dispersal of *Pseudindalmus* into Malaya and a large radiation of *Mycetina* spreading through the whole Northern Hemisphere and Africa.

The close relationships between genera presently inhabiting the south-eastern tropics (Africa, Madagascar, India, Southeast Asia/ Southeast Pacific, New Guinea and northern Australia) – *Eumorphus*-group – can be explained as a result of recent dispersal along the coasts of the Indian Ocean in the middle Miocene (about 18 MYA), when a close African-Eurasian connection was established, ending a long period of isolation (including various degrees of connections) between both landmasses (Ratcliffe 1984). Although Madagascar diverged from Africa in the early Cretaceous (121 MYA), both lands have, however, remained relatively close, because of the narrow Mozambique Channel being a comparatively minor barrier to dispersal for plants and animals. The study on biogeography of the Southern Hemisphere including plants and animals, showed that dispersal between Africa and Madagascar was more frequent than

between Africa and South America (Sanmartín and Ronquist 2004). According to this, the Madagascan Lycoperdininae represent derived members of the subfamily and are certainly not old enough to have been present before the block of Madagascar and India broke away from Africa in the early Cretaceous. The present distribution in Australia of some species of *Indalmus* and *Encymon*, is probably a result of Malaysian biotic introgression to Australia, when both plates collided in the Miocene.

The evolution of the *Amphisternus*-group and the present distribution indicate a strong radiation of its genera in the whole Oriental Region.

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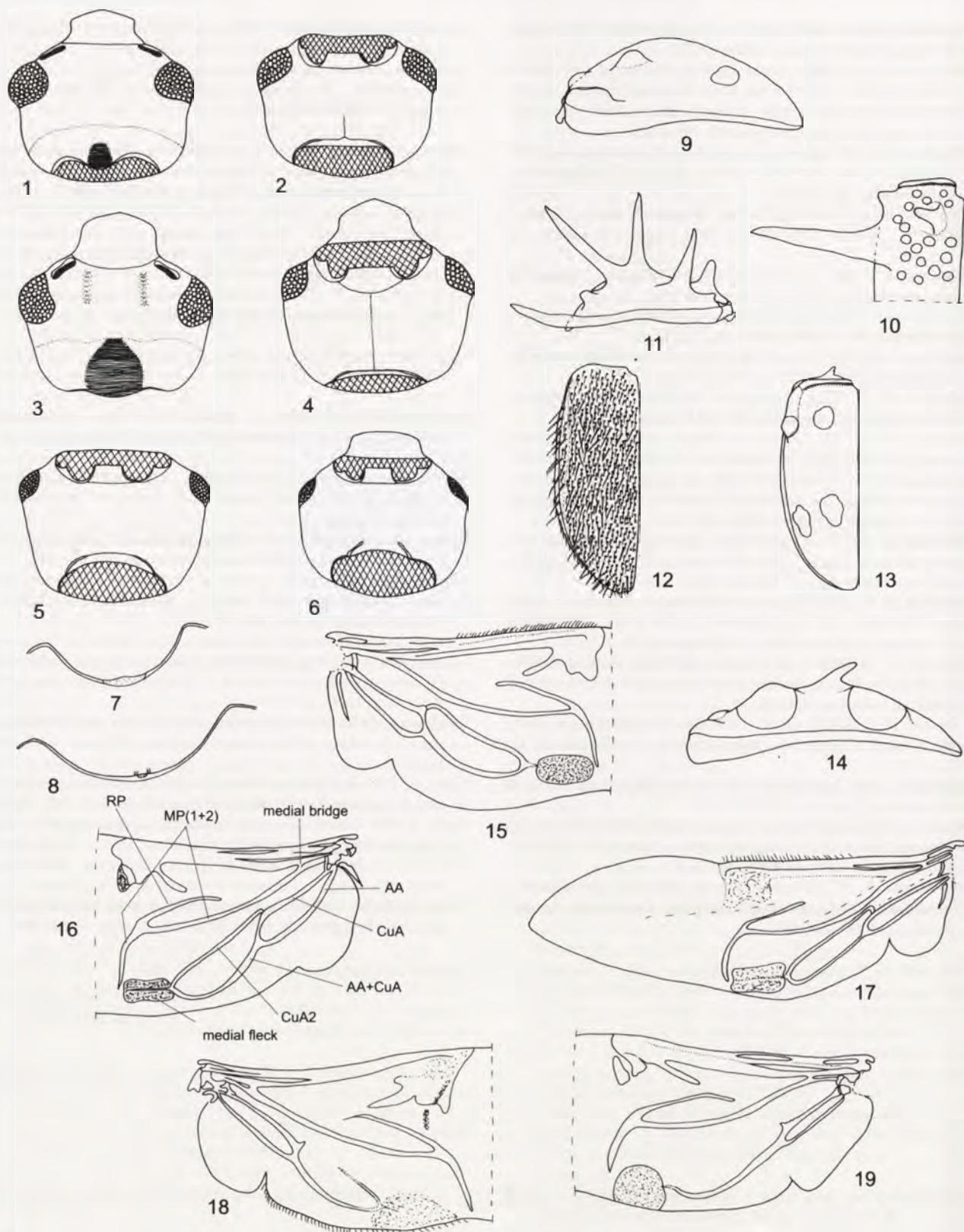
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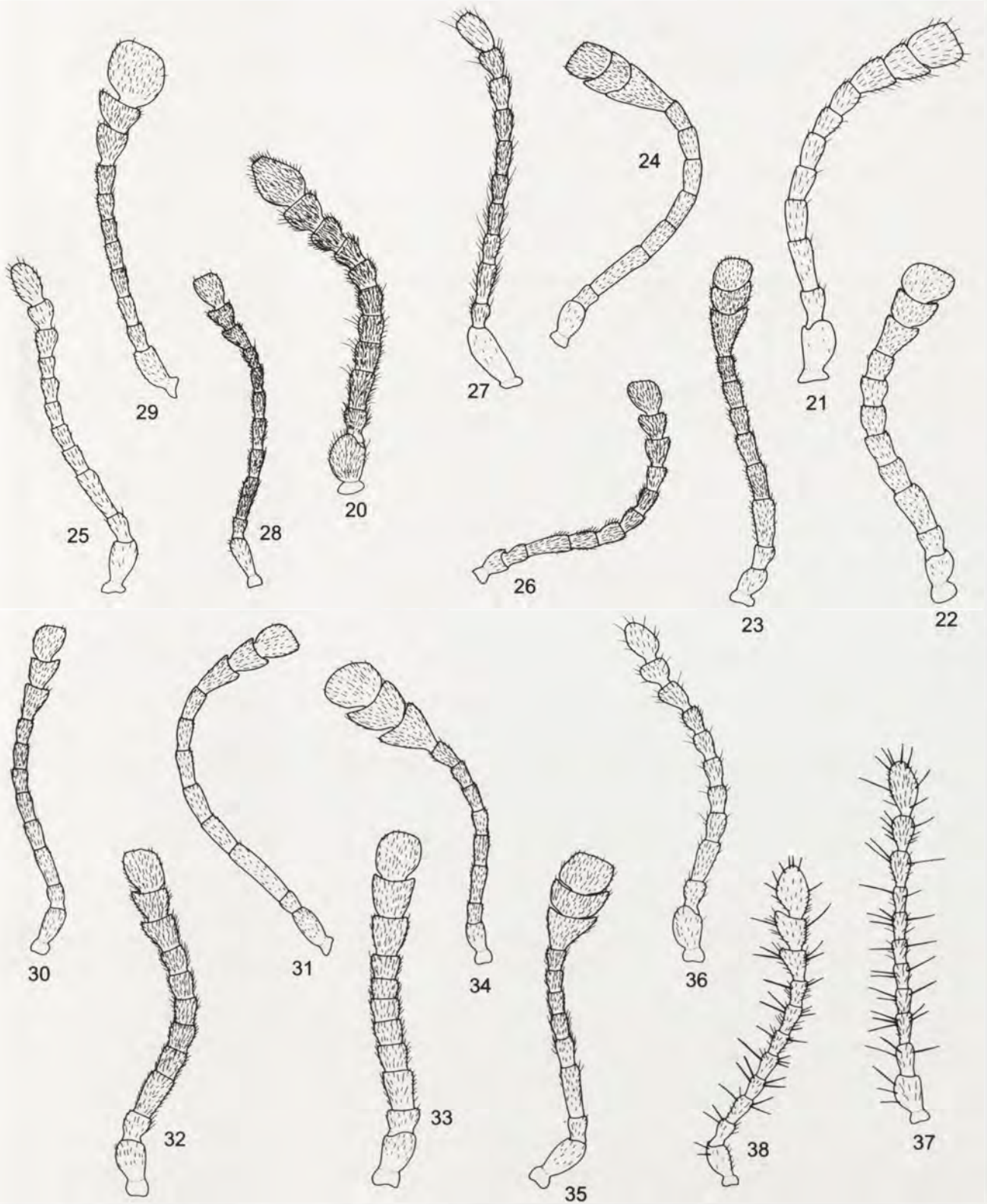
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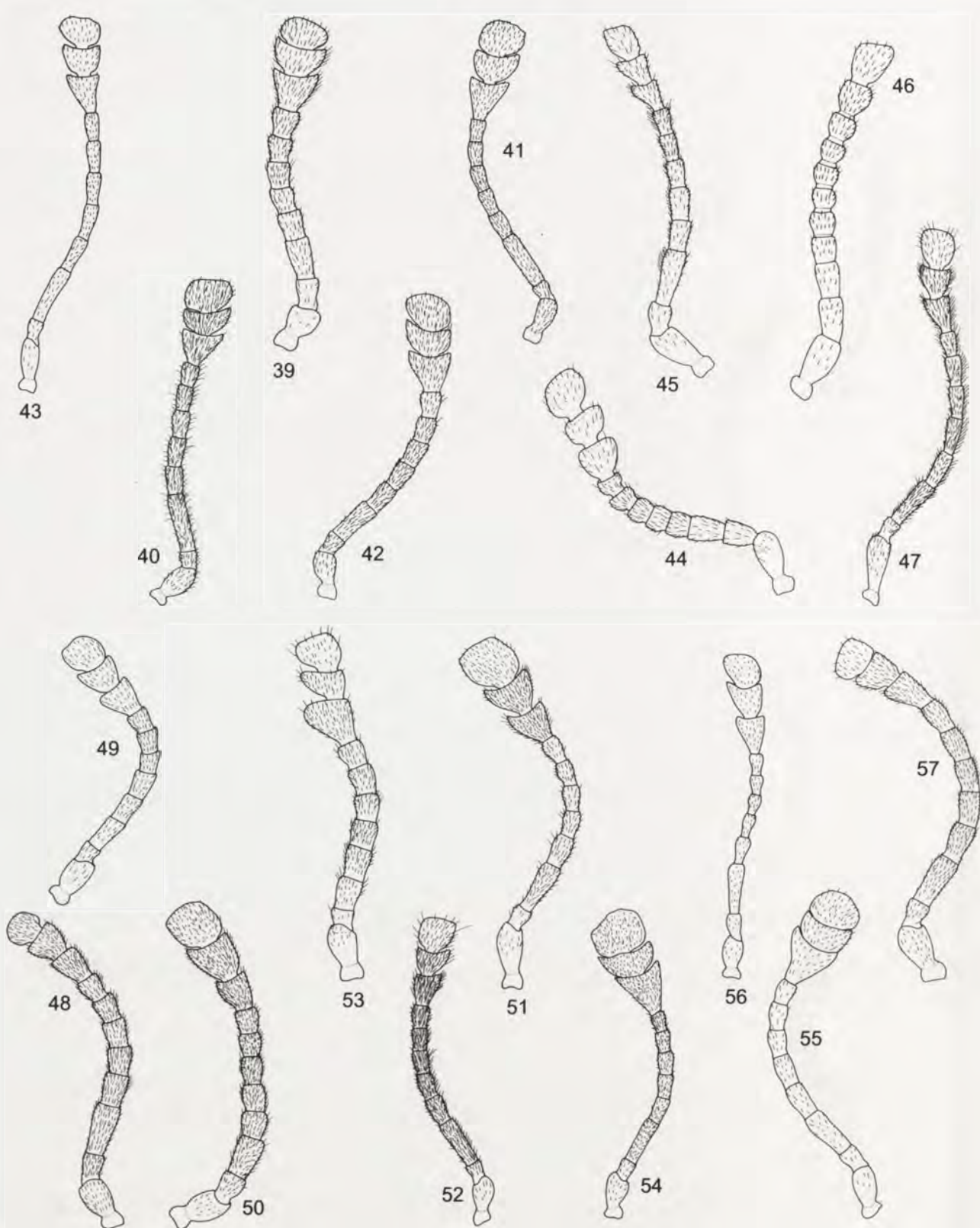
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Figures 1–19. 1–2. Head, dorsal view. 2, 4–6. Head, ventral view. 7–8. Anterior edge of pronotum. 9, 14. Elytron, left, lateral. 10. Elytron, basal half, left, dorsal. 11. Elytron, right, lateral. 12–13. Elytron, left, dorsal. 15–19. Hind wing. (1, 2) *Chetryrus raffrayi* (Gorham); (3, 4) *Malindus excavatus* Viliers; (5, 9) *Amphisternus tuberculatus* Germar; (6) *Brachytrycherus madurensis* Arrow; (7) *Mycetina cruciata* (Schaller); (8) *Beccariola orca* Heller; (10, 11) *Cacodaemon satanas* (Thomson); (12) *Daulis cimicoides* Erichson; (13) *Stictomela chrysomeloides* Gorham; (14) *Spathomeles anaglyptus* Gerstaecker; (15) *Callimodapsa nigrofusca* (Gorham); (16) *Amphistethus pustulifer* (Gorham); (17) *Indalmus kirbvanus* (Latreille); (18) *Daulotypus picticornis* Lea; (19) *Pseudindalmus tonkinensis* Arrow.



Figures 20–38. Antenna. (20) *Achuarmyachus carltoni* Tomaszewska et Leschen; (21) *Acinaces lebasii* Gerstaecker; (22) *Amphisternus tuberculatus* Germar; (23) *Amphistethus pustulifer* (Gorham); (24) *Amphix marginatus* (Fabricius); (25) *Ancylopus pictus indianus* Strohecker; (26) *Aphorista laeta* LeConte; (27) *Archipines exsanguis* Gerstaecker; (28) *Avencymon ruficephalus* (Ohta); (29) *Beccariola orca* Heller; (30) *Brachytrycherus madurensis* Arrow; (31) *Cacodaemon satanas* (Thomson); (32) *Callimodapsa nigrofusca* (Gorham); (33) *Chetryrus raffrayi* (Gorham); (34) *Cymbachus pulchellus* Gerstaecker; (35) *Cymones atroclavatus* (Fairmaire); (36) *Dapsa denticollis* (Germar); (37) *Daulis cimicoides* Erichson; (38) *Daulotypus picticornis* Lea.



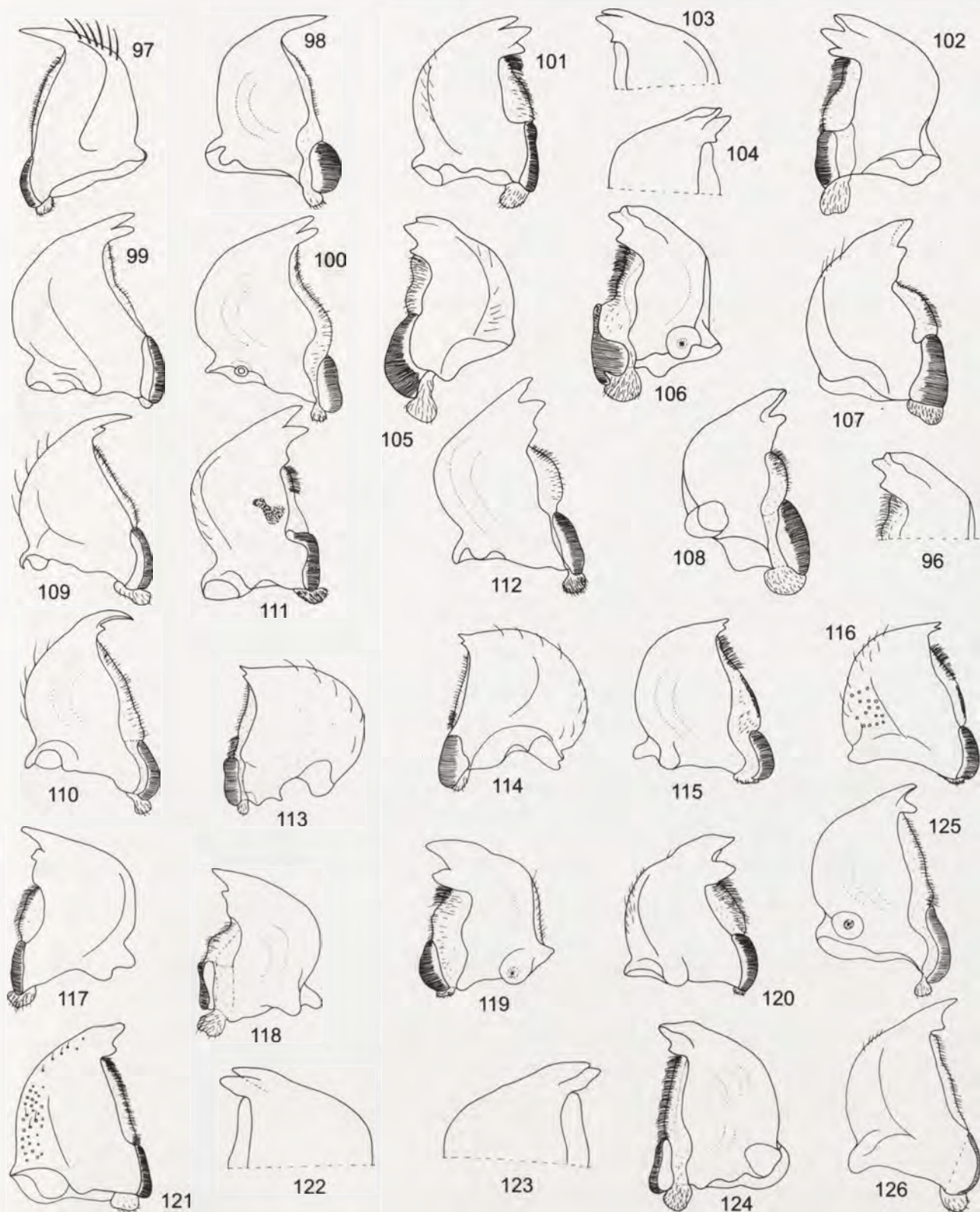
Figures 39–57. Antenna. (39) *Dryadites violaceus* Tomaszewska; (40) *Encymon violaceus* Gerstaecker; (41) *Eumorphus quadriguttatus* (Illiger); (42) *Gerstaeckerus sexguttatus* (Gerstaecker); (43) *Haploscelis atratus* Klug; (44) *Hylaia rubricollis* (Germar); (45) *Indalmus kirbyanus* (Latreille); (46) *Lycoperdina bovistae* (Fabricius); (47) *Malindus excavatus* Viliers; (48) *Microtrycherus rugicollis* (Strohecker); (49) *Mycetina cruciata* (Schaller); (50) *Ohtaius signifer* (Gorham); (51) *Parindalmus tonkineus* Achard; (52) *Platindalmus calcaratus* (Arrow); (53) *Pseudindalmus tonkinensis* Arrow; (54) *Sinocymbachus excisipes* (Strohecker); (55) *Spathomeles anaglyptus* Gerstaecker; (56) *Stictomela chrysoloides* Gorham; (57) *Trycherus lootensi* Strohecker.



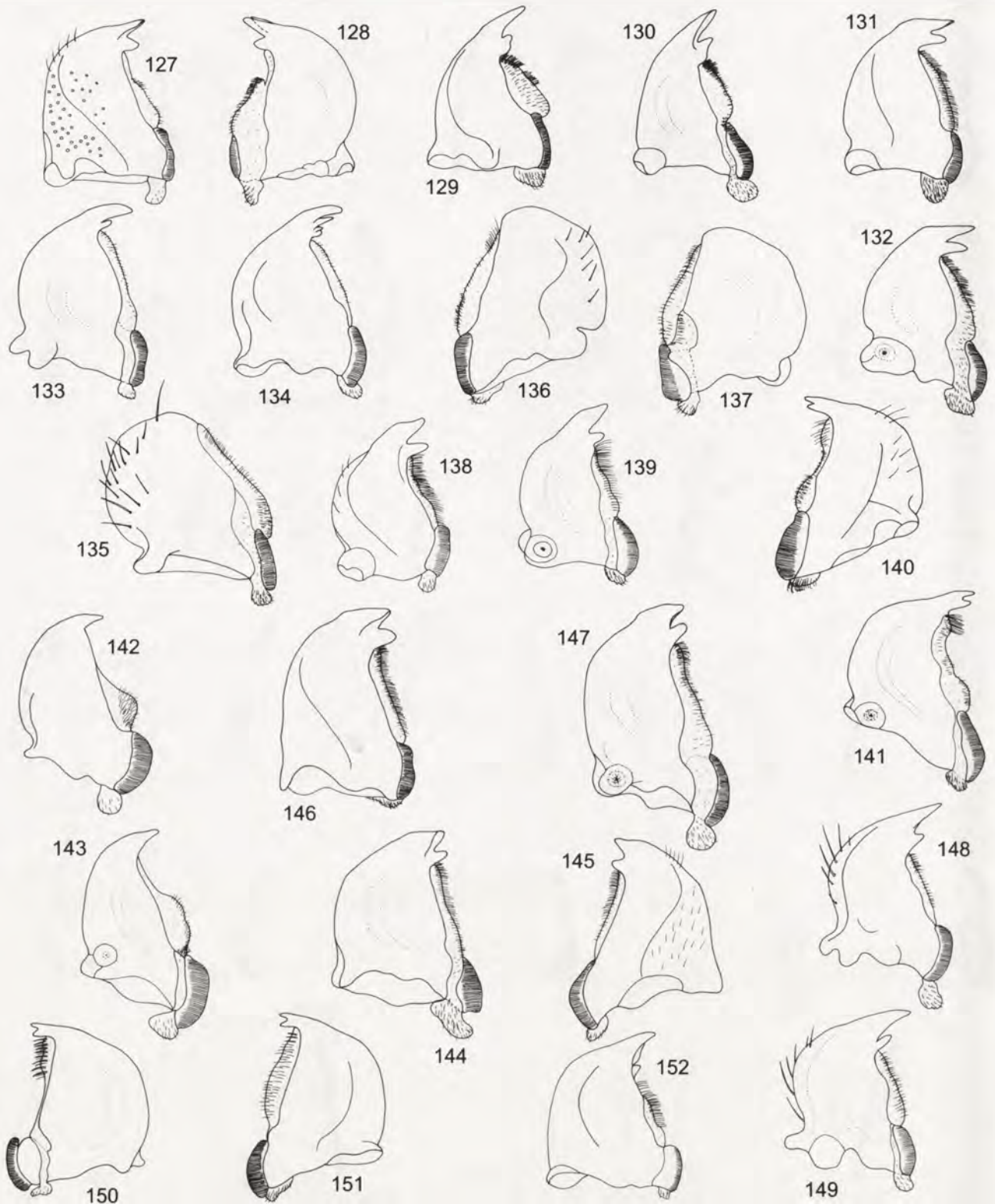
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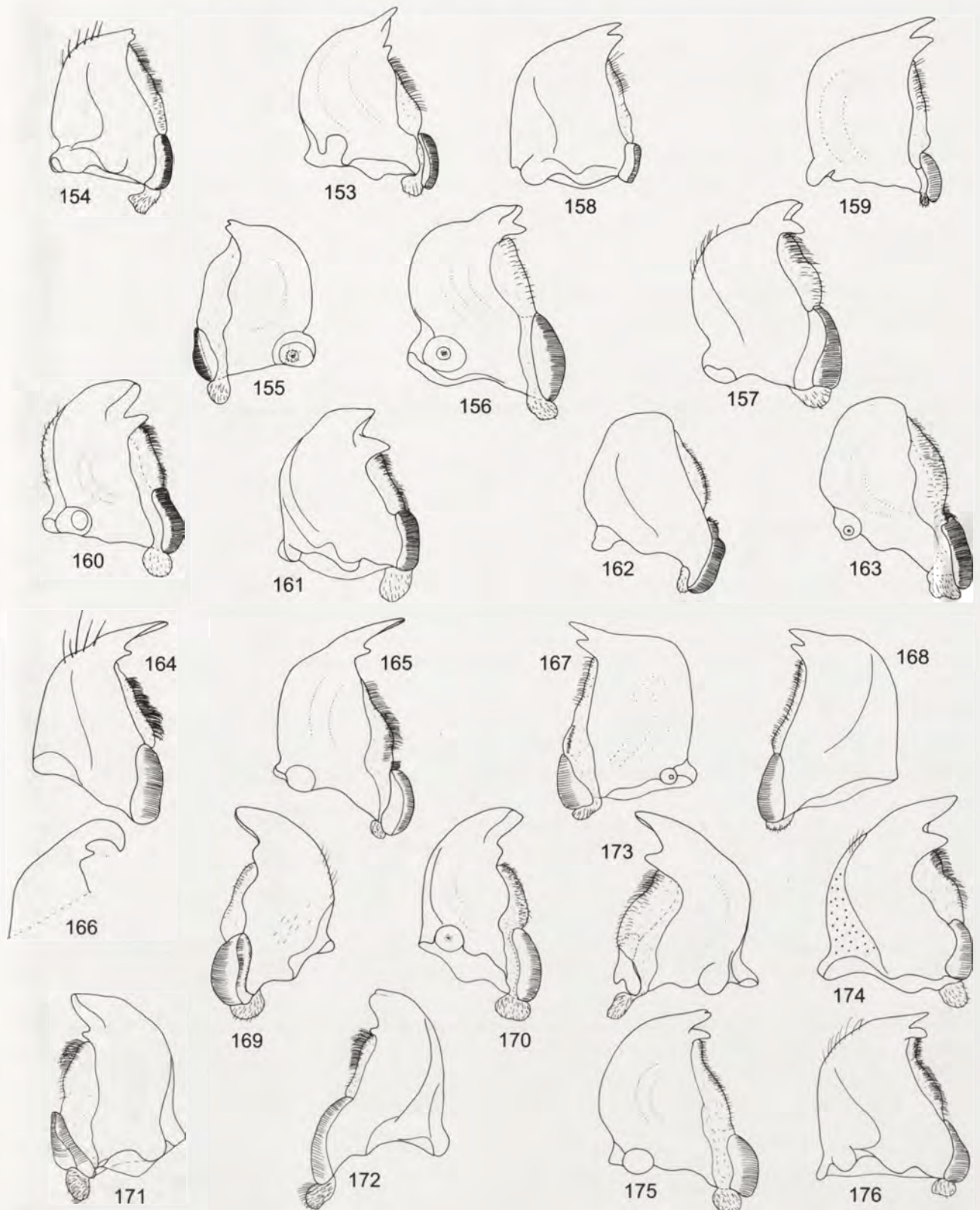
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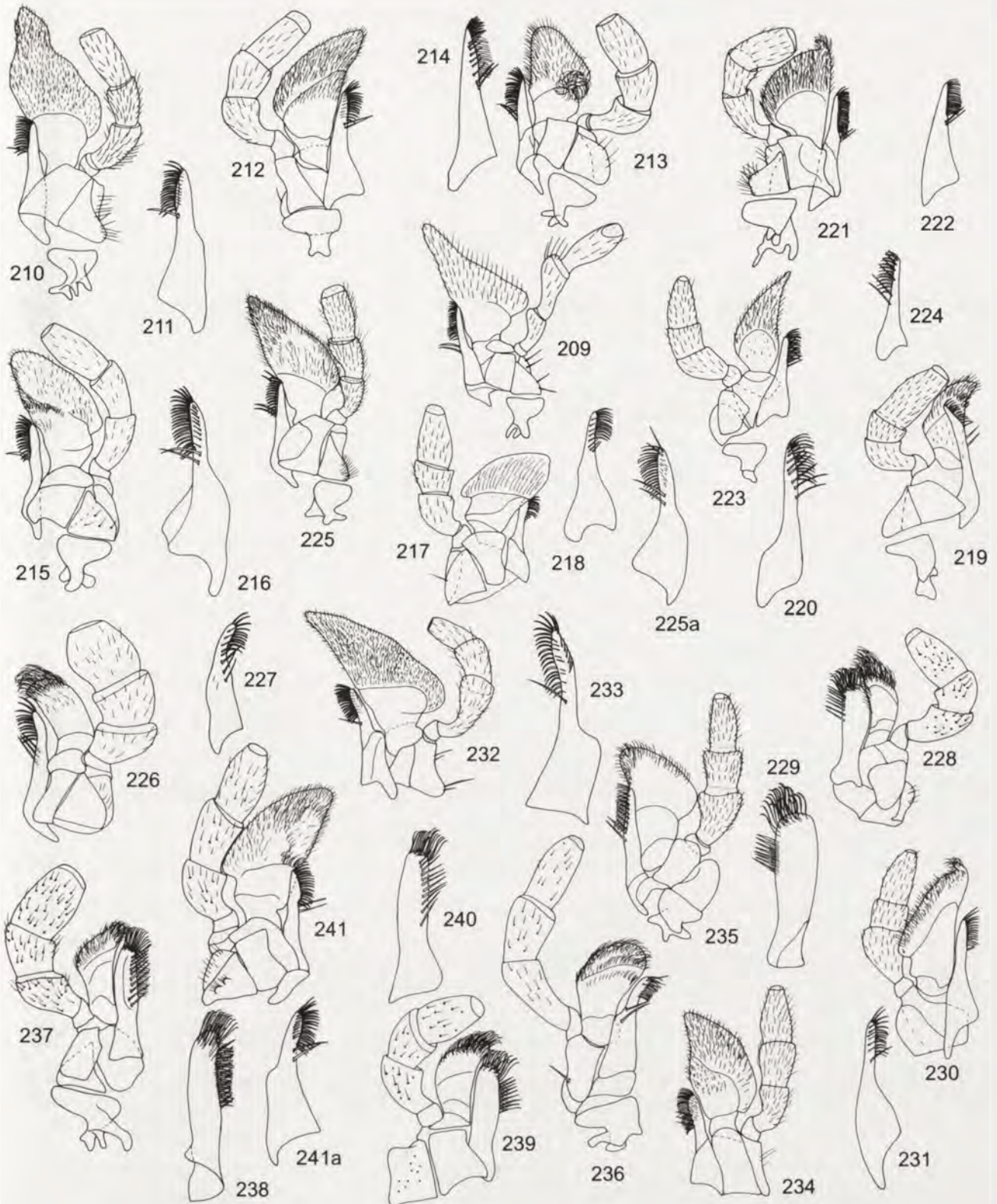
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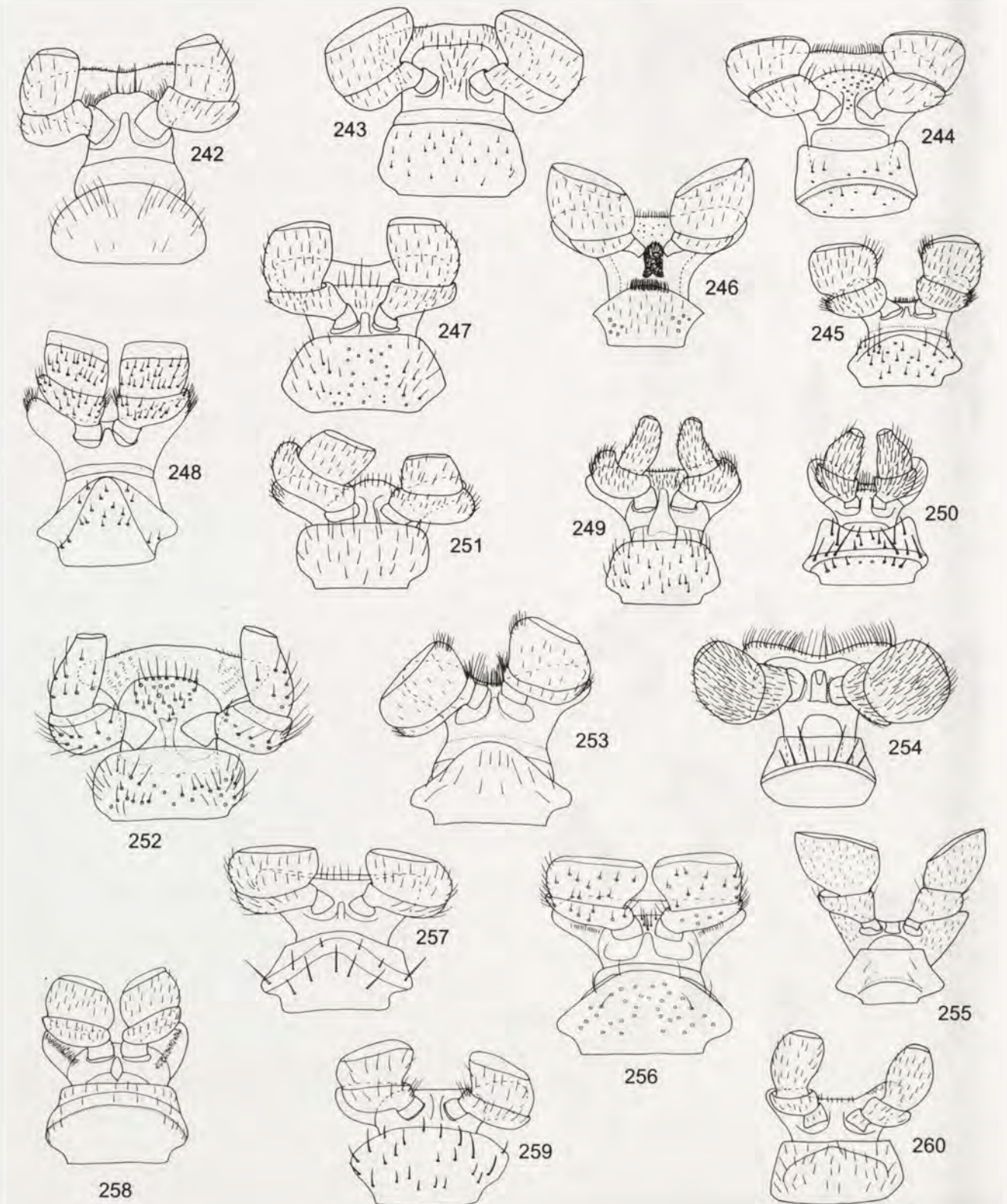
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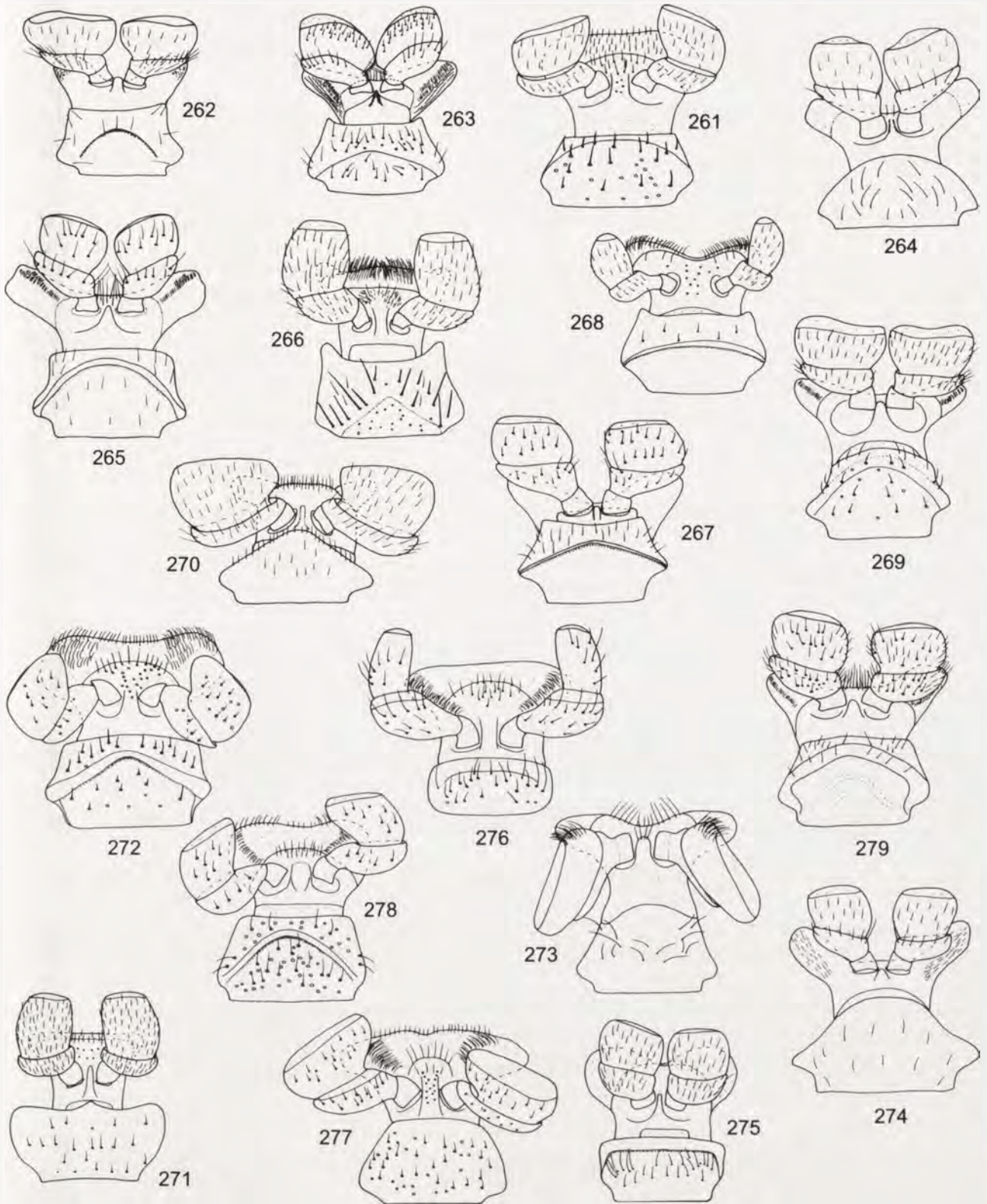
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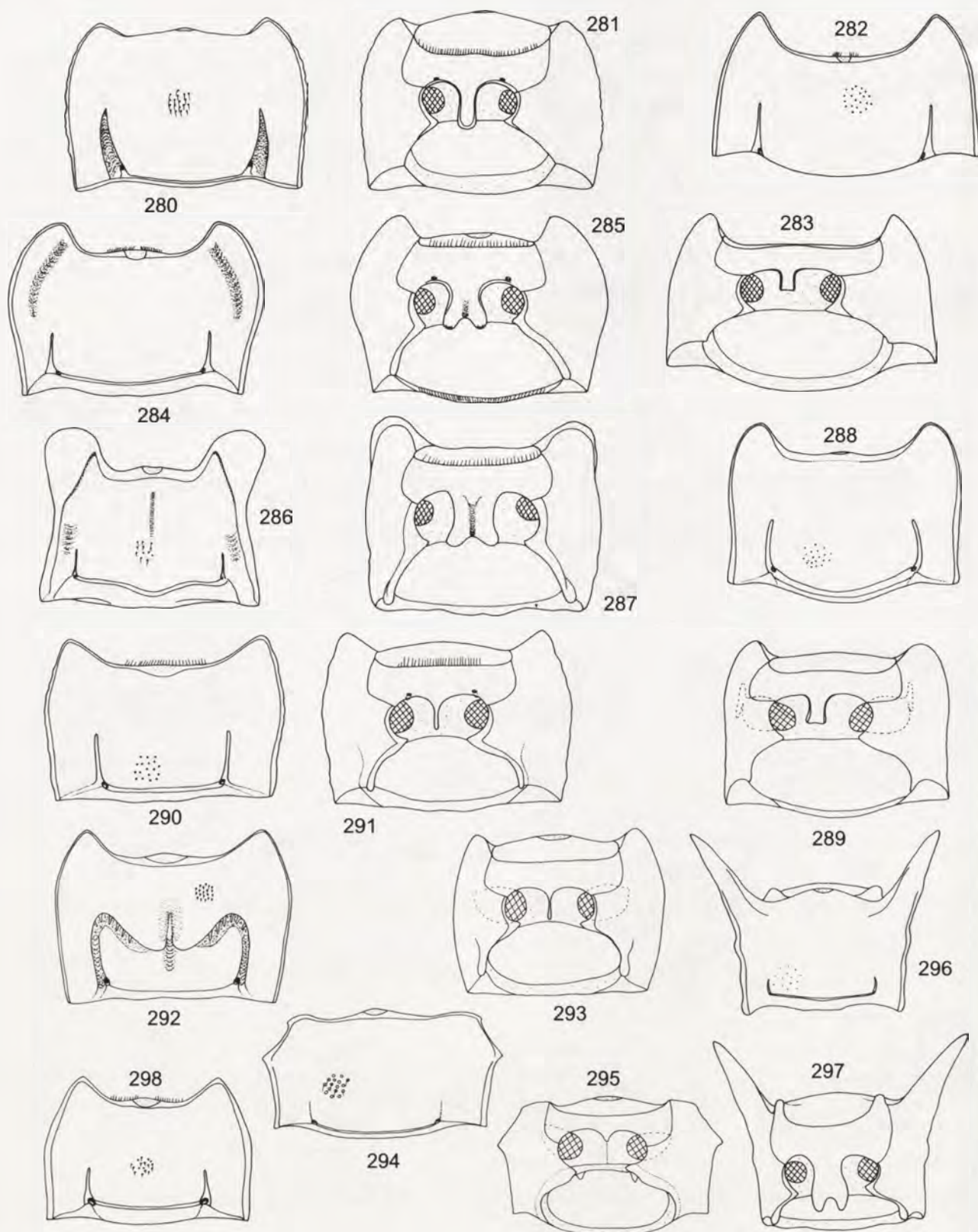
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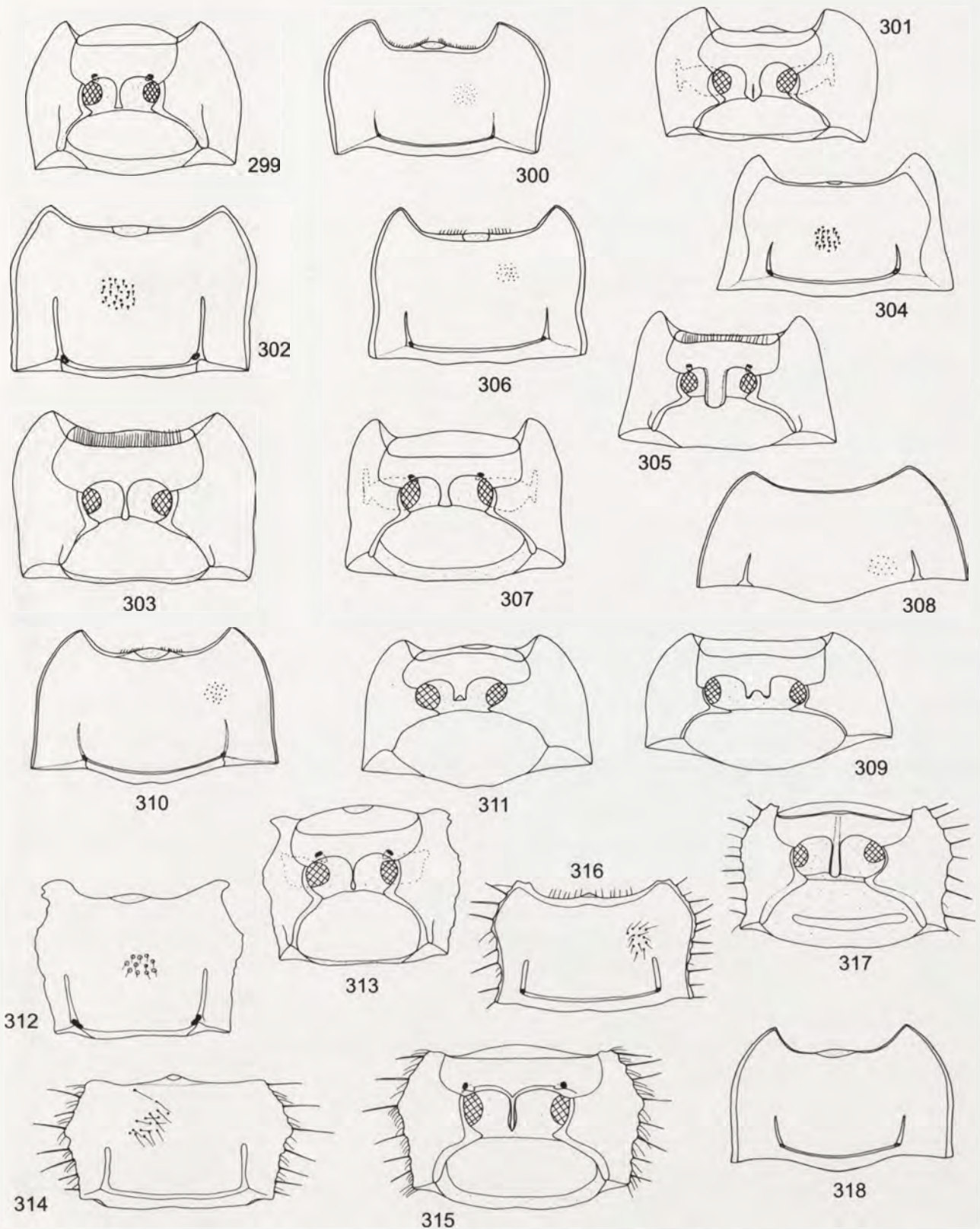
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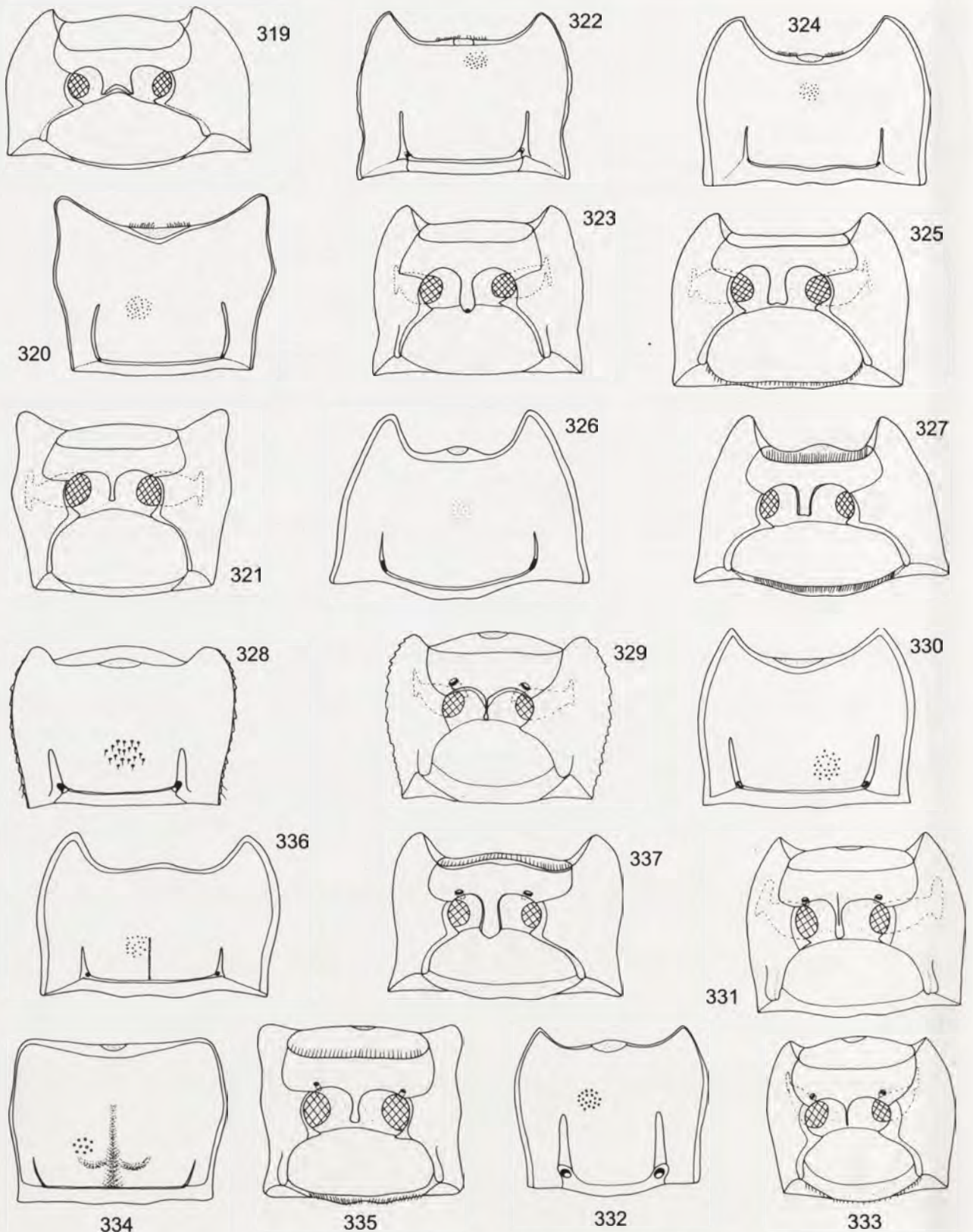
Figures 261–279. Labium. (261) *Brachytrycherus madurensis* Arrow; (262) *Encymon violaceus* Gerstaecker; (263) *Gerstaeckerus sexguttatus* (Gerstaecker); (264) *Eumorphus quadriguttatus* (Illiger); (265) *Haploscelis atratus* Klug; (266) *Hylaia rubricollis* (Germar); (267) *Indalmus kirbyanus* (Latreille); (268) *Lycoperdina bovistae* (Fabricius); (269) *Malindus excavatus* Viliers; (270) *Microtrycherus rugicollis* (Strohecker); (271) *Mycetina cruciata* (Schaller); (272) *Ohtaius signifer* (Gorham); (273) *Parindalmus tonkineus* Achard; (274) *Platindalmus calcaratus* (Arrow); (275) *Pseudindalmus tonkinensis* Arrow; (276) *Sinocymbachus excisipes* (Strohecker); (277) *Spathomeles anaglyptus* Gerstaecker; (278) *Stictomela chrysomeloides* Gorham; (279) *Trycherus lootensi* Strohecker.



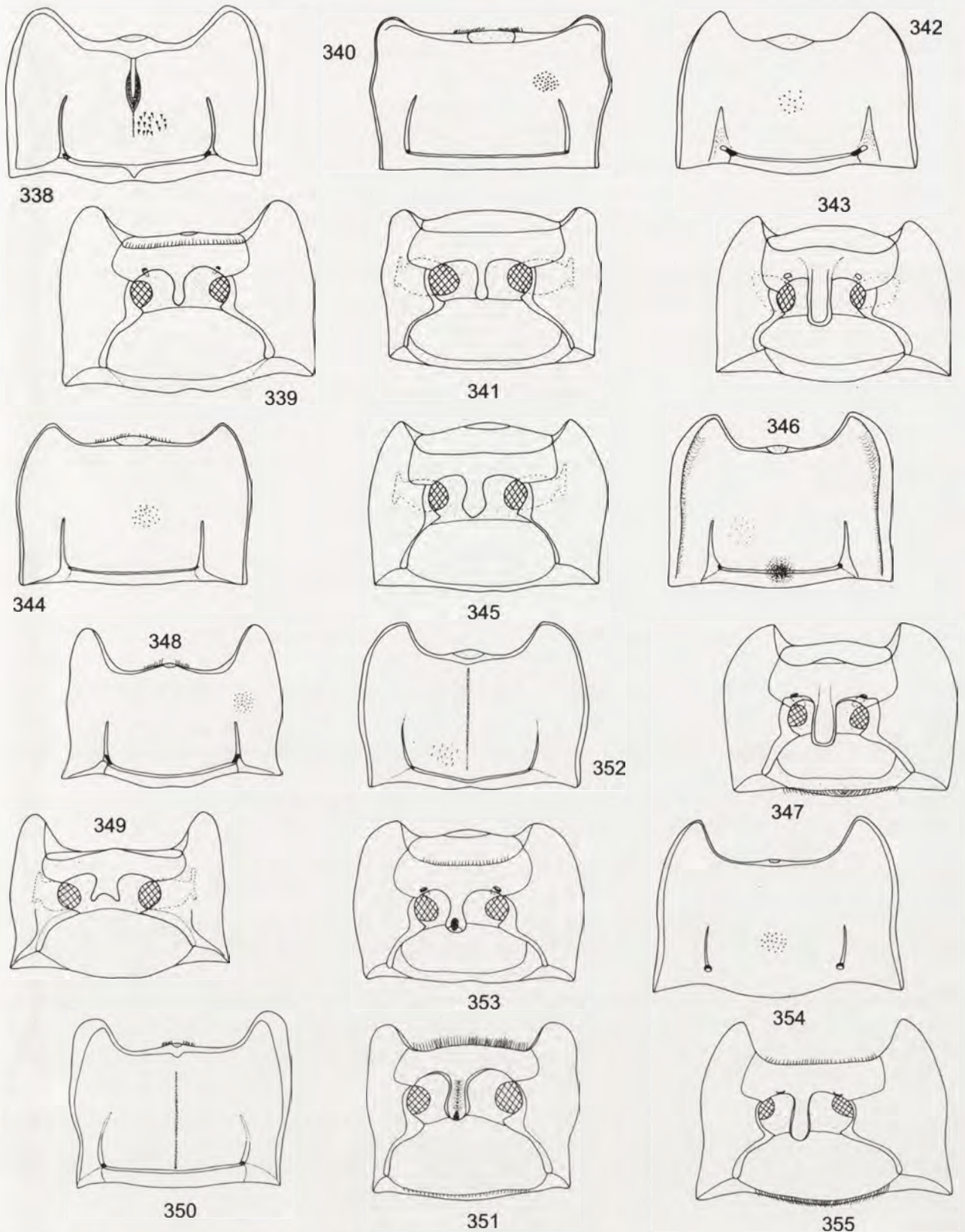
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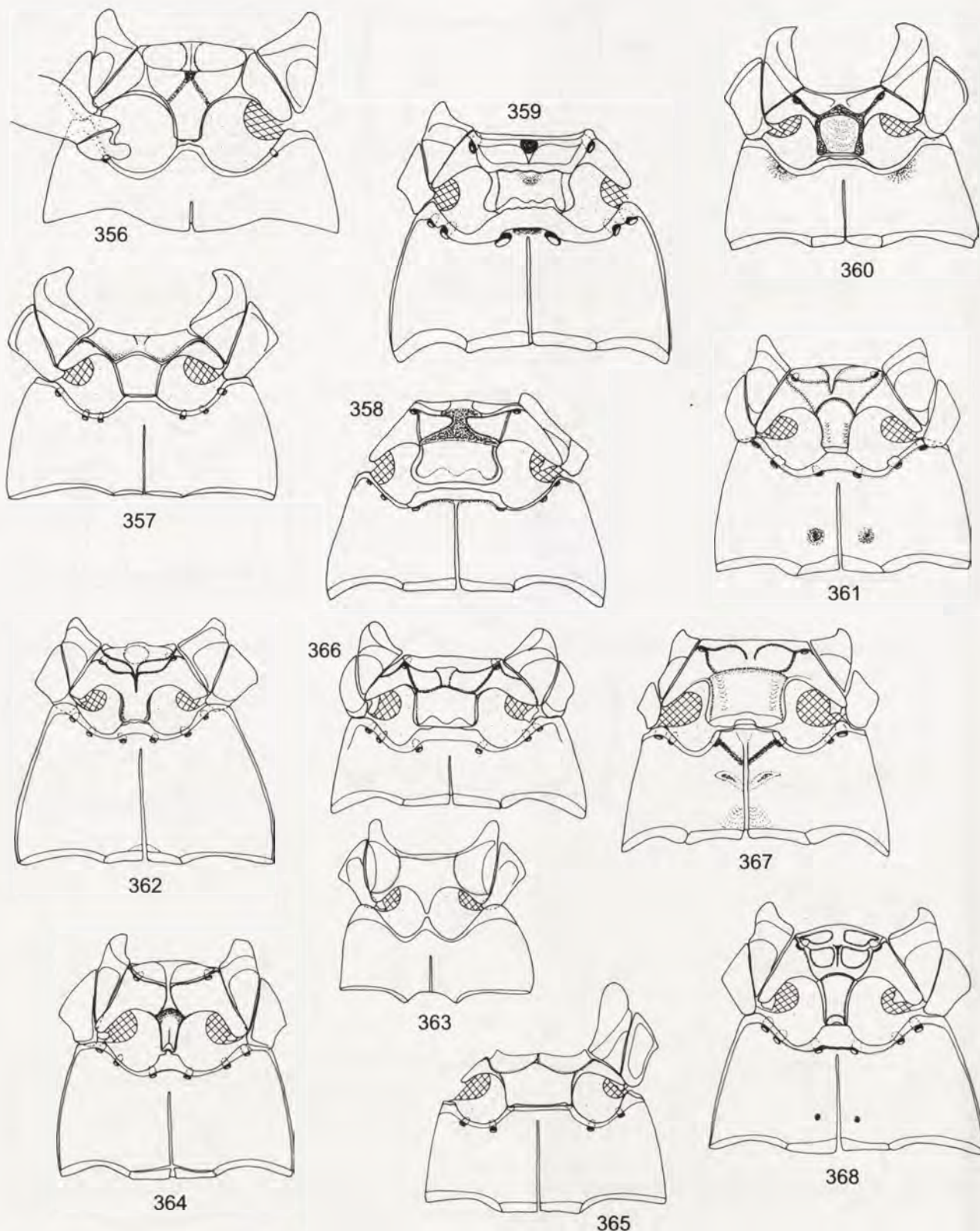
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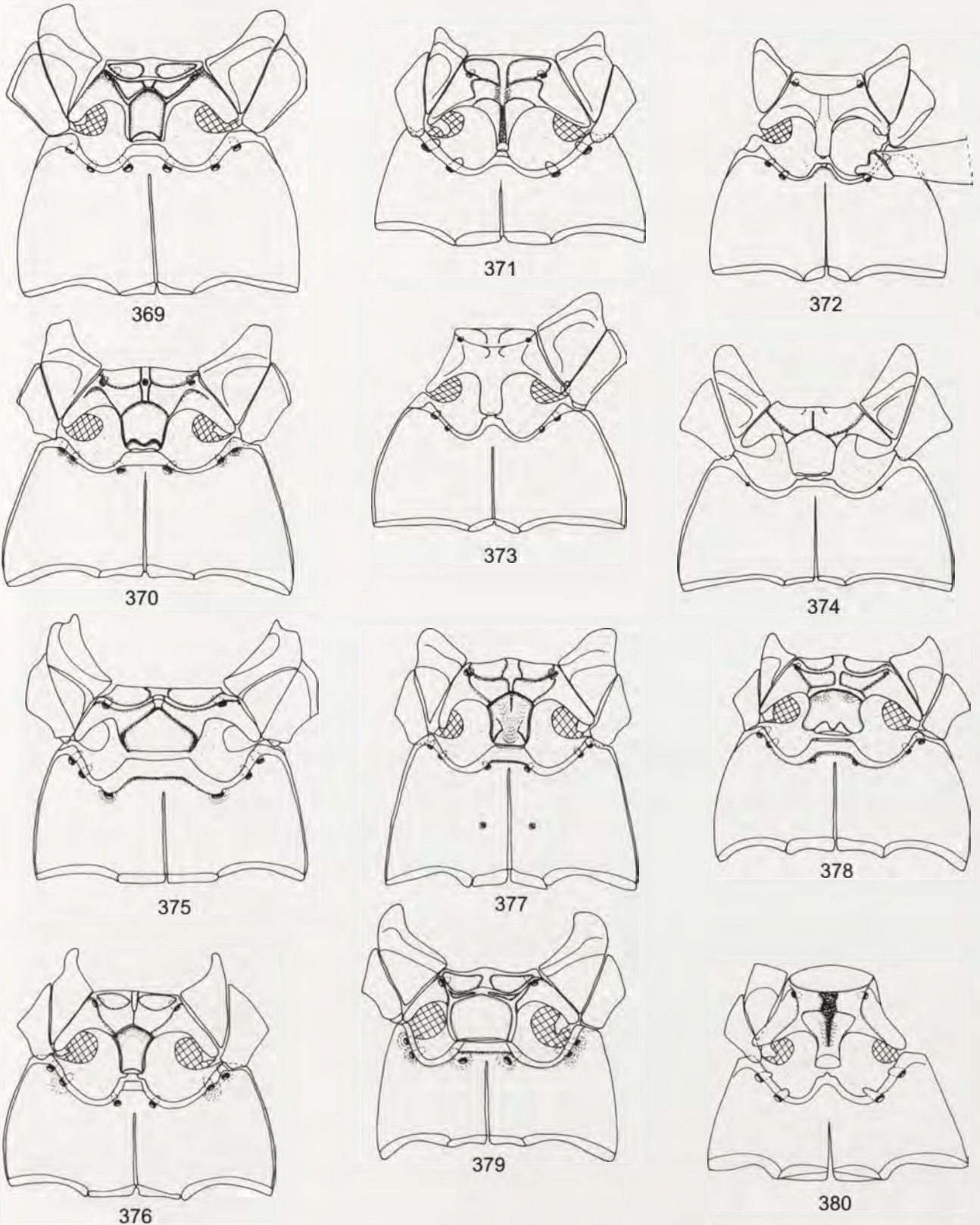
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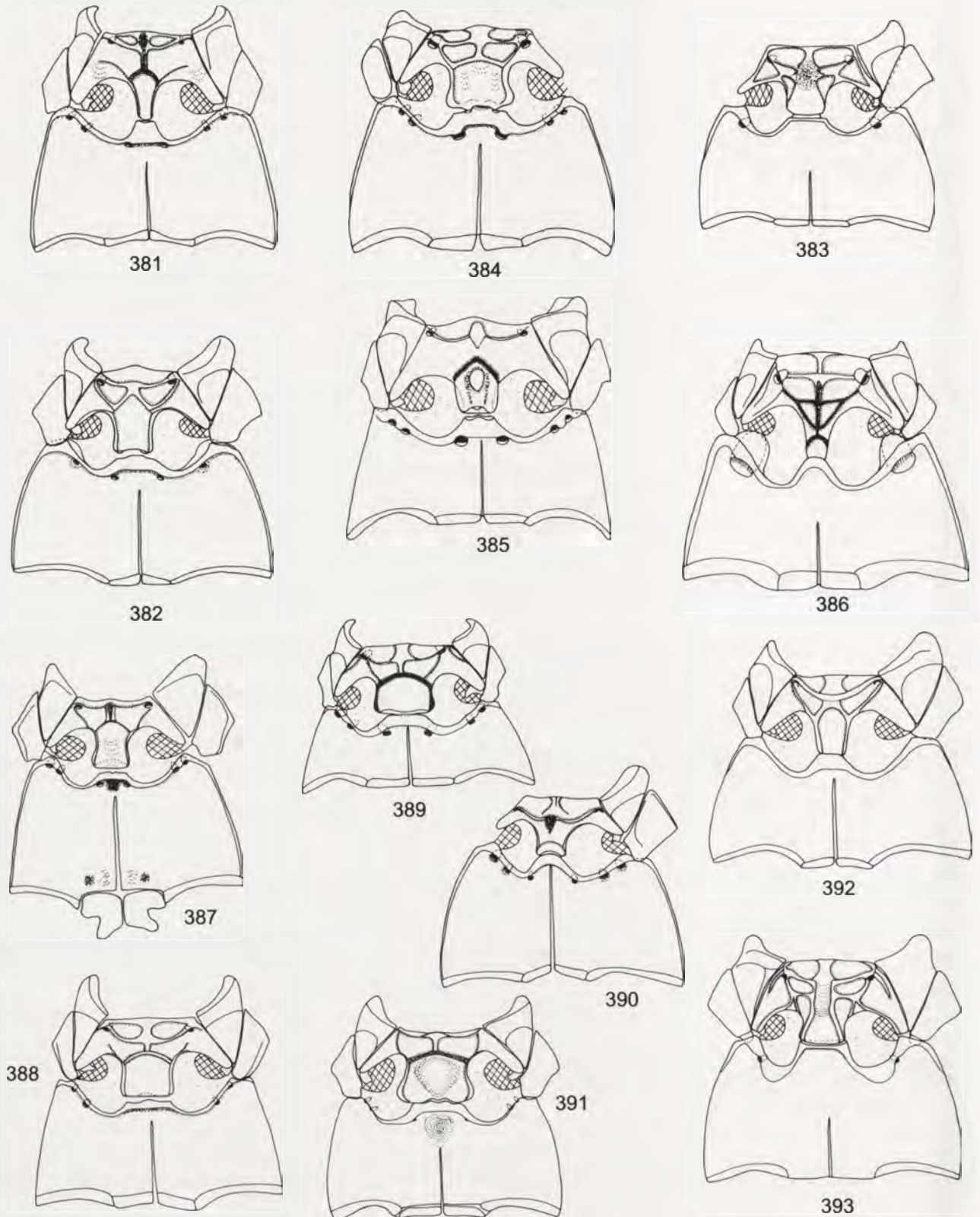
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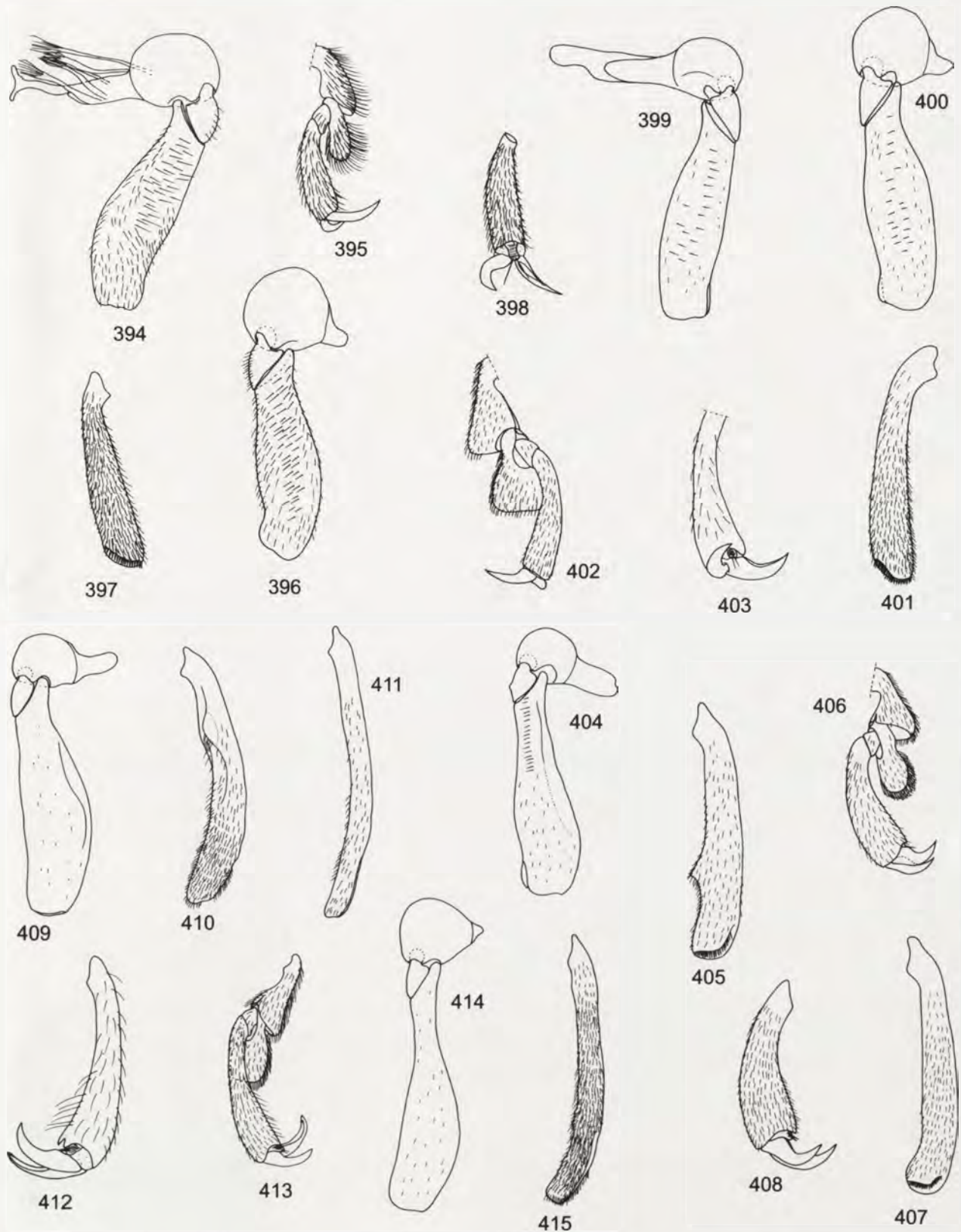
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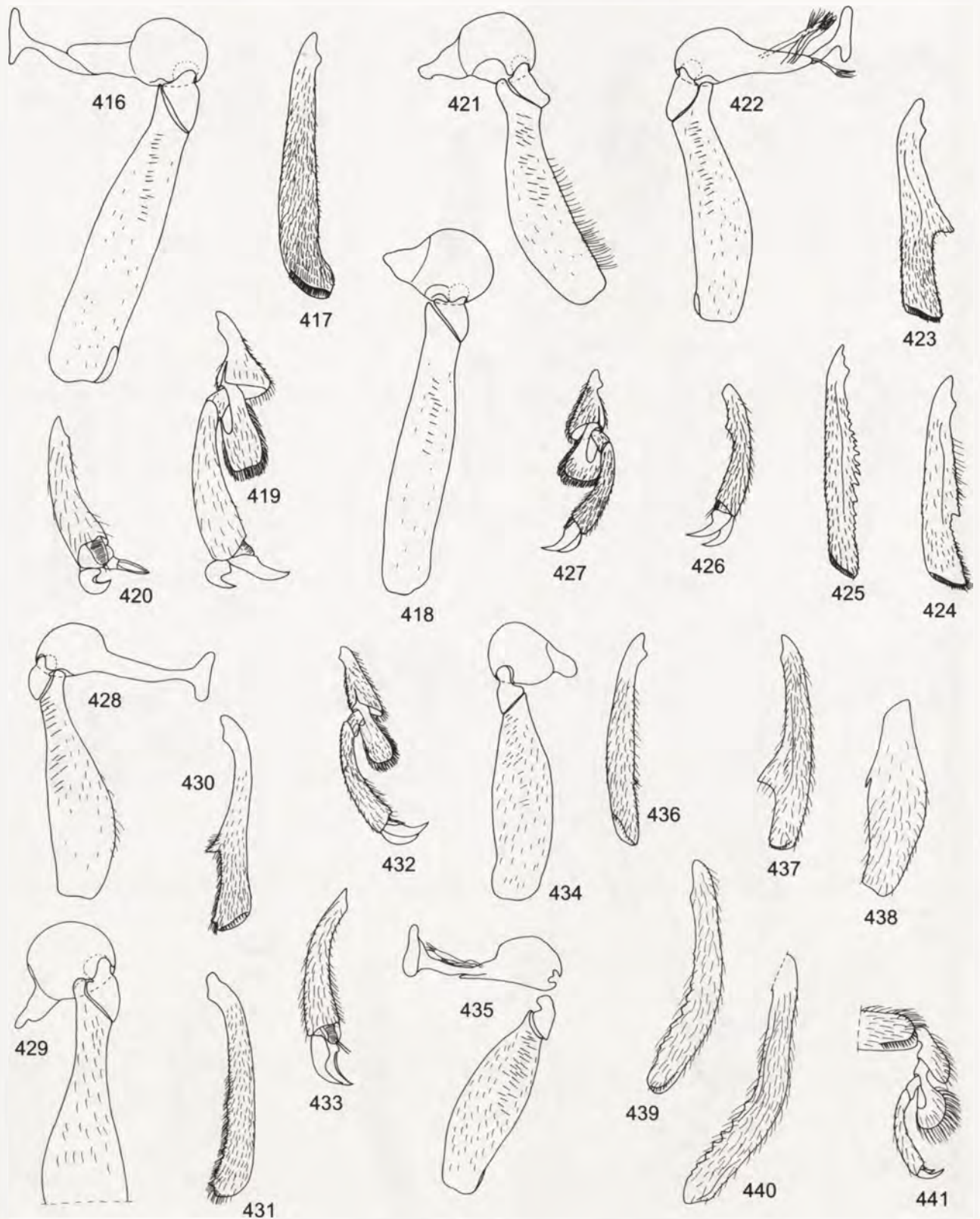
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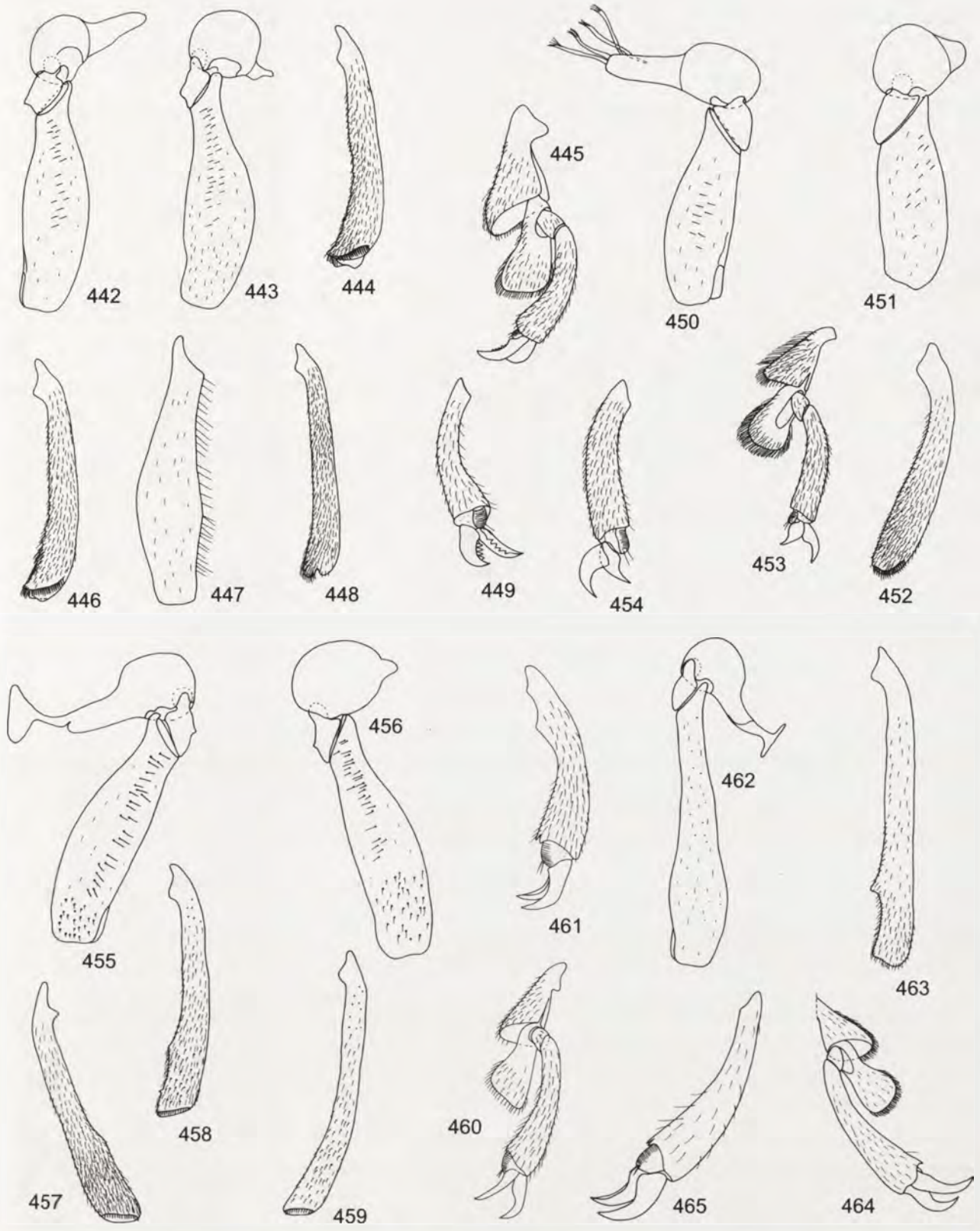
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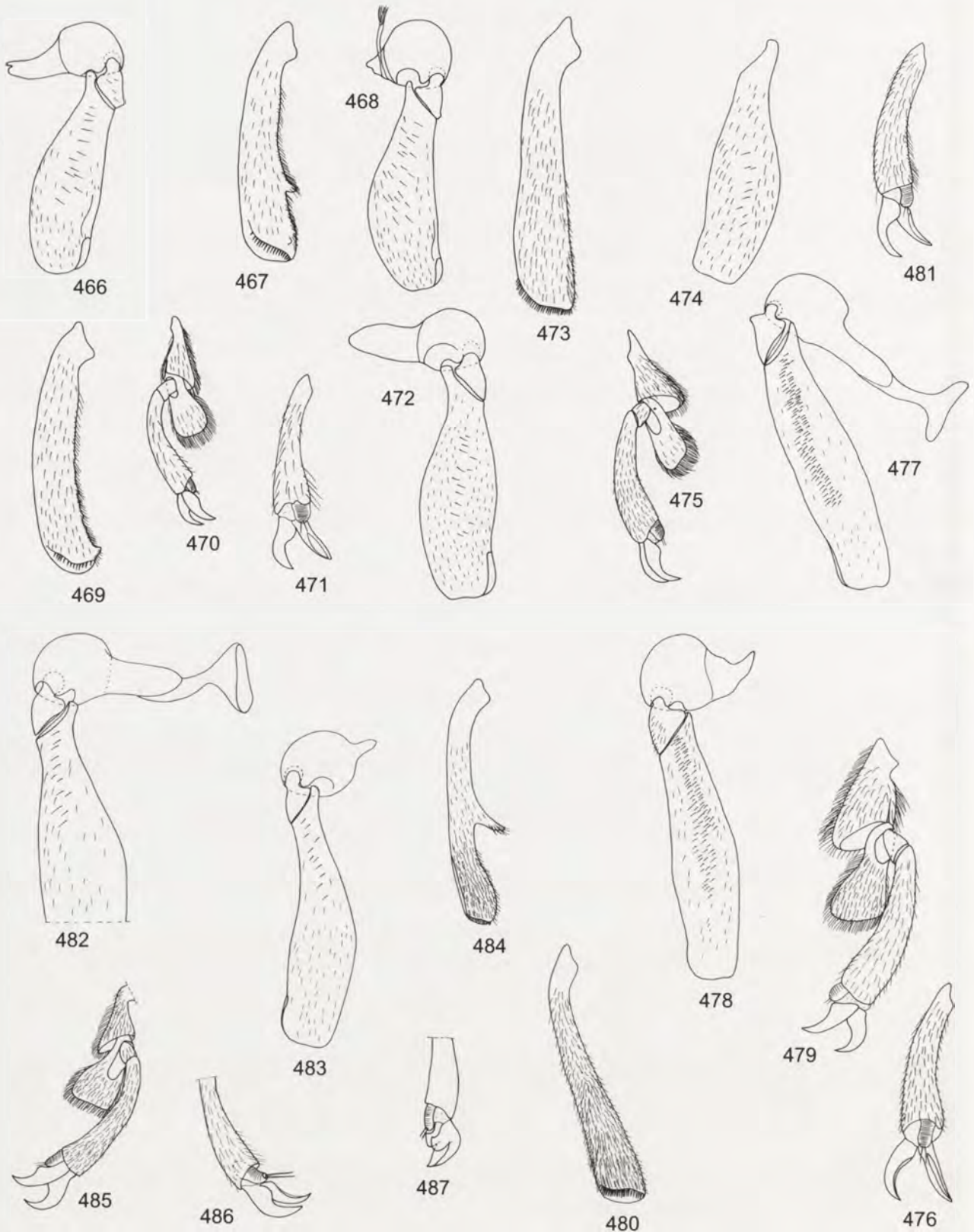
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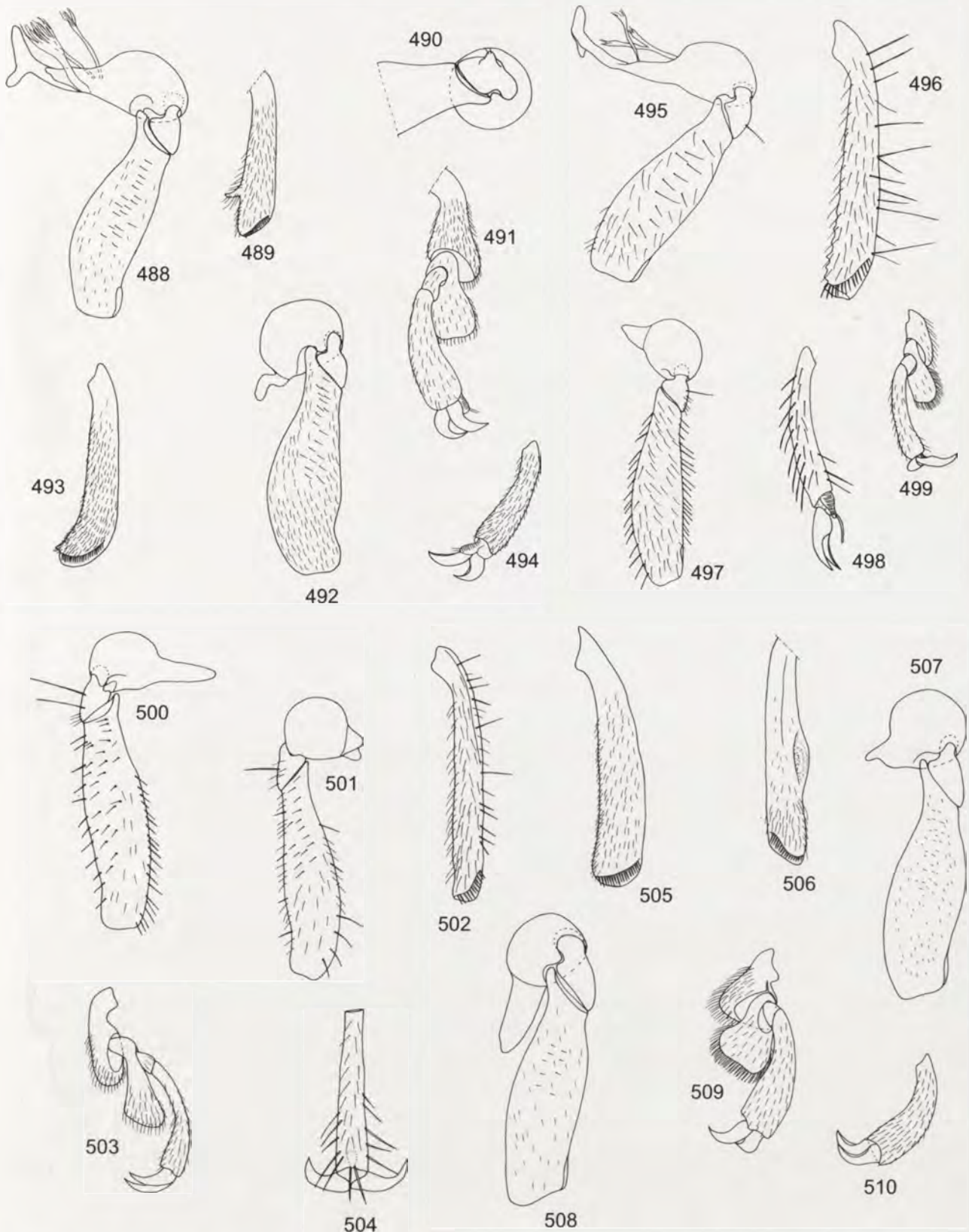
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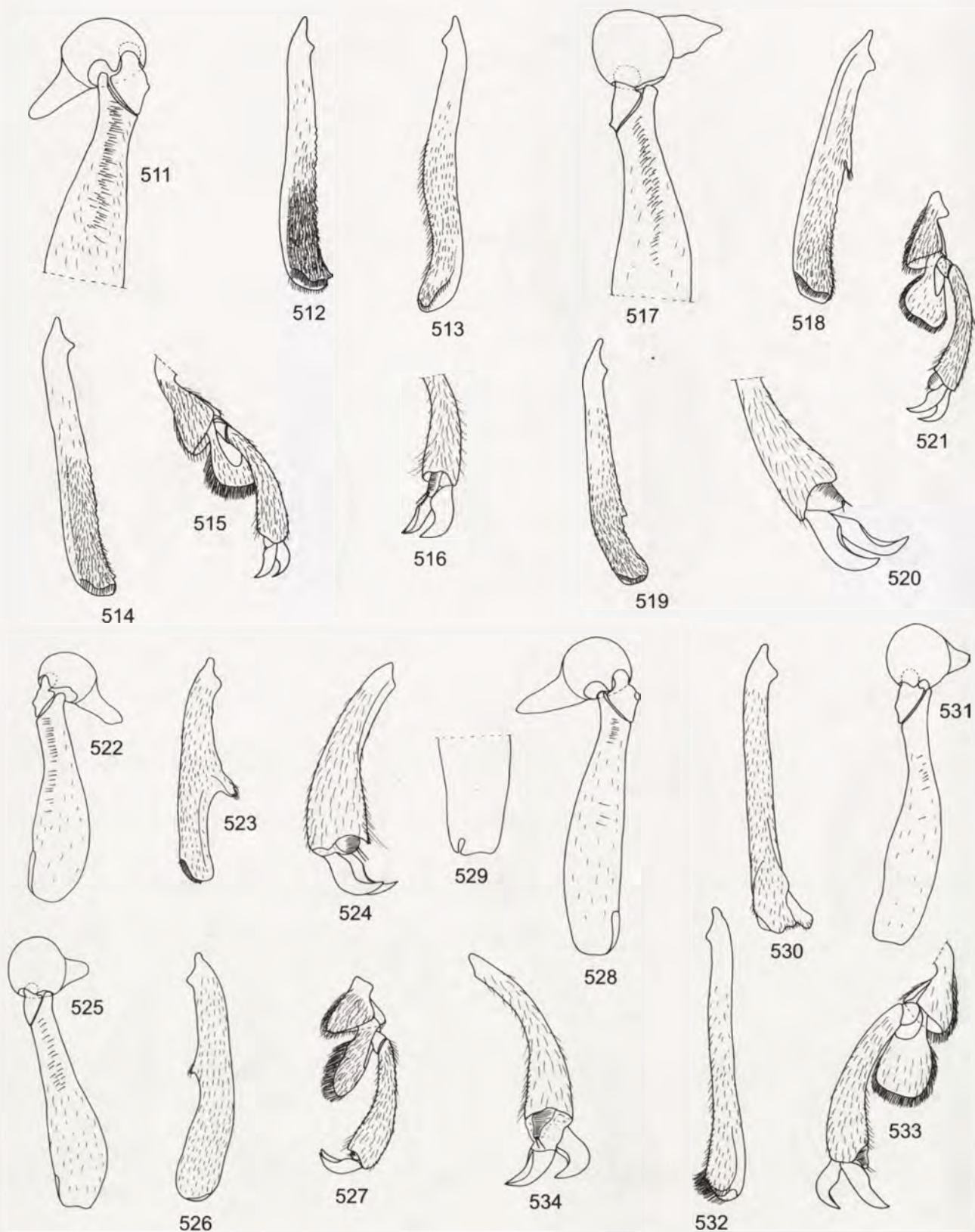
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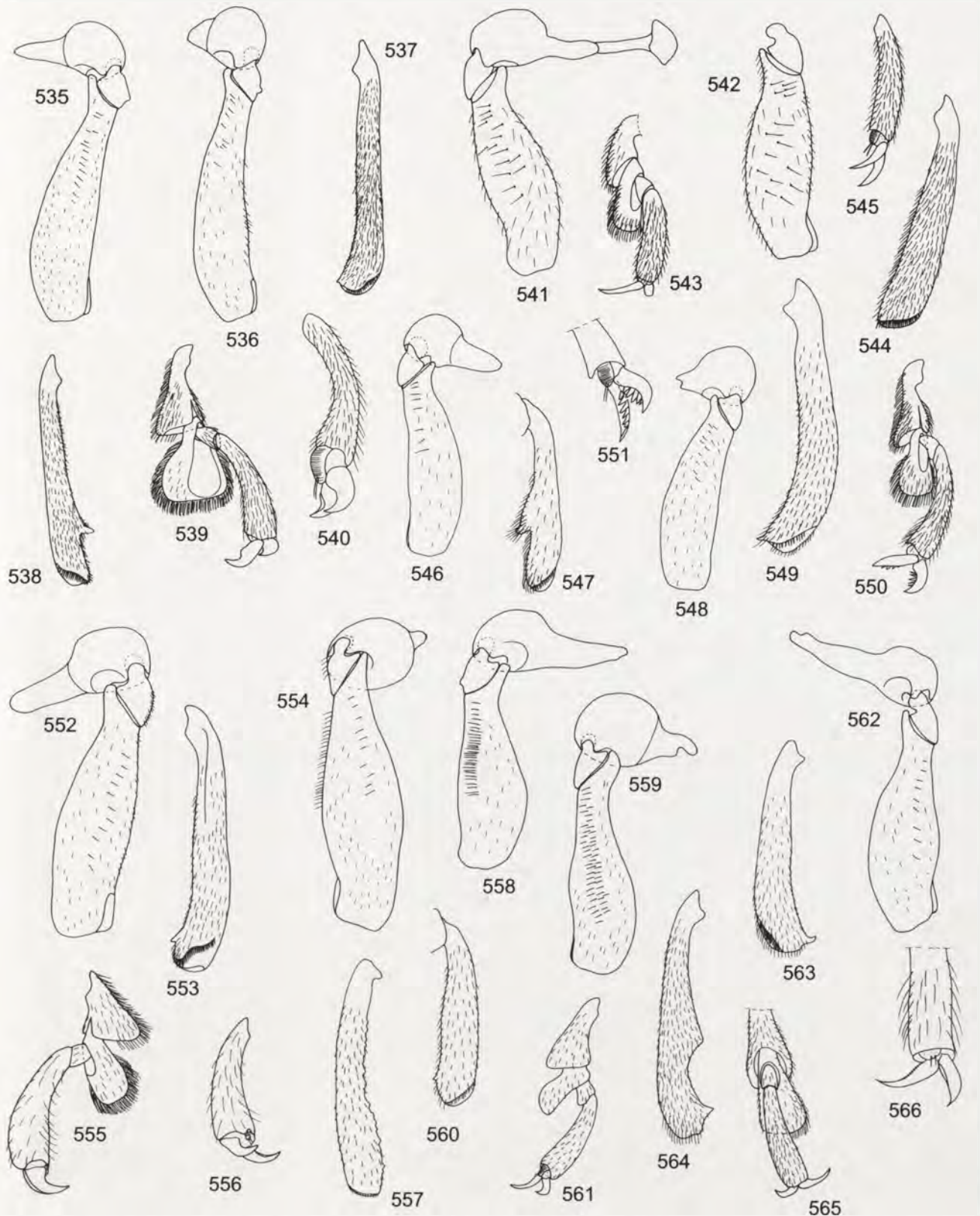
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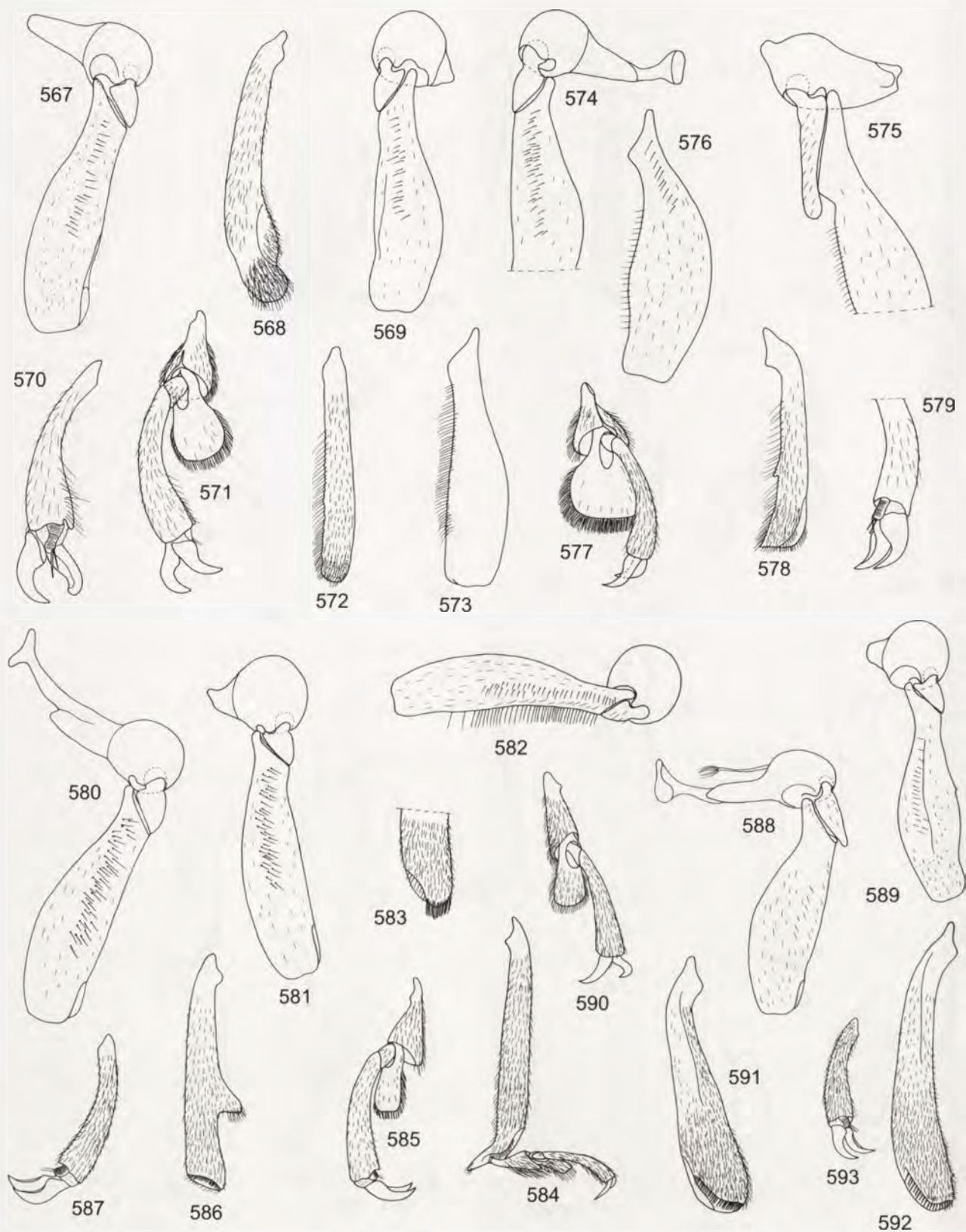
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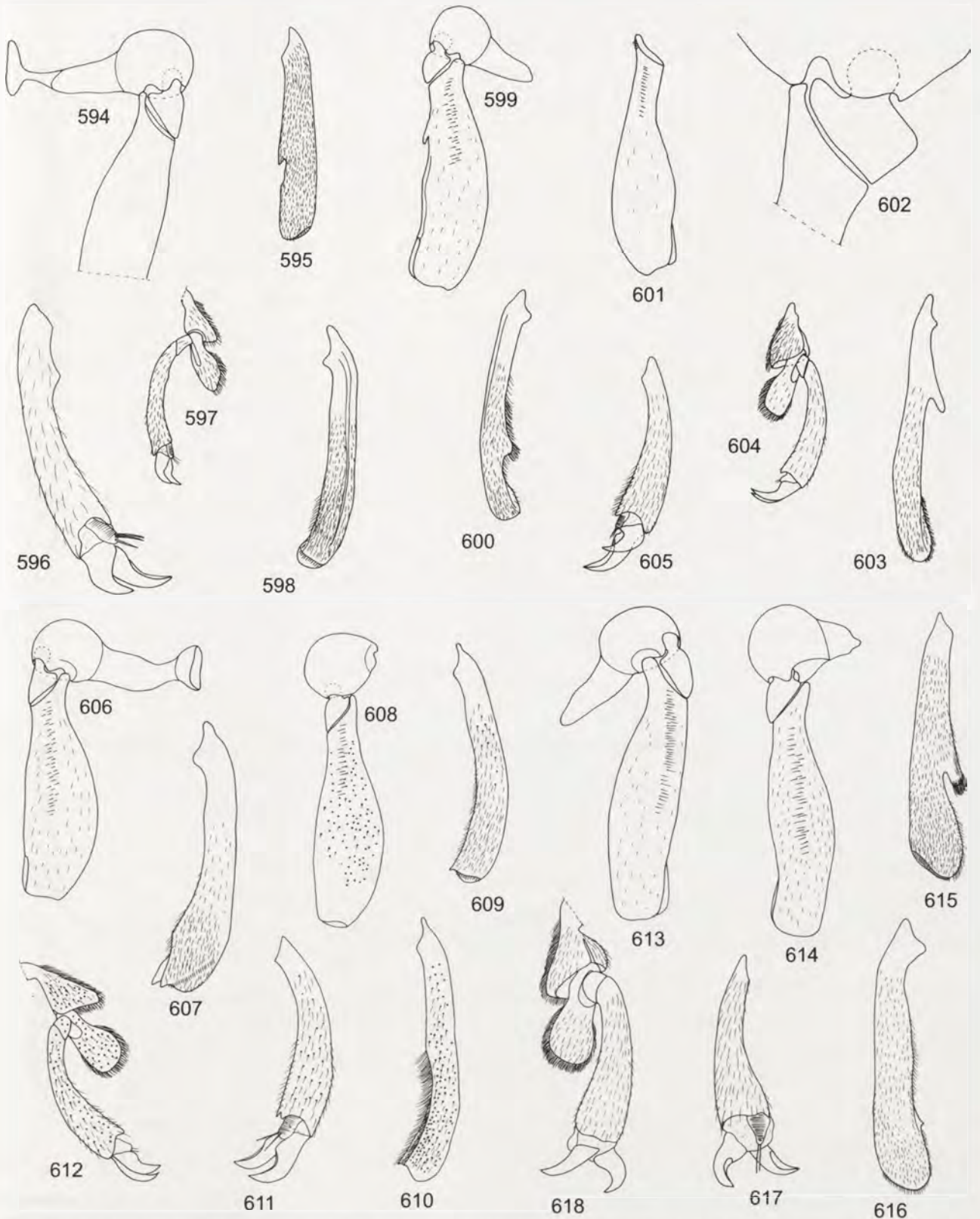
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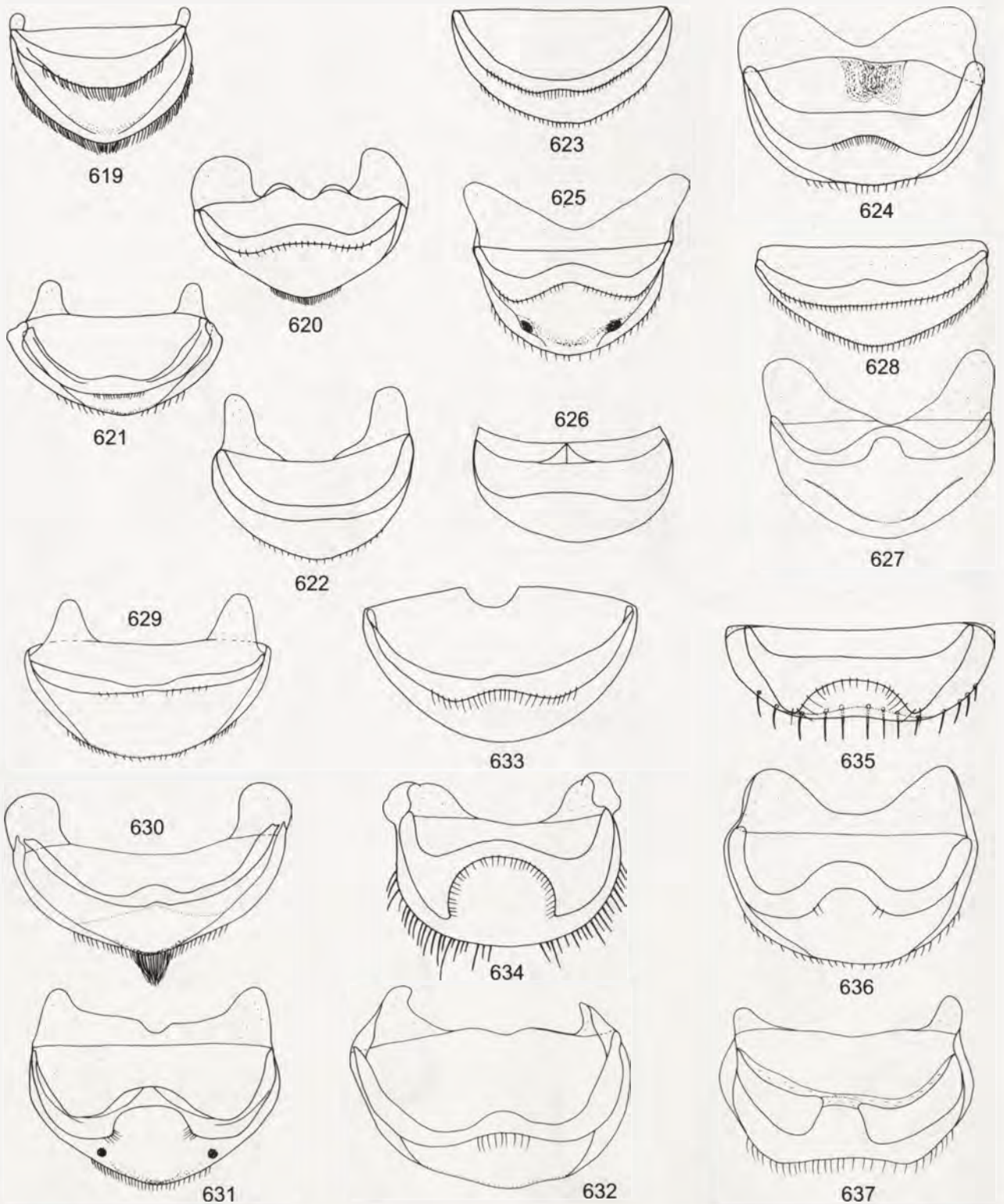
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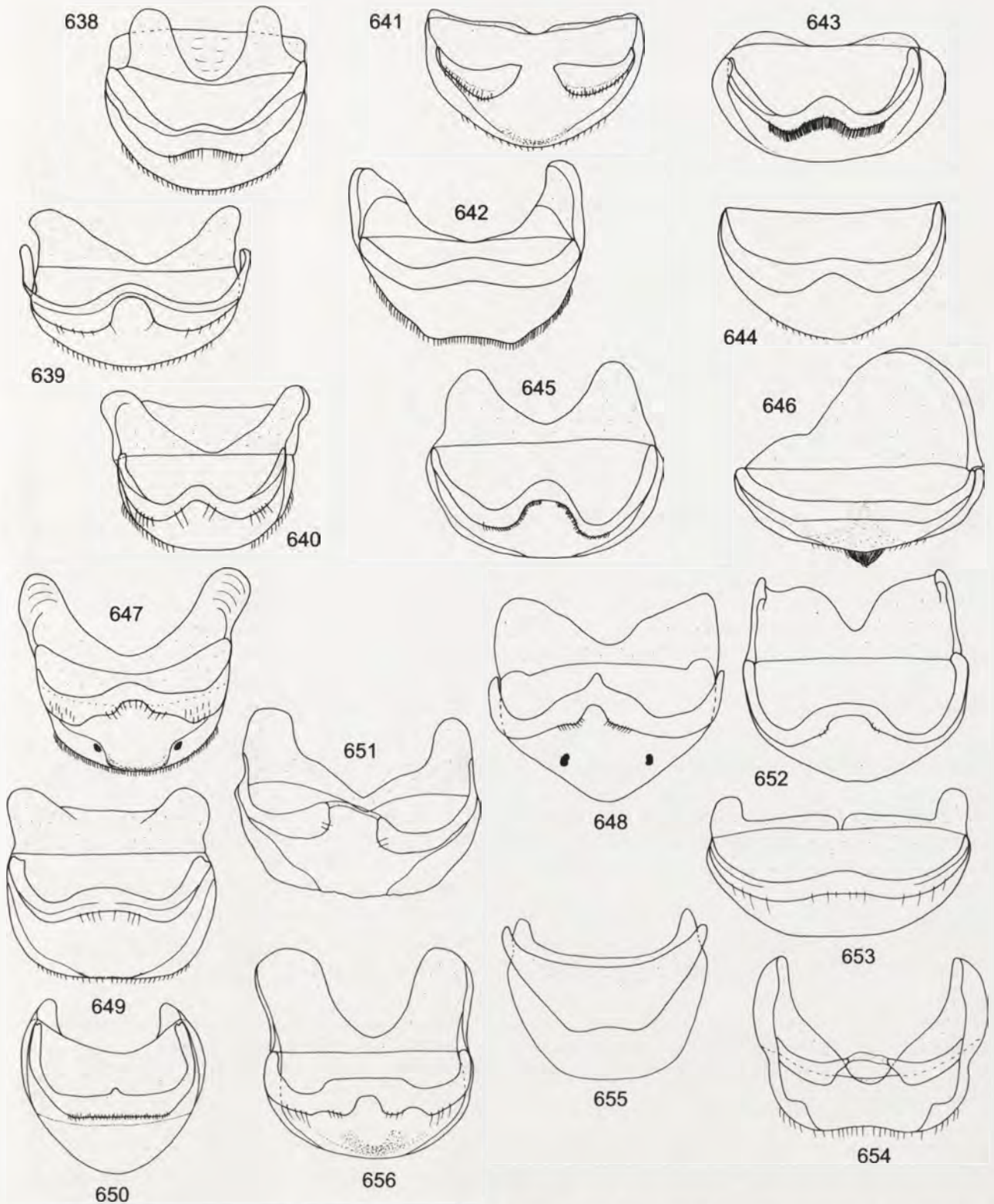
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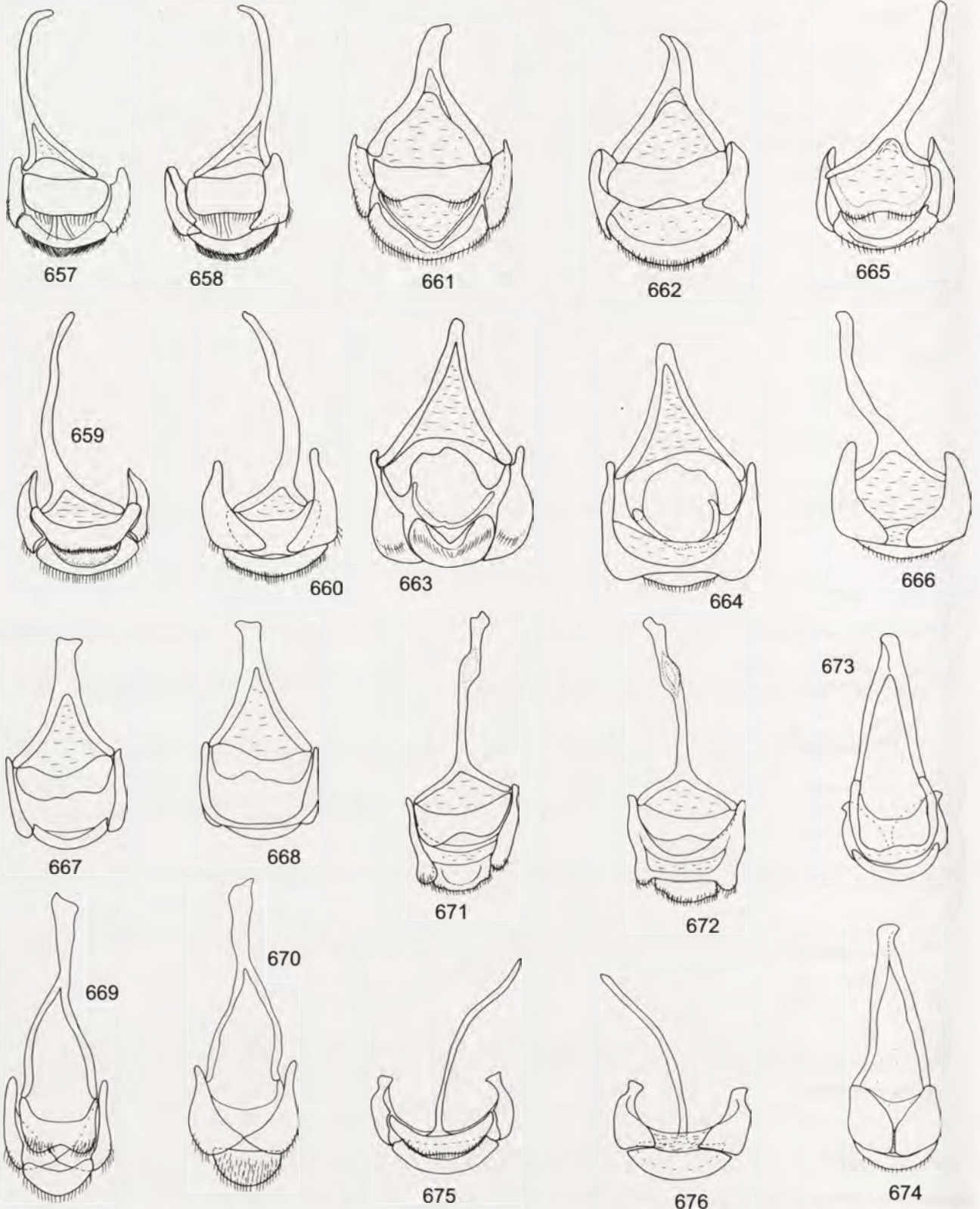
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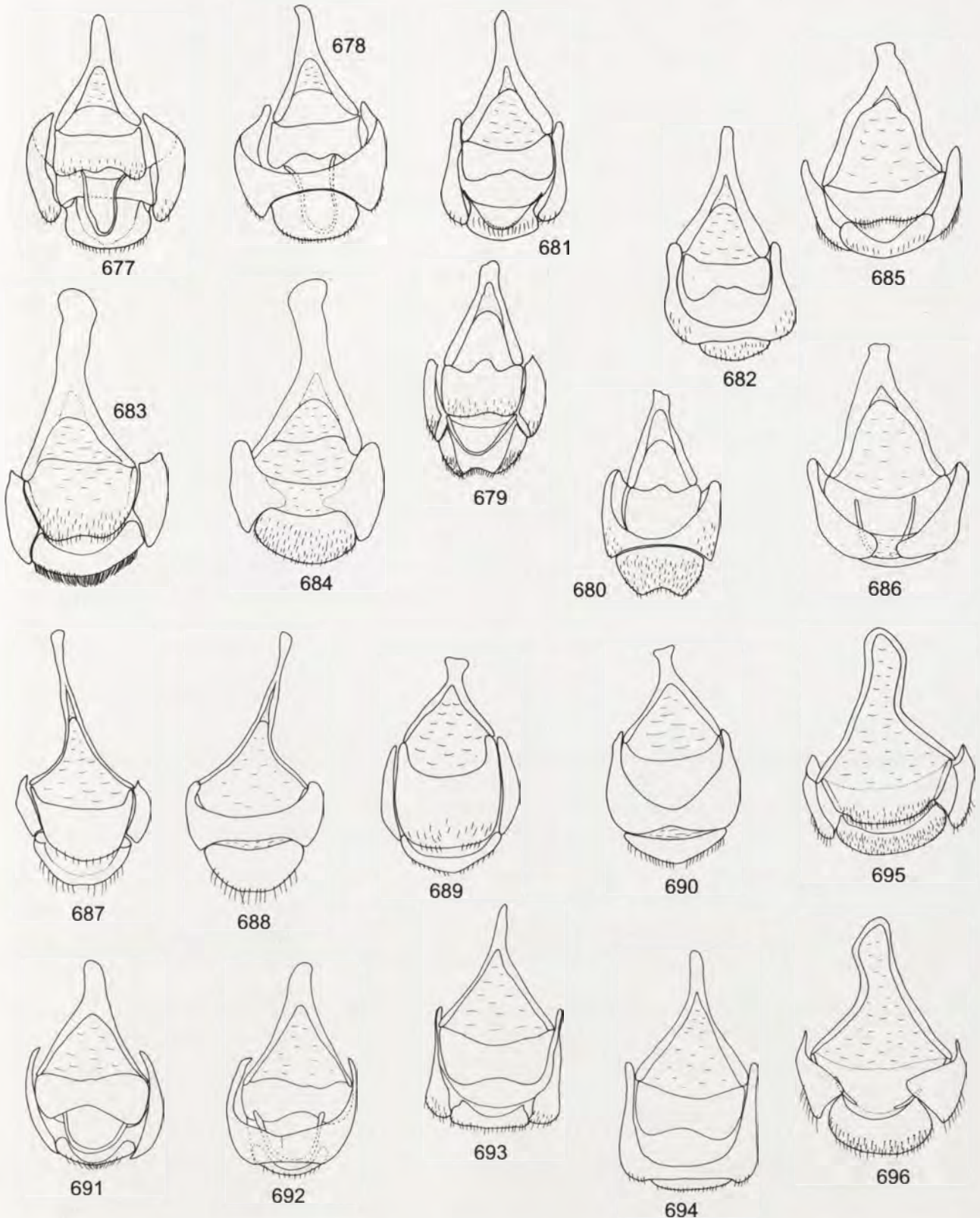
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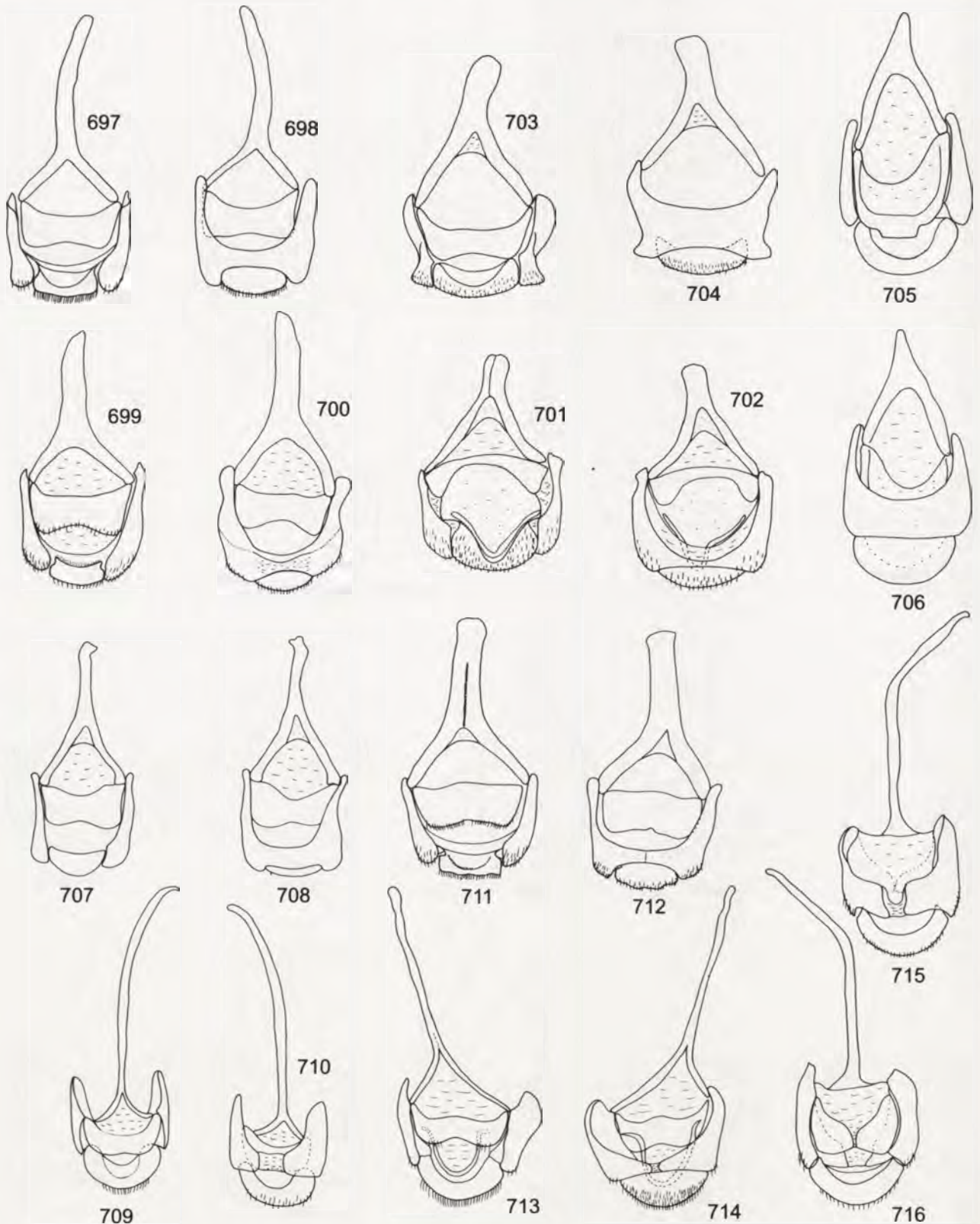
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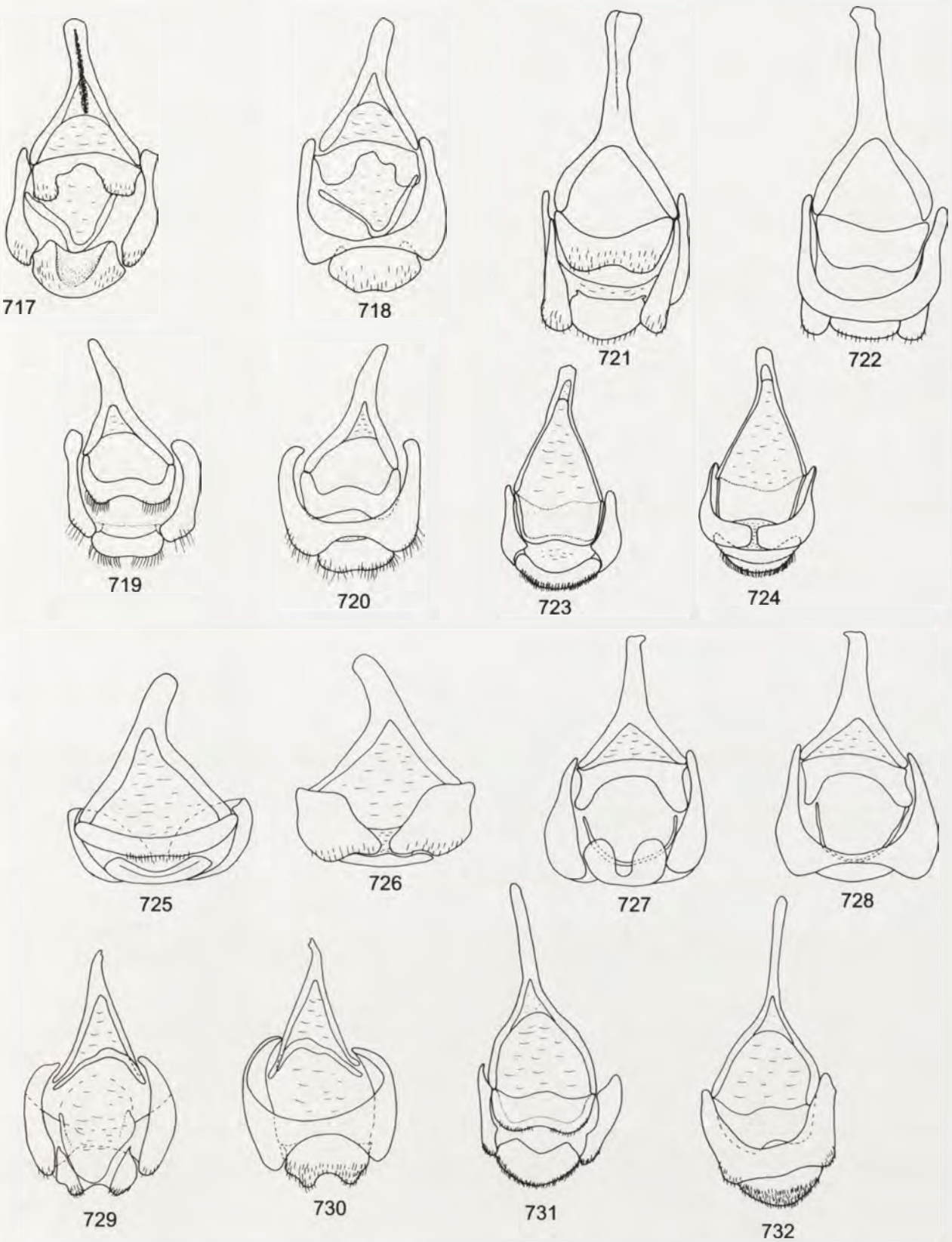
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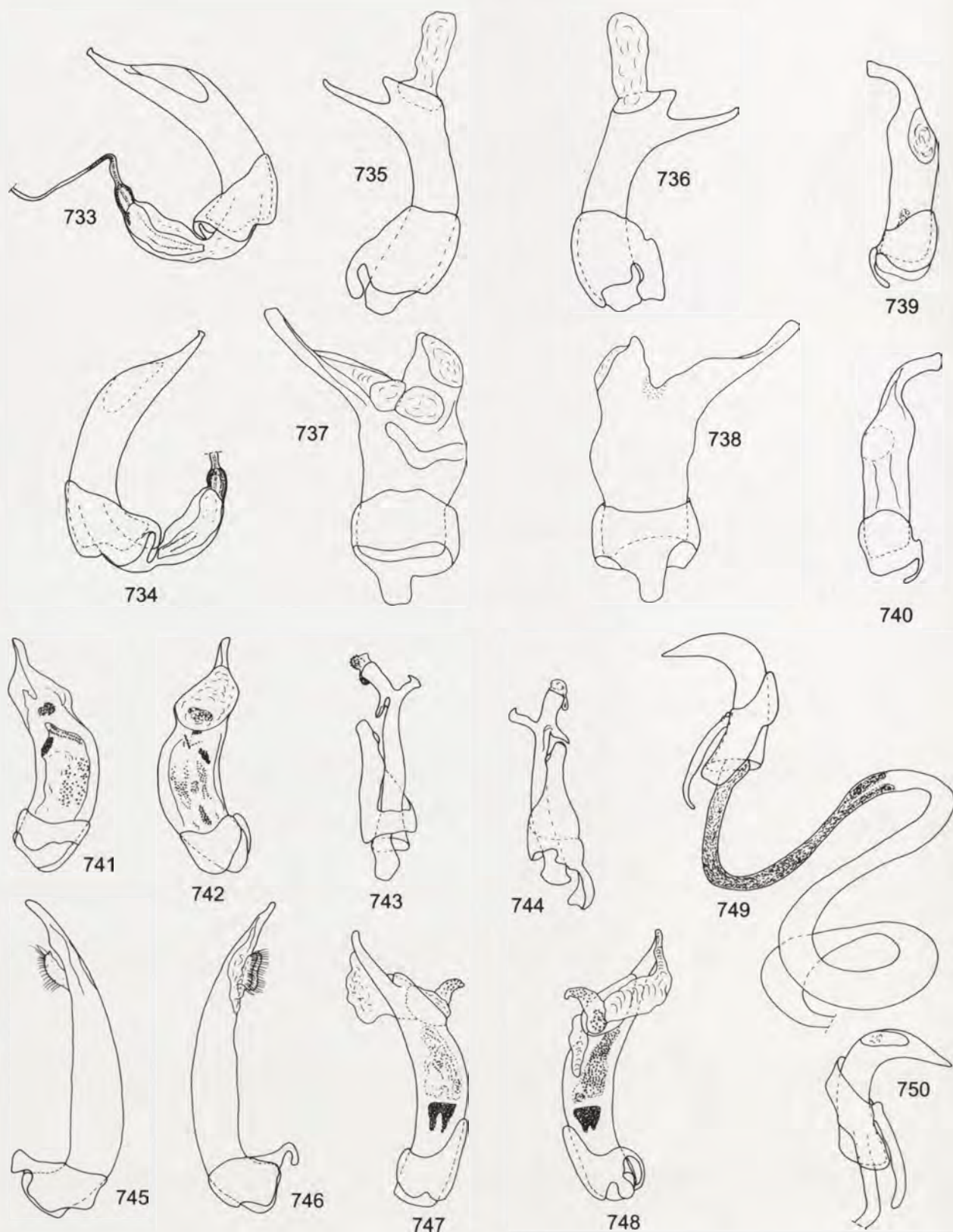
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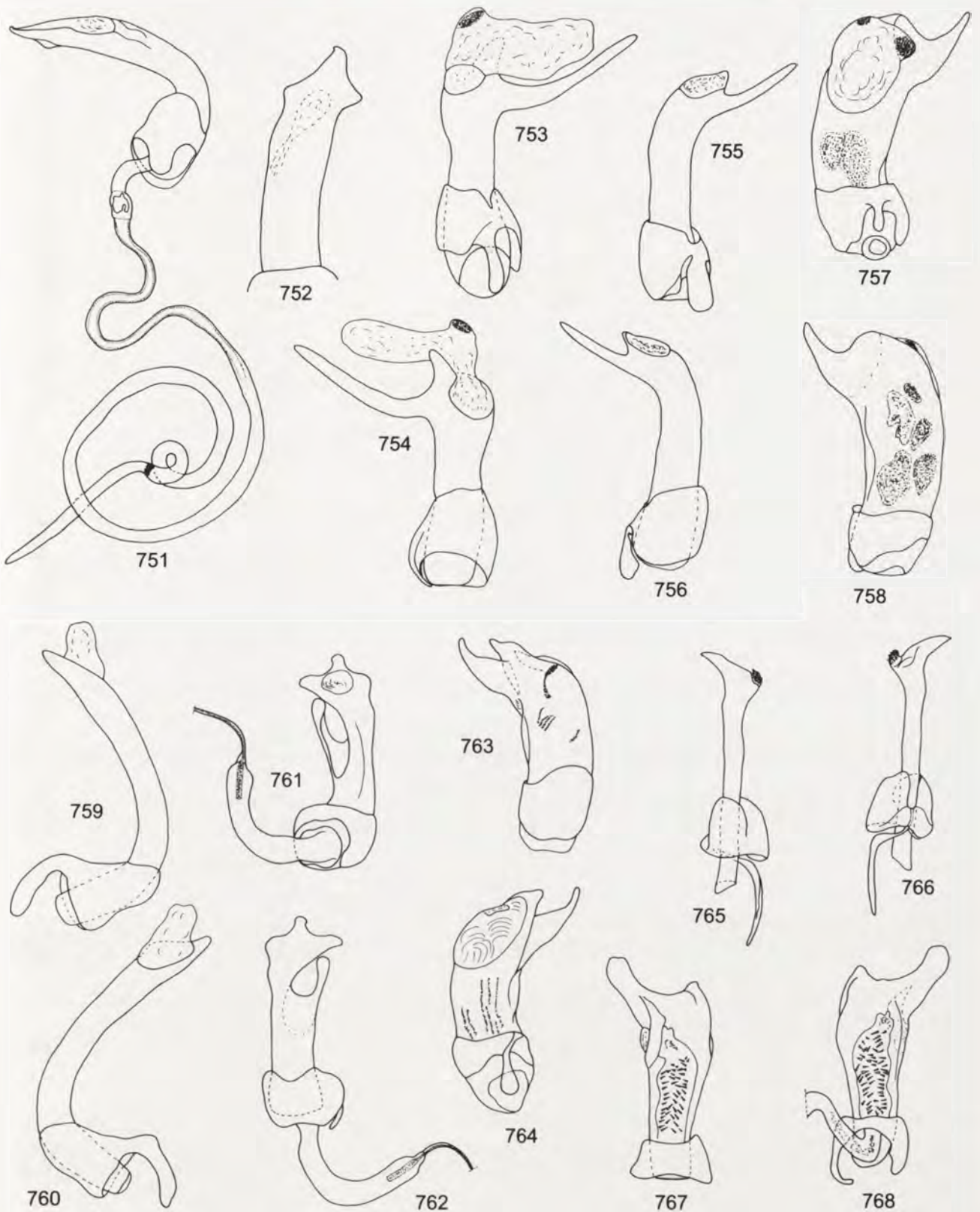
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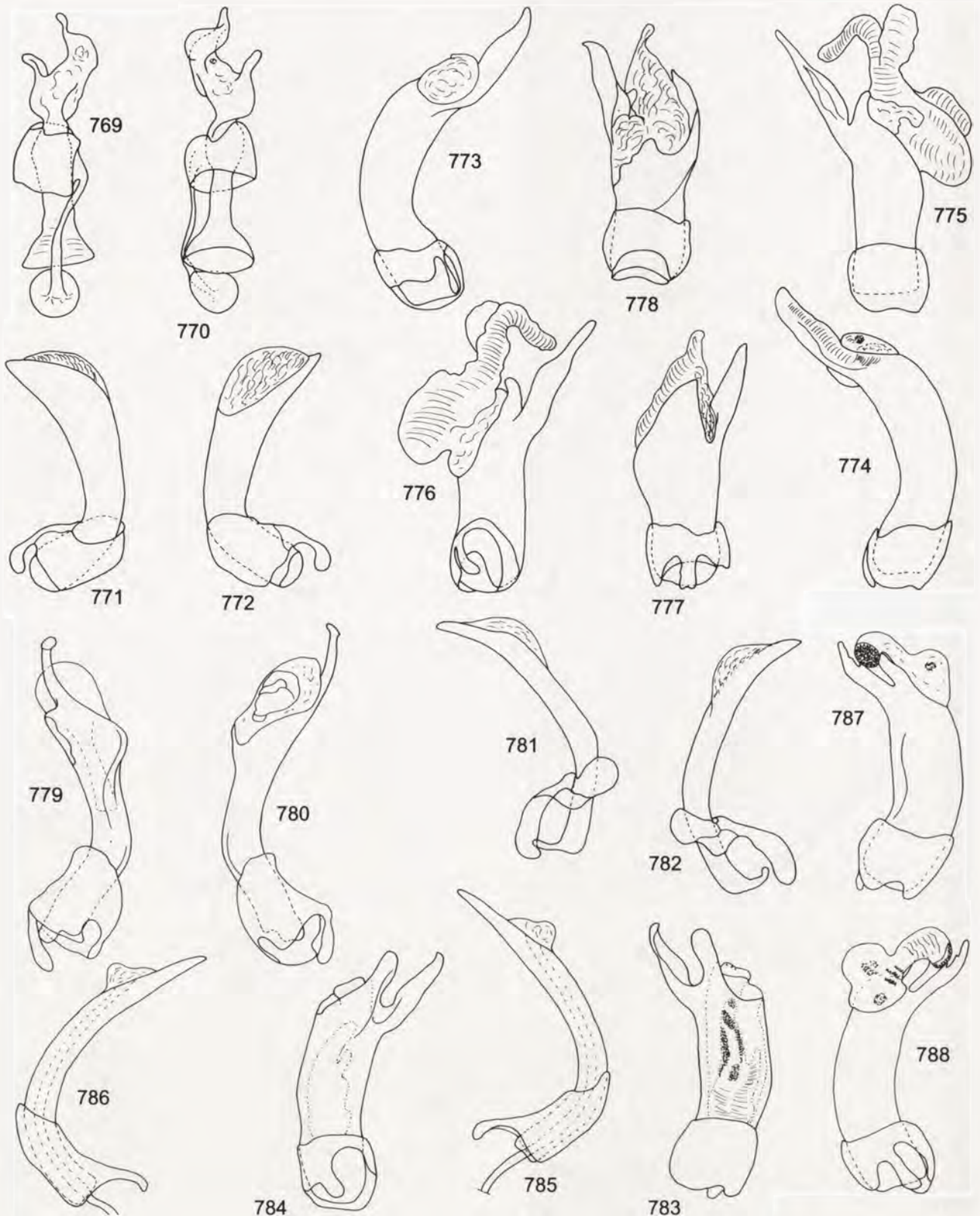
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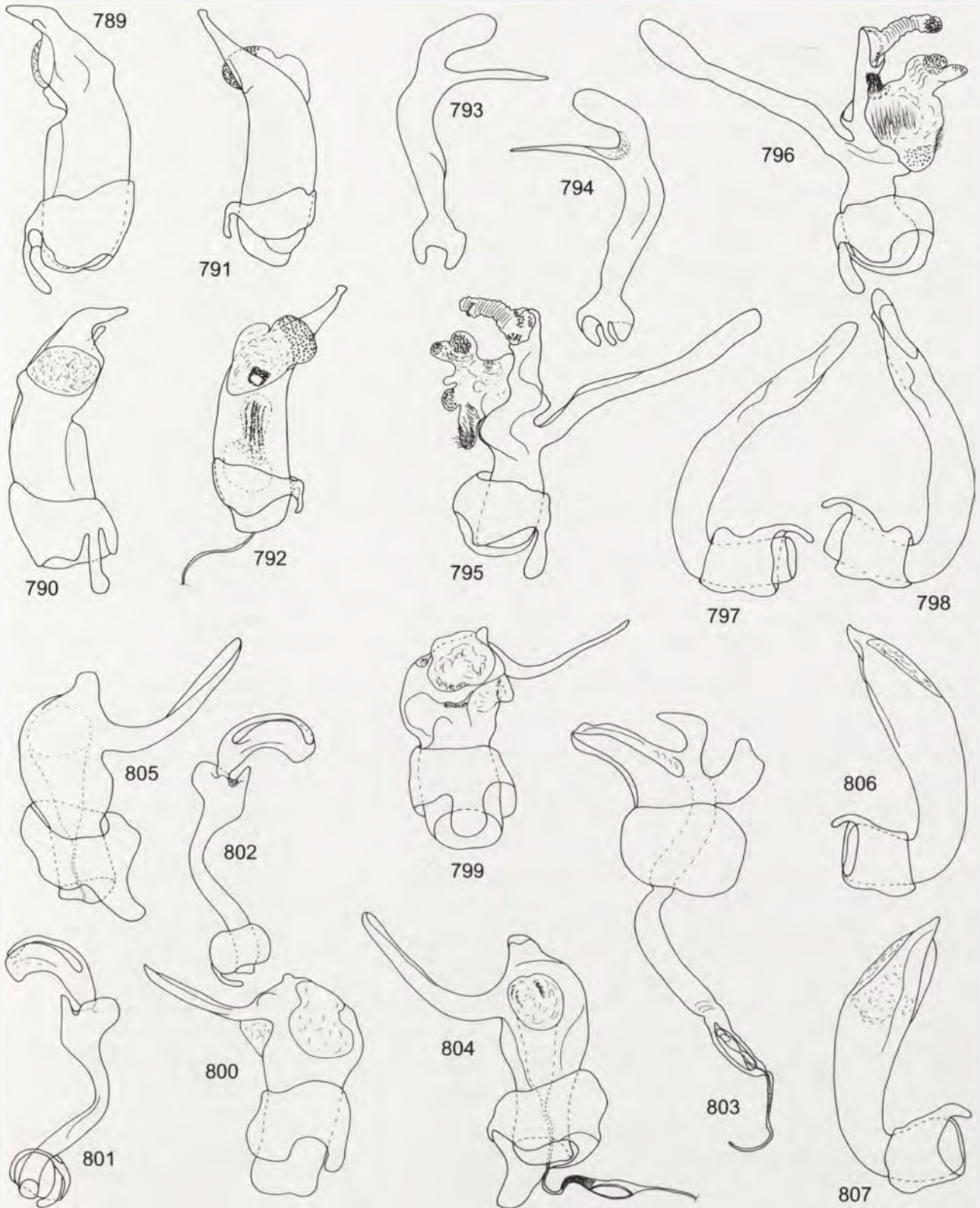
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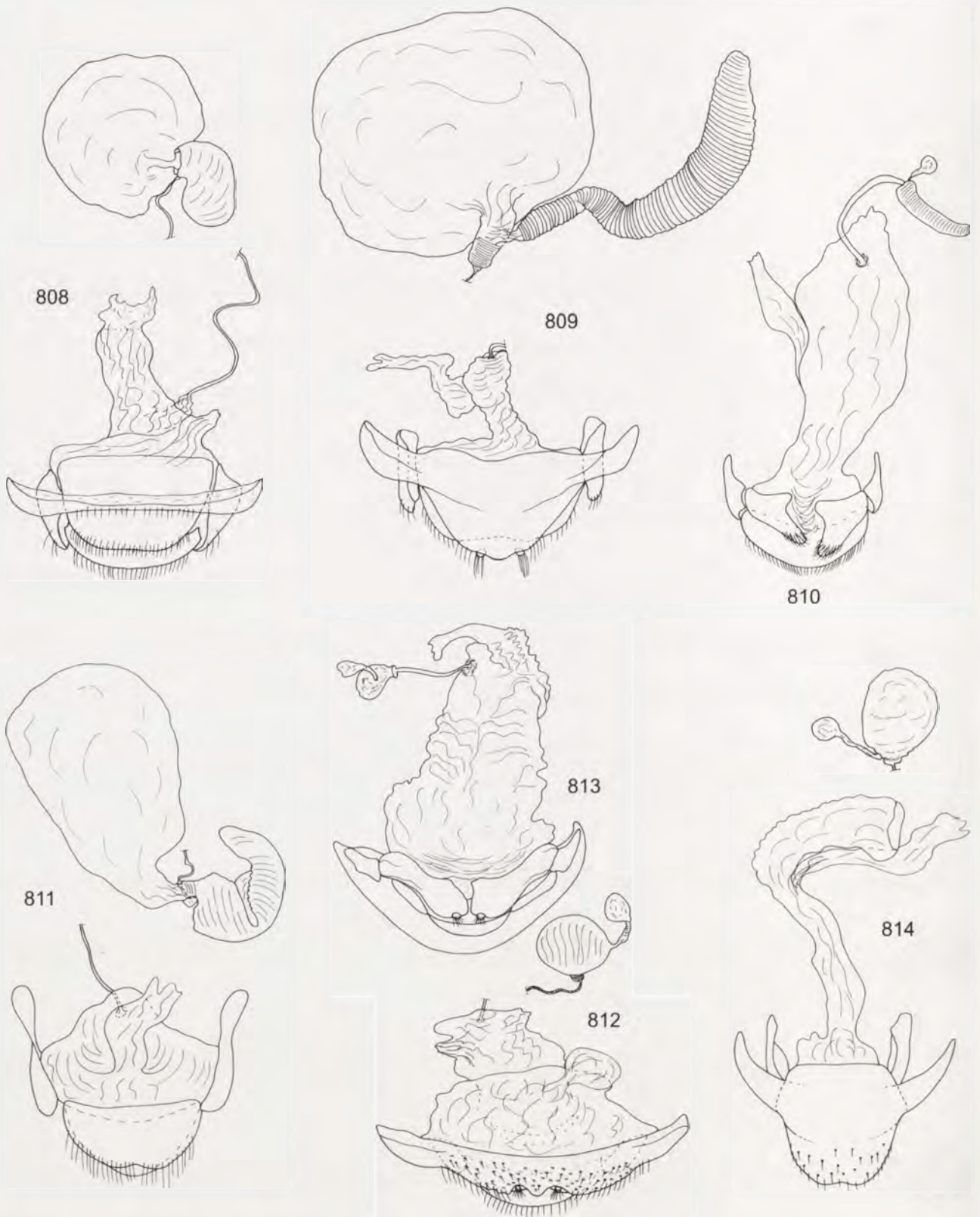
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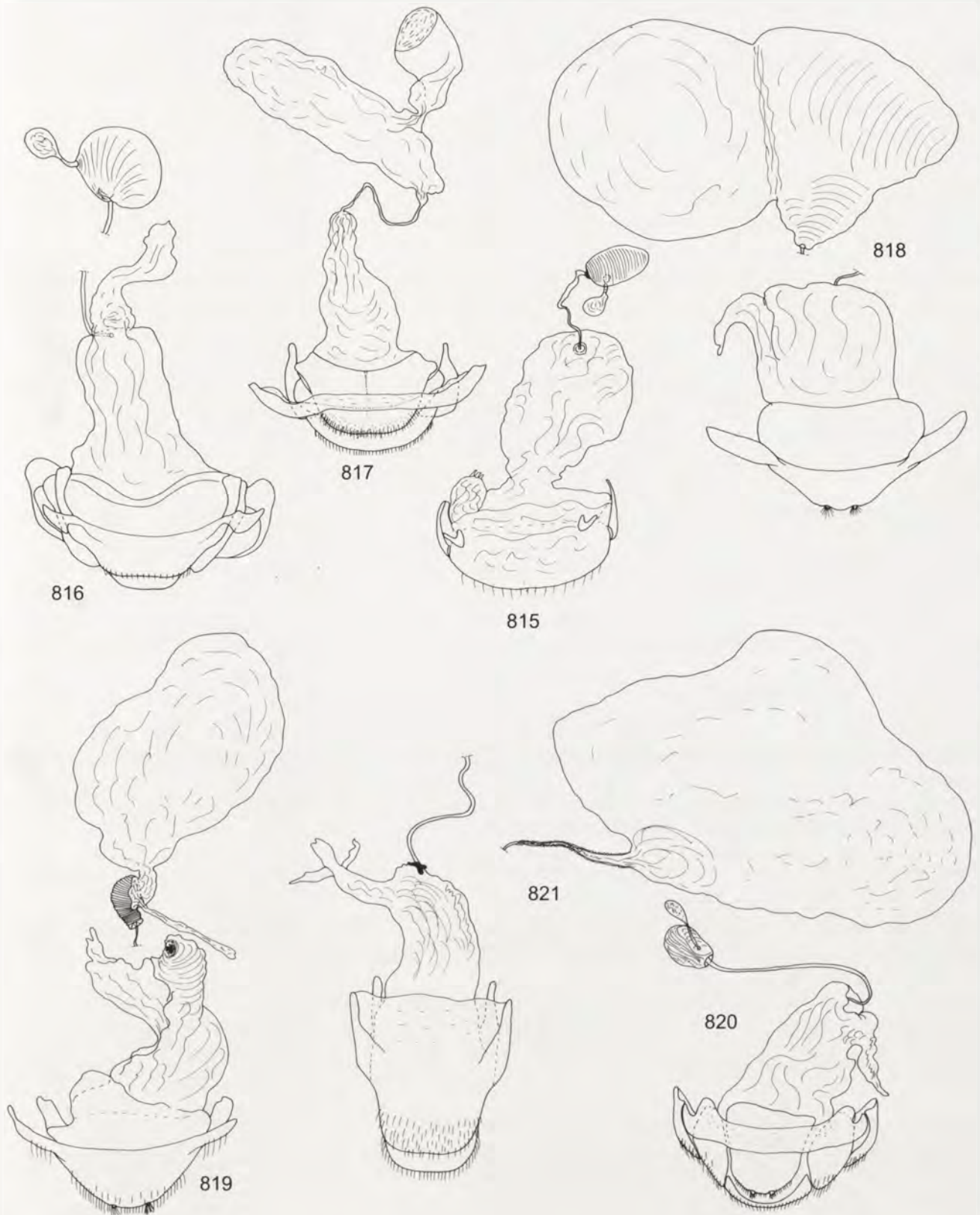
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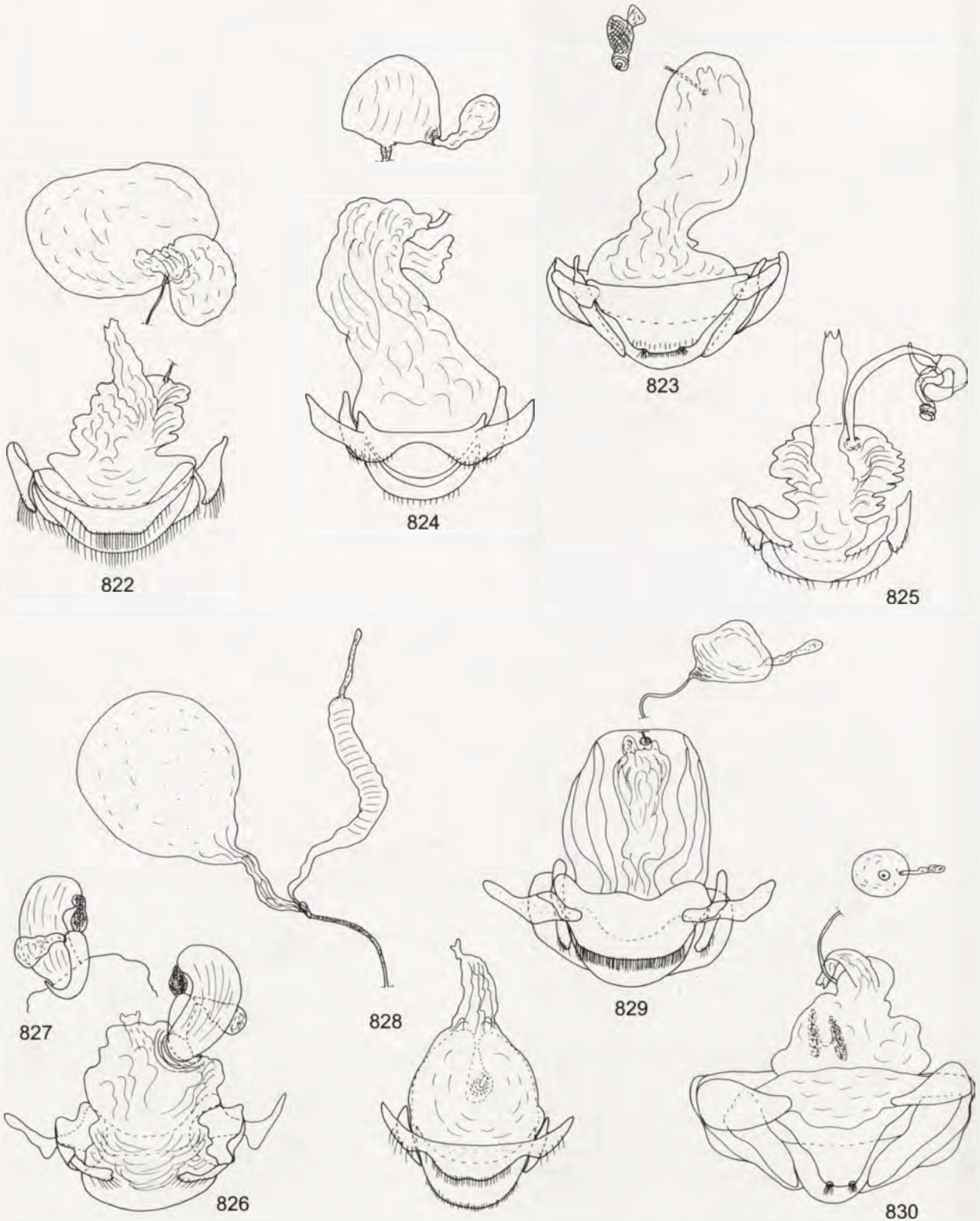
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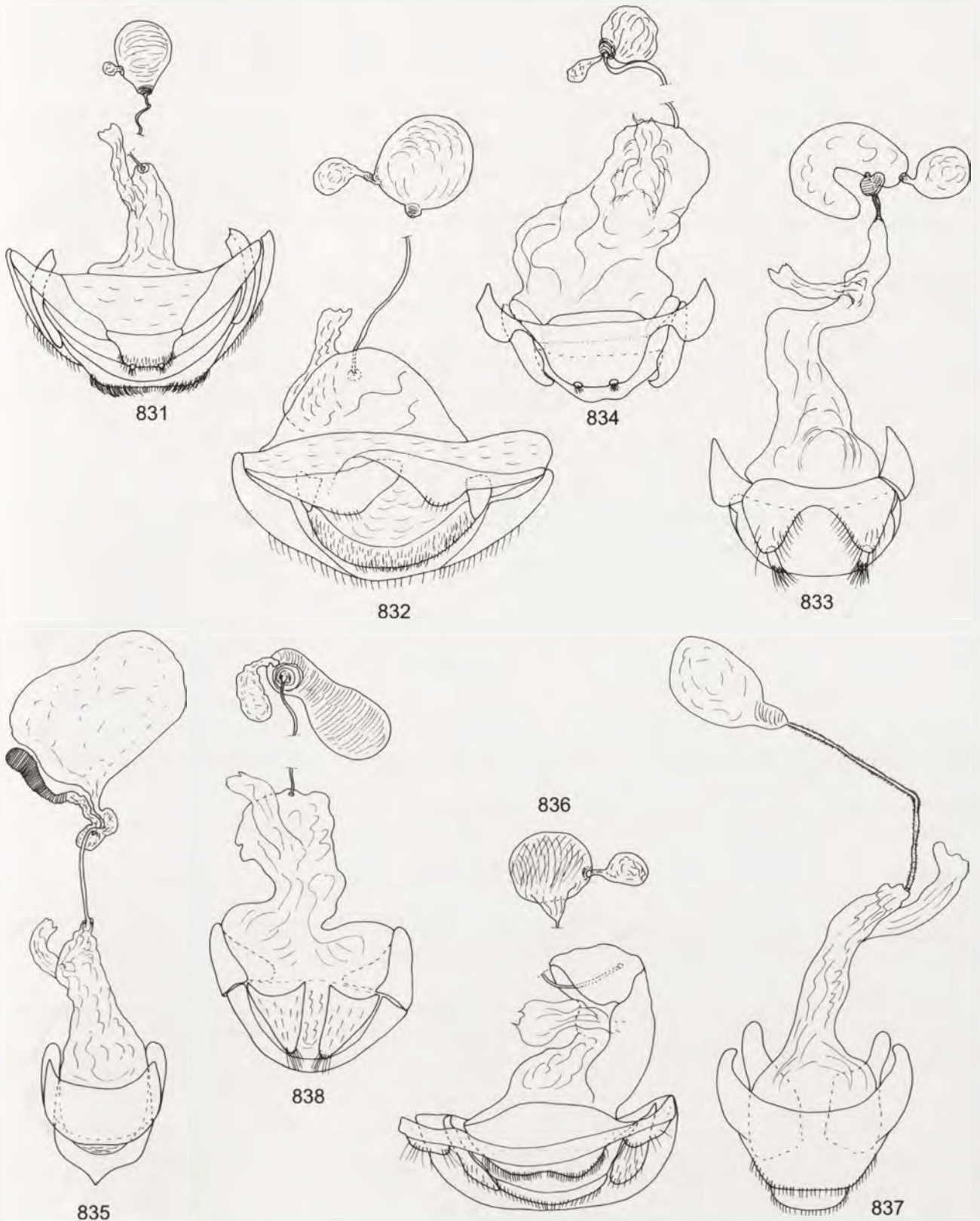
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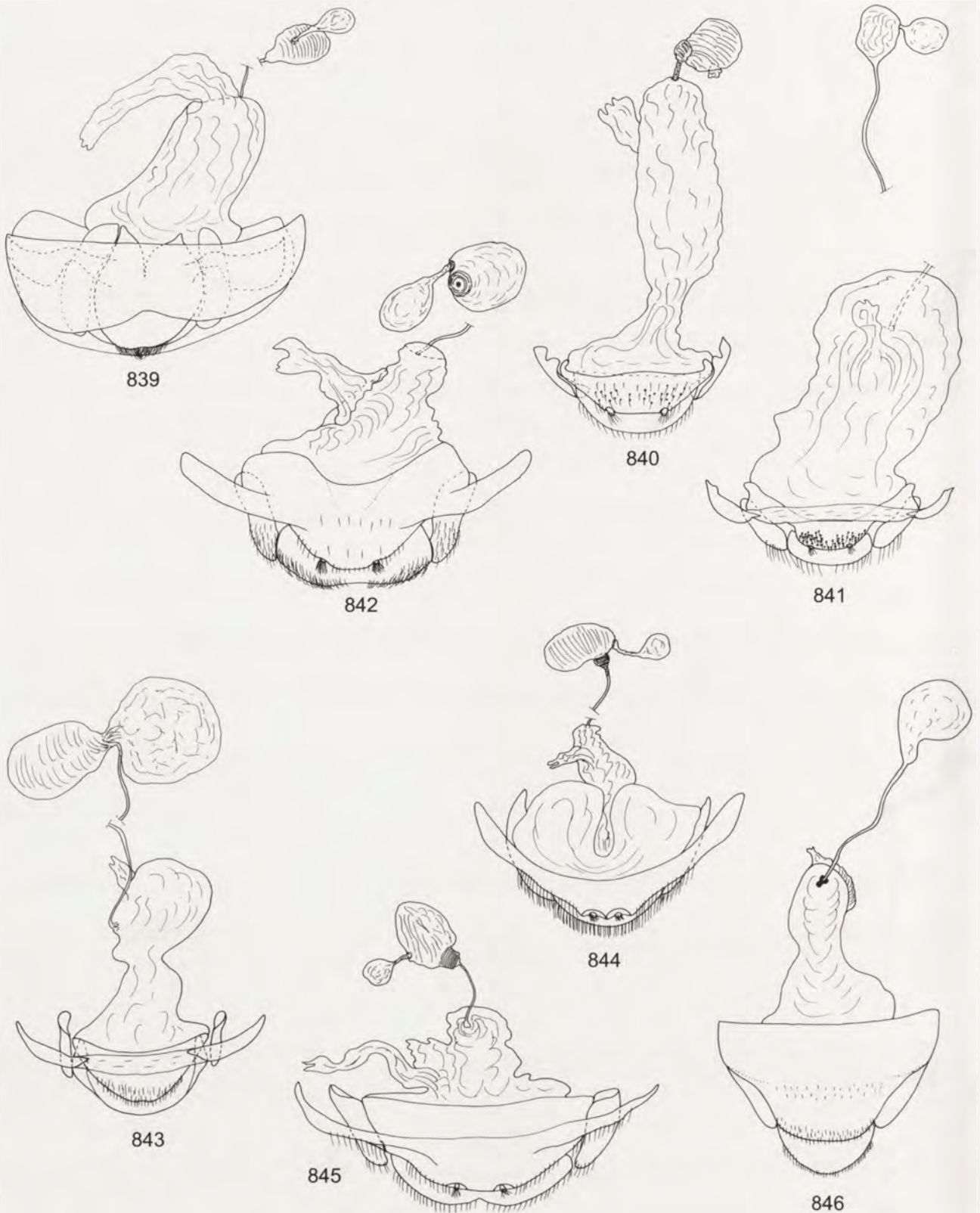
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Figures 822–830. 822–826, 828–830. Female genitalia, ventral. 827. Apex of bursa copulatrix, sperm duct and spermatheca, dorsal. (822) *Cymbachus pulchellus* Gerstaecker; (823) *Cymones atroclavatus* (Fairmaire); (824) *Dapsa denticollis* (Germar); (825) *Daulis cimicoides* Erichson; (826, 827) *Daulotypus picticornis* Lea; (828) *Dryadites borneensis* Fivaldszky; (829) *Encymon violaceus* Gerstaecker; (830) *Eumorphus quadriguttatus* (Illiger).



Figures 831–838. Female genitalia, ventral. (831) *Gerstaeckerus sexguttatus* (Gerstaecker); (832) *Haploscelis atratus* Klug; (833) *Hylaia reissi* Csiki; (834) *Indalmus kirbyanus* (Latreille); (835) *Lycoperdina bovistae* (Fabricius); (836) *Malindus excavatus* Viliers; (837) *Microtrycherus rugicollis* (Strohecker); (838) *Mycetina cruciata* (Schaller).



Figures 839–846. Female genitalia, ventral. (839) *Platindalmus calcaratus* (Arrow); (840) *Pseudindalmus sumatrensis* Tomaszewska; (841) *Parindalmus tonkineus* Achard; (842) *Ohtaius signifer* (Gorham); (843) *Sinocymbachus excisipes* (Strohecker); (844) *Spathomeles anaglyptus* Gerstaecker; (845) *Stictomela chrysomeloides* Gorham; (846) *Trycherus lootensi* Strohecker.



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Figures 847–855. Habitus. (847) *Achnarmychnus carltoni* Tomaszewska et Leschen; (848) *Acinaces lebasii* Gerstaecker; (849) *Amphisternus opacus* Strohecker; (850) *Amphistethus pustulifer* (Gorham); (851) *Amphix marginatus* (Fabricius); (852) *Ancylopus pictus indianus* Strohecker; (853) *Aporista laeta* LeConte; (854) *Archipines elongata* (Pic); (855). *Avencymon ruficephalus* (Ohta).



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Figures 856–864. Habitus. (856) *Beccariola overbecki* (Günther); (857) *Beccariola brevicornis* (Arrow); (858) *Brachytrycherus madurensis* Arrow; (859) *Cacodaemon satanas* (Thomson); (860) *Cacodaemon spinicollis* (Gerstaecker); (861) *Cacodaemon proavus* Strohecker; (862) *Callimodapsa obscura* (Strohecker); (863) *Callimodapsa afra* (Strohecker); (864) *Chetryrus diversifasciatus* (Pic).



Figures 865–873. Habitus. (865) *Cymbachus pulchellus* Gerstaecker; (866) *Cymones atroclavatus* (Fairmaire); (867) *Dapsa celata* Arrow; (868) *Dapsa denticollis* (Germar); (869) *Daulis cimicoides* Erichson; (870) *Daulotypus picticornis* Lea; (871) *Dryadites borneensis* Frivaldszky; (872) *Encymon violaceus* Gerstaecker; (873) *Encymon immaculatus* (Montruzier).



Figures 874–882. Habitus. (874) *Eumorphus quadriguttatus* (Illiger); (875) *Eumorphus cryptus* Strohecker; (876) *Eumorphus oculatus* Gerstaecker; (877) *Eumorphus marginatus* Fabricius; (878) *Gerstaeckerus klugi* (Gerstaecker); (879) *Haploscelis atratus* Klug; (880) *Hylaia reissi* Csiki; (881) *Indalmus kirbyanus* (Latreille); (882) *Indalmus lineella* (Chapuis).



Figures 883–891. Habitus. (883) *Lycoperdina bovistae* (Fabricius); (884) *Lycoperdina mandarinae* Gerstaecker; (885) *Malindus excavatus* Viliers; (886) *Microtrycherus* sp.; (887) *Mycetina cruciata* (Schaller); (888) *Mycetina turneri* Arrow; (889) *Mycetina marginalis* (Gebler); (890) *Ohtaius signifer* (Gorham); (891) *Parindalmus tonkineus* Achard.



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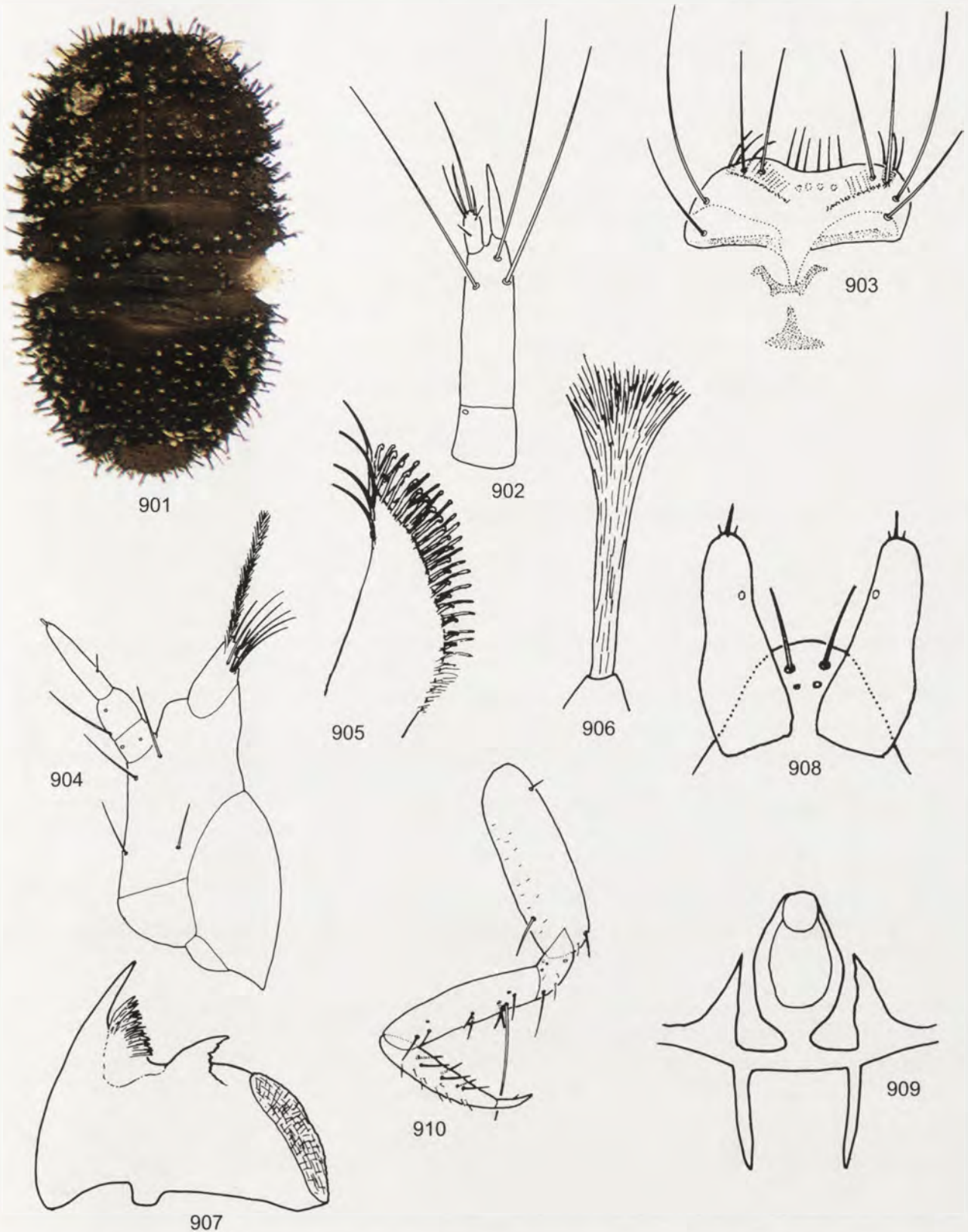


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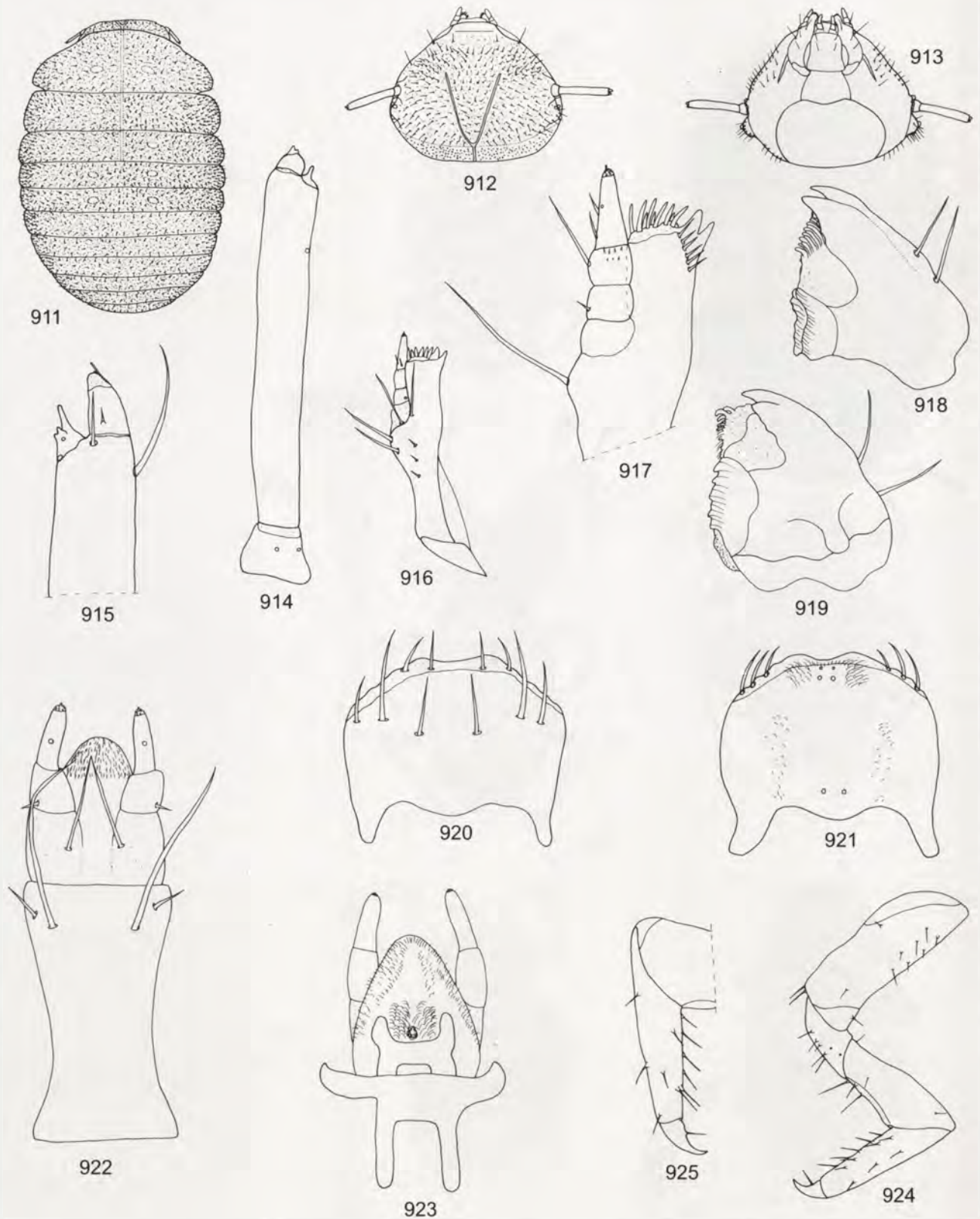


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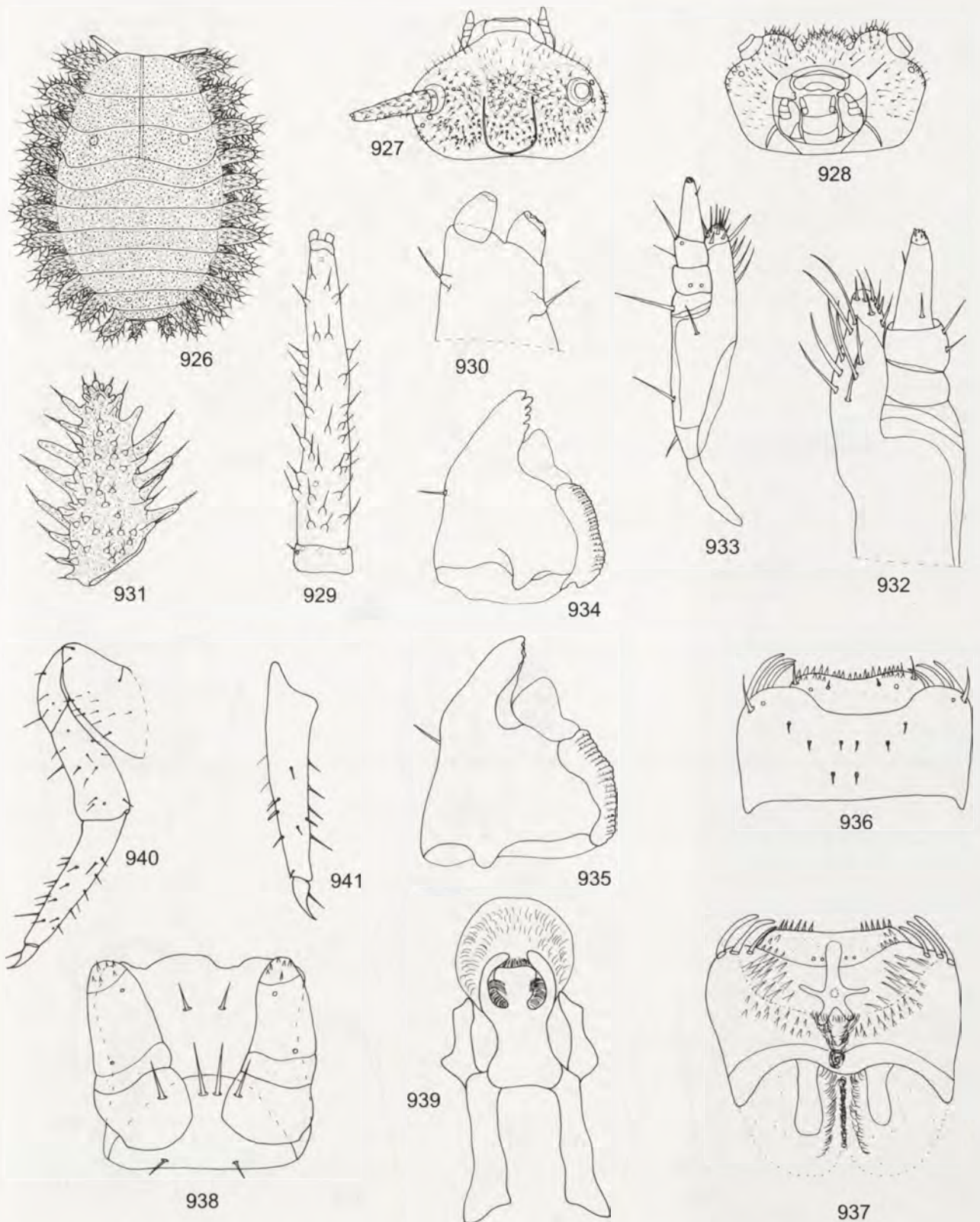
Figures 892–900. Habitus. (892) *Platindalmus calcaratus* (Arrow); (893) *Pseudindalmus tonkinensis* Arrow; (894) *Sinocymbachus politus* (Mader); (895) *Sinocymbachus quadrimaculatus* (Pic); (896) *Spathomeles anagyptus* Gerstaecker; (897) *Spathomeles retiarius* Strohecker; (898) *Stictomela chrysomeloides* Gorham; (899) *Trycherus bifasciatus* Gerstaecker; (900) *Trycherus longanimis* (Thomson).



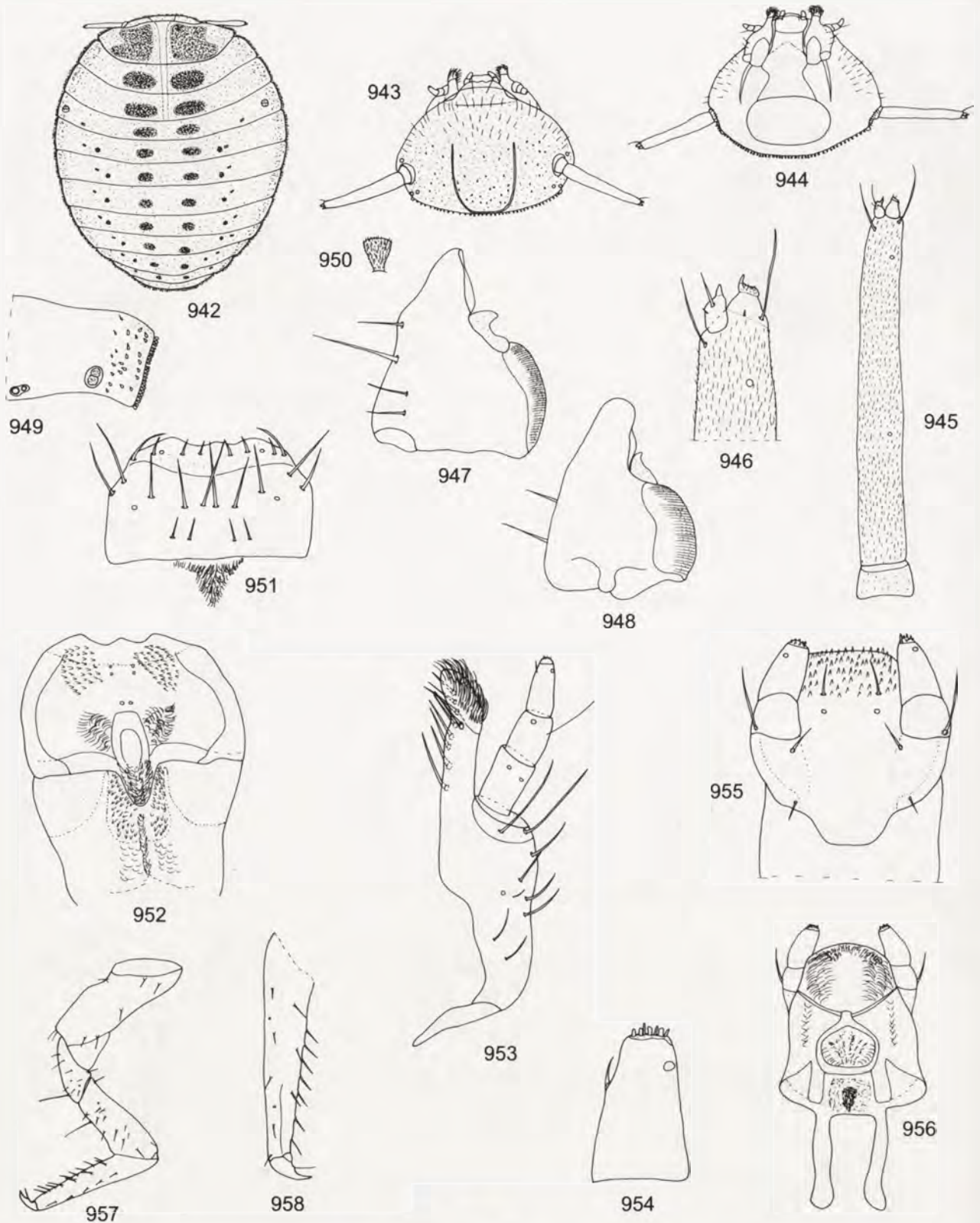
Figures 901–910. *Achuarmyichus carltoni* Tomaszewska et Leschen, mature larva and larval structures. (901) habitus, dorsal; (902) antenna, left, dorsal; (903) labrum-epipharynx, dorsal; (904) maxilla, ventral; (905) maxillary mala, lateral view; (906) frayed seta; (907) mandible, dorsal; (908) labium, ventral; (909) hypopharyngeal sclerome, dorsal; (910) middle leg, lateral.



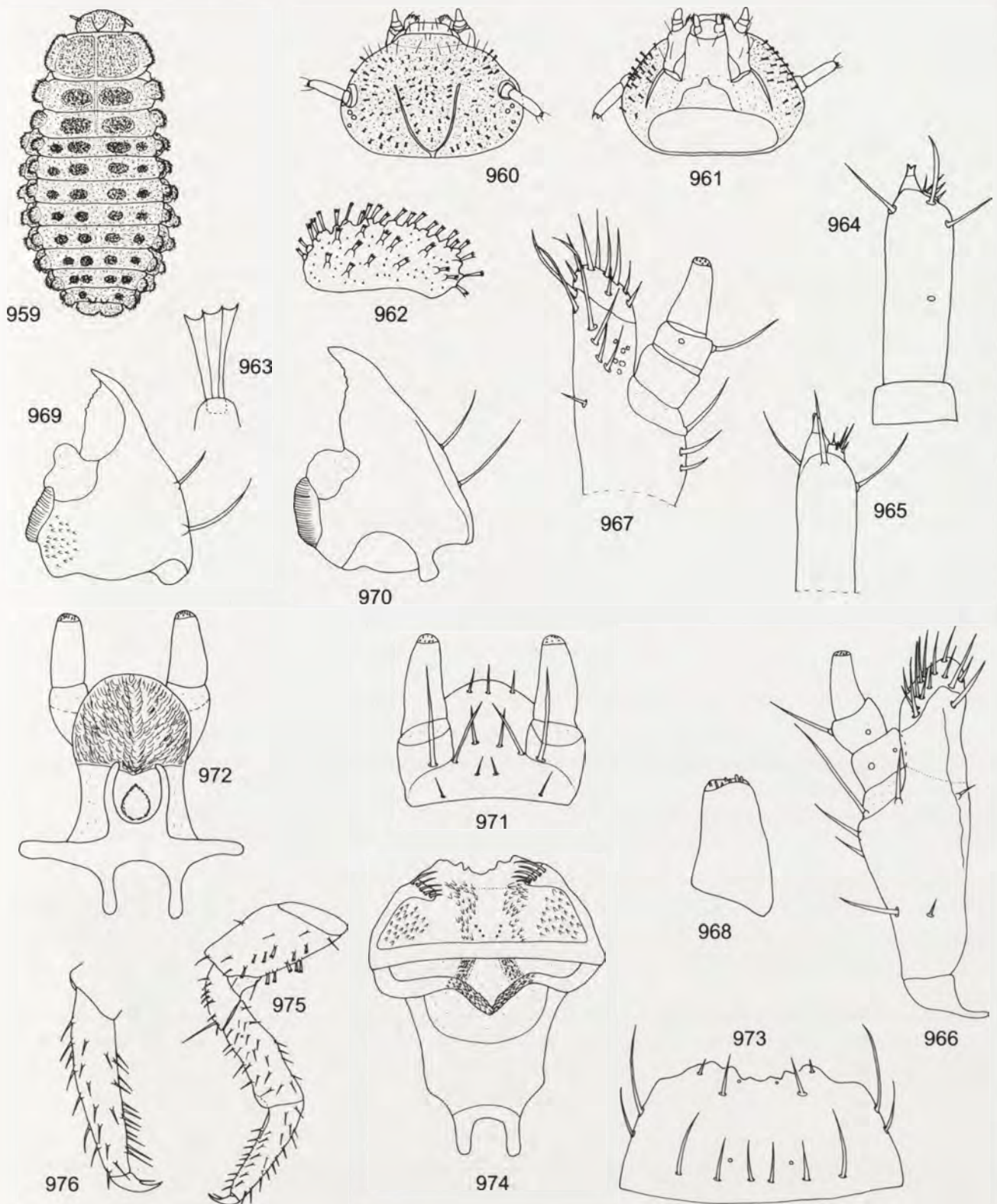
Figures 911–925. *Acinaces* sp., mature larva and larval structures. (911) habitus, dorsal; (912) head, dorsal; (913) head, ventral; (914) antenna, dorsal; (915) apical part of antenna, ventral; (916) maxilla, right, ventral; (917) apex of maxilla, left, dorsal; (918) mandible, ventral; (919) mandible, dorsal; (920) labrum, dorsal; (921) labrum-epipharynx; (922) labium, ventral; (923) labium-hypopharynx; (924) fore leg, left, ventral; (925) tibiotarsus and claw, dorsal view.



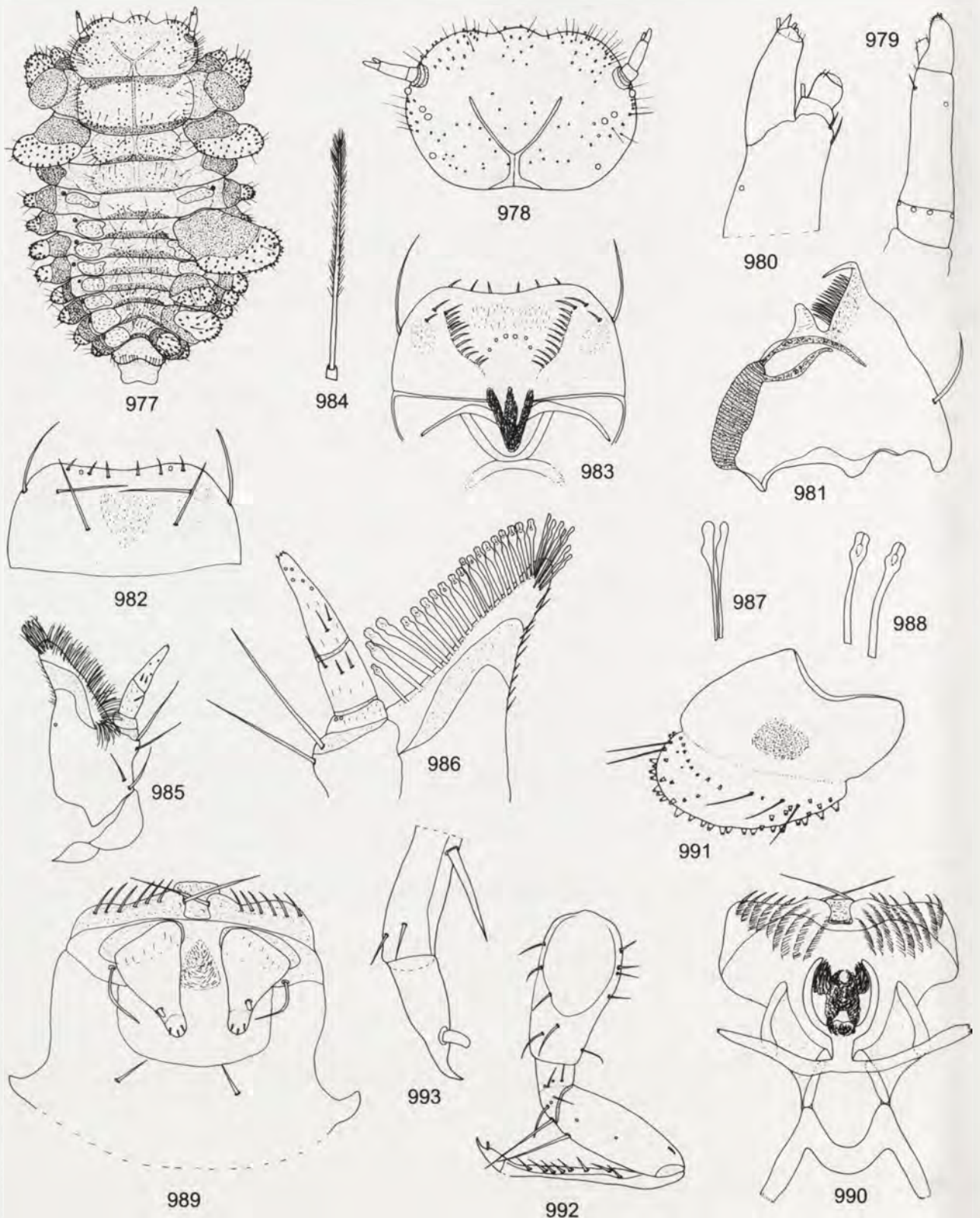
Figures 926–941. *Amphisternus verrucosus* Gorham, mature larva and larval structures. (926) habitus, dorsal; (927) head, dorsal; (928) head, anterior; (929) antenna, dorsal; (930) apical part of antenna, dorsal; (931) body process; (932) apex of maxilla, dorsal; (933) maxilla, ventral; (934) mandible, dorsal; (935) mandible, ventral; (936) labrum, dorsal; (937) labrum-epipharynx; (938) labium, ventral; (939) labium-hypopharynx; (940) fore leg, left, ventral; (941) tibiotarsus and claw, dorsal.



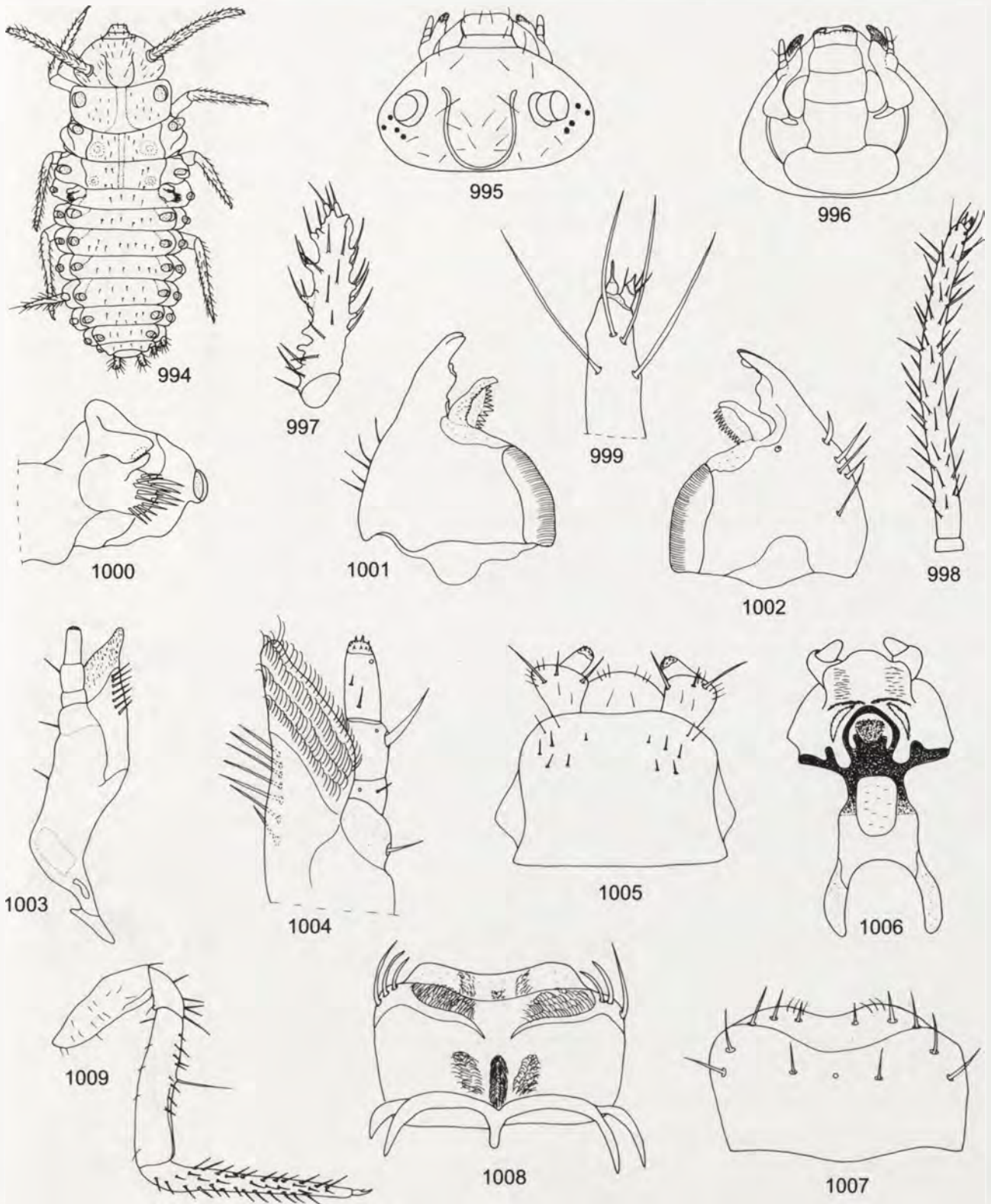
Figures 942–958. *Amphix vestitus cinctus* (Fabricius), mature larva and larval structures. (942) habitus, dorsal; (943) head, dorsal; (944) head, ventral; (945) antenna, ventral; (946) apical part of antenna, ventral; (947) mandible, ventral; (948) mandible, dorsal; (949) tergite of abdominal segment 1, right side; (950) body seta; (951) labrum, dorsal; (952) labrum-epipharynx; (953) maxilla, ventral; (954) terminal maxillary palpomere; (955) labium, ventral; (956) labium-hypopharynx; (957) fore leg, left, ventral; (958) tibiotarsus and claw, dorsal.



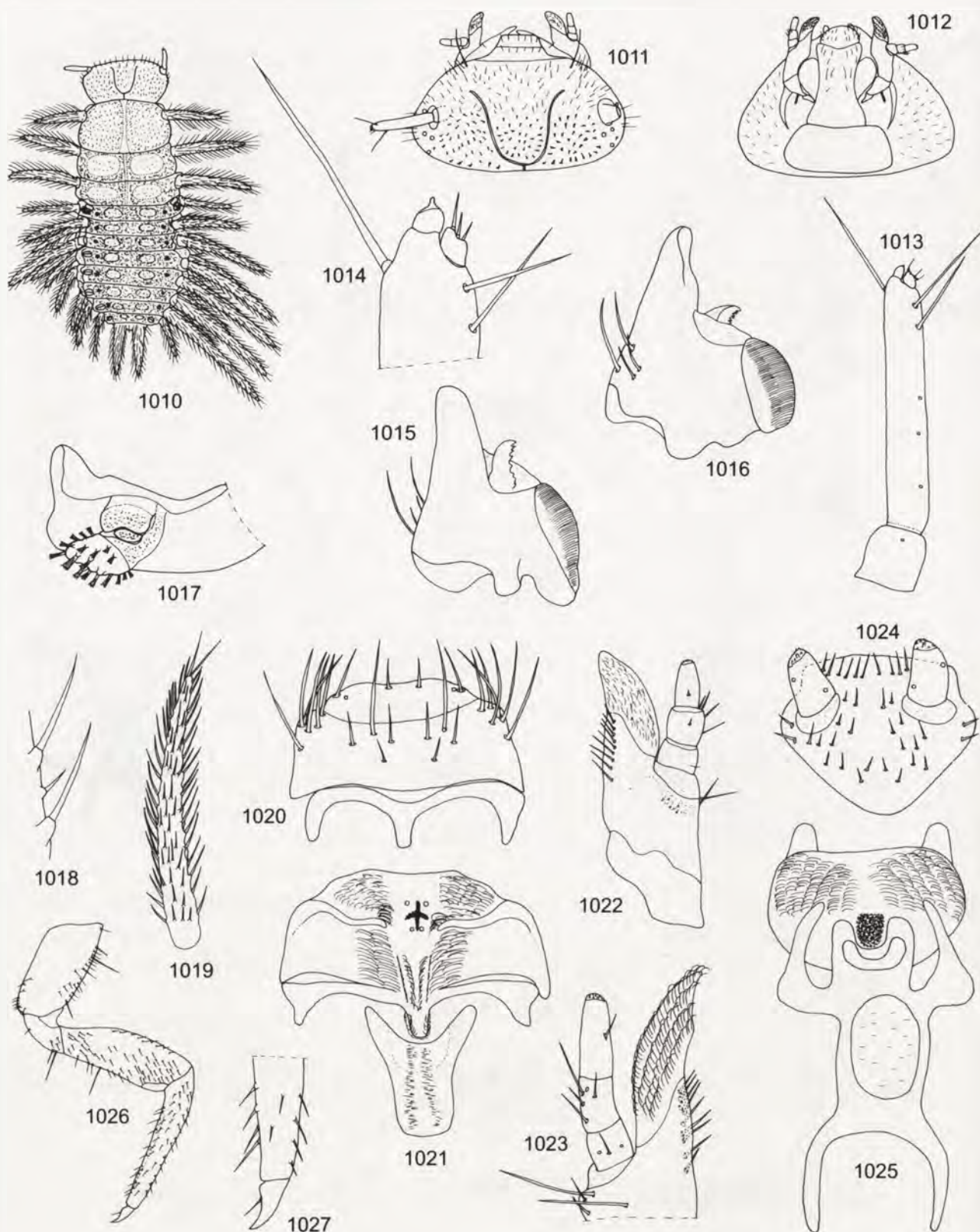
Figures 959–976. *Aphorista morosa* LeConte, mature larva and larval structures. (959) habitus, dorsal; (960) head, dorsal; (961) head, ventral; (962) body process; (963) frayed seta; (964) antenna, lateral; (965) apical part of antenna, dorsal; (966) maxilla, ventral; (967) apical part of maxilla, dorsal; (968) terminal maxillary palpomere; (969) mandible, ventral; (970) mandible, dorsal; (971) labium, ventral; (972) labium-hypopharynx; (973) labrum, dorsal; (974) labrum-epipharynx; (975) fore leg, left, ventral; (976) tibiotsarsus and claw, dorsal.



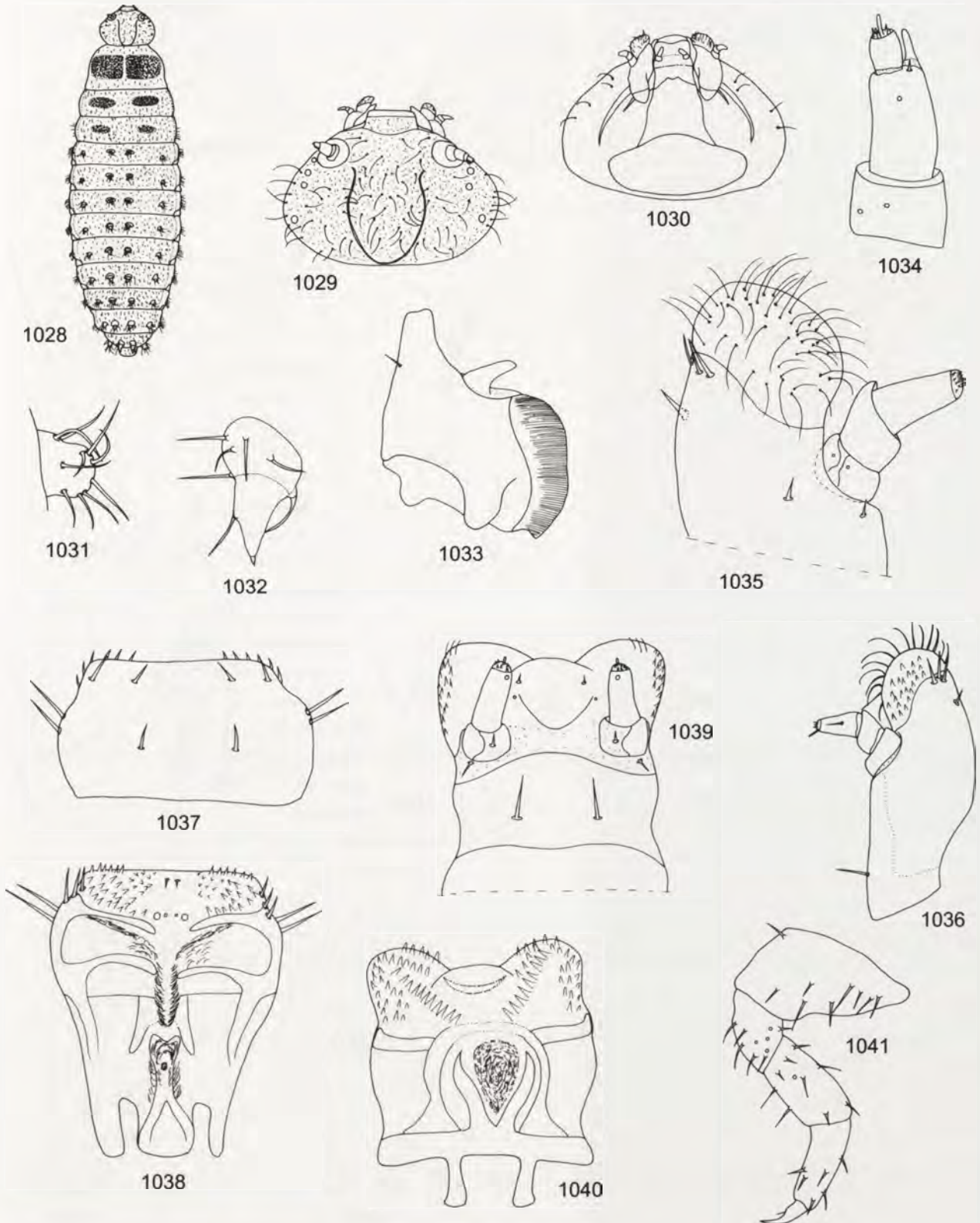
Figures 977–993. *Archipines championi* (Gorham), mature larva and larval structures. (977) habitus, dorsal; (978) head, dorsal; (979) antenna, right, dorsal; (980) apical part of antenna, right, ventral; (981) mandible, left, ventral; (982) labrum, dorsal; (983) labrum-epipharynx; (984) branched seta; (985) maxilla, left, ventral; (986) apical part of maxilla, left, dorsal; (987, 988) apical setae of mala; (989) labium, ventral; (990) hypopharynx; (991) tergal process of abdominal segment 2, left, dorsal; (992) leg; (993) apical part of tibia and claw.



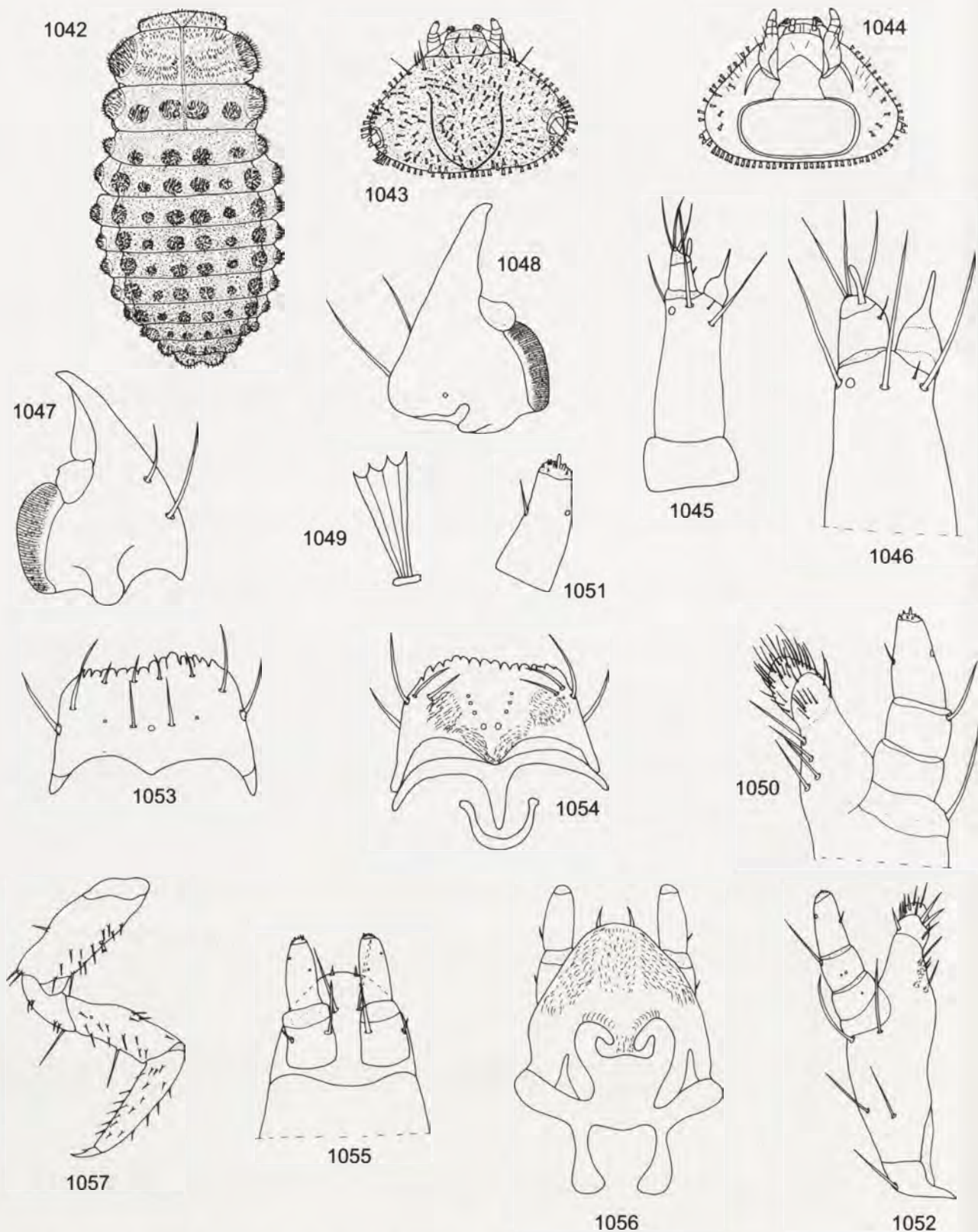
Figures 994–1009. *Encymon immaculatus* (Montruzier), mature larva and larval structures. (994) habitus, dorsal; (995) head, dorsal; (996) head, ventral; (997) body process; (998) antenna, right, dorsal; (999) apical part of antenna, dorsal; (1000) right side of abdominal segment 1 with repugnatorial gland opening, dorsal; (1001) mandible, dorsal; (1002) mandible, ventral; (1003) maxilla, dorsal; (1004) apical part of maxilla, ventral; (1005) labium, ventral; (1006) labium-hypopharynx; (1007) labrum, dorsal; (1008) labrum-epipharynx; (1009) fore leg, left, ventral.



Figures 1010–1027. *Eumorphus* sp., mature larva and larval structures. (1010) habitus, dorsal; (1011) head, dorsal; (1012) head, ventral; (1013) antenna, right, ventral; (1014) apical part of antenna, ventral; (1015) mandible, dorsal; (1016) mandible, ventral; (1017) left side of abdominal segment 1 with repugnatorial gland opening, dorsal; (1018, 1019) body process and pointed setae; (1020) labrum, dorsal; (1021) labrum-epipharynx; (1022) maxilla, dorsal; (1023) apical part of maxilla, ventral; (1024) labium, ventral; (1025) labium-hypopharynx; (1026) fore leg, left, ventral; (1027) apical part of tibiotsarsus and claw.



Figures 1028–1041. *Lycoperdina ferruginea* LeConte, mature larva and larval structures. (1028) habitus, dorsal; (1029) head, dorsal; (1030) head, ventral; (1031, 1032) abdominal, tergal processes; (1033) mandible, ventral; (1034) antenna; (1035) apical part of maxilla, ventral; (1036) maxilla, dorsal; (1037) labrum, dorsal; (1038) labrum-epipharynx; (1039) labium, ventral; (1040) labium-hypopharynx; (1041) fore leg, left, ventral.



Figures 1042–1057. *Mycetina perpulchra* Newman, mature larva and larval structures. (1042) habitus, dorsal; (1043) head, dorsal; (1044) head, ventral; (1045) antenna, left, dorsal; (1046) apical part of antenna, dorsal (1047) mandible, ventral; (1048) mandible, dorsal; (1049) frayed seta; (1050) apical part of maxilla, dorsal; (1051) terminal maxillary palpomere; (1052) maxilla, ventral; (1053) labrum, dorsal; (1054) labrum-epipharynx; (1055) labium, ventral; (1056) labium-hypopharynx; (1057) fore leg, ventral.

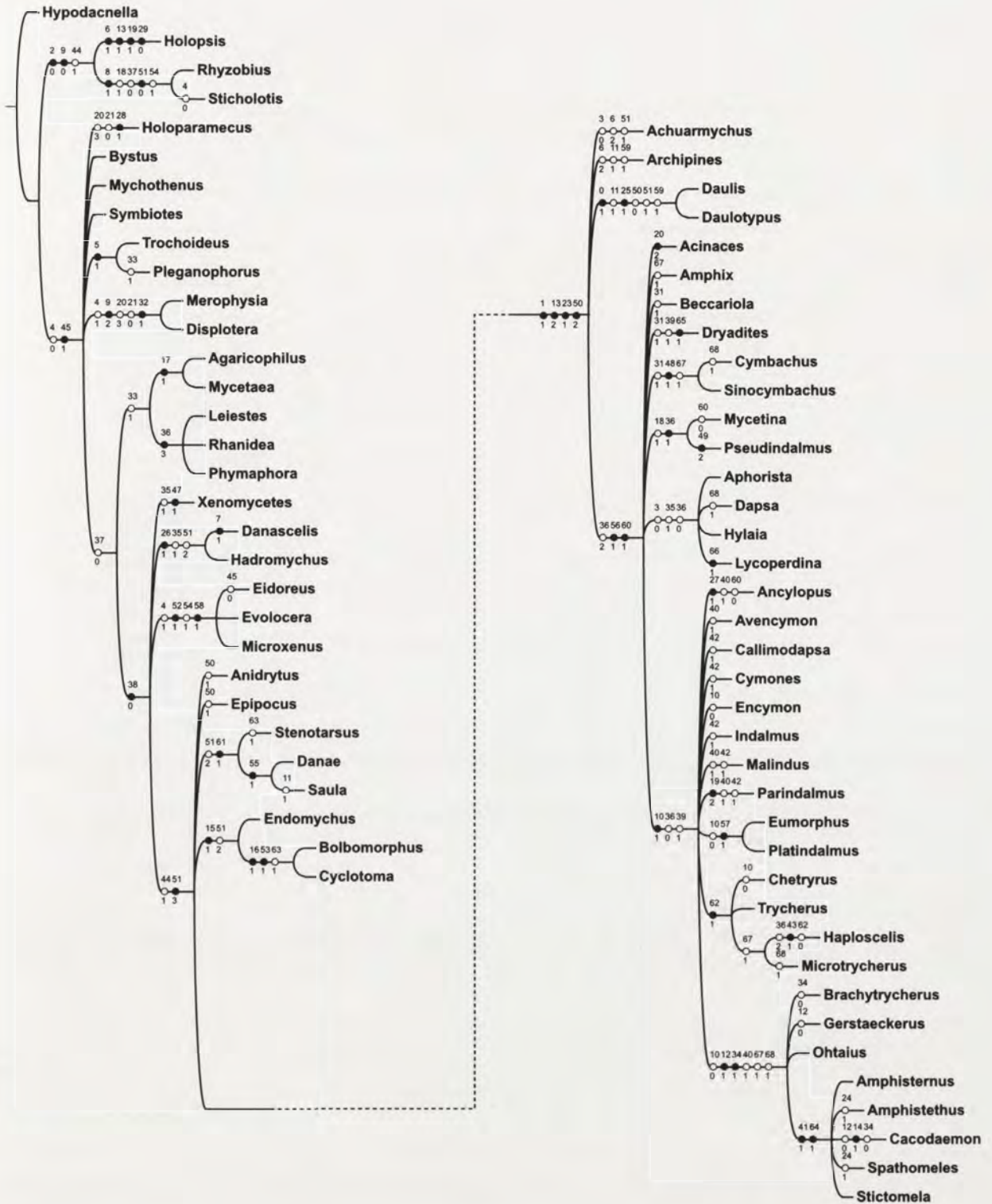
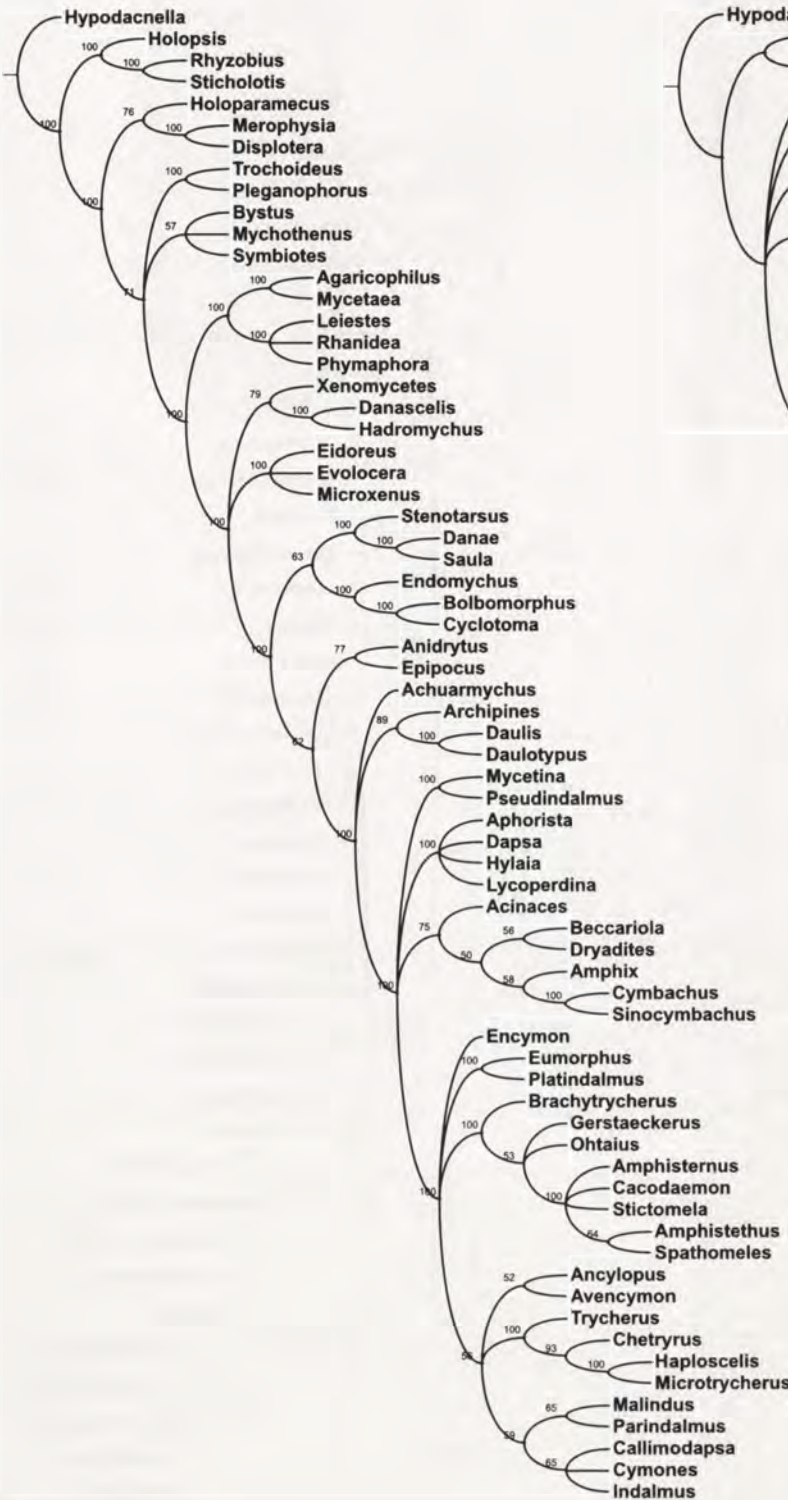
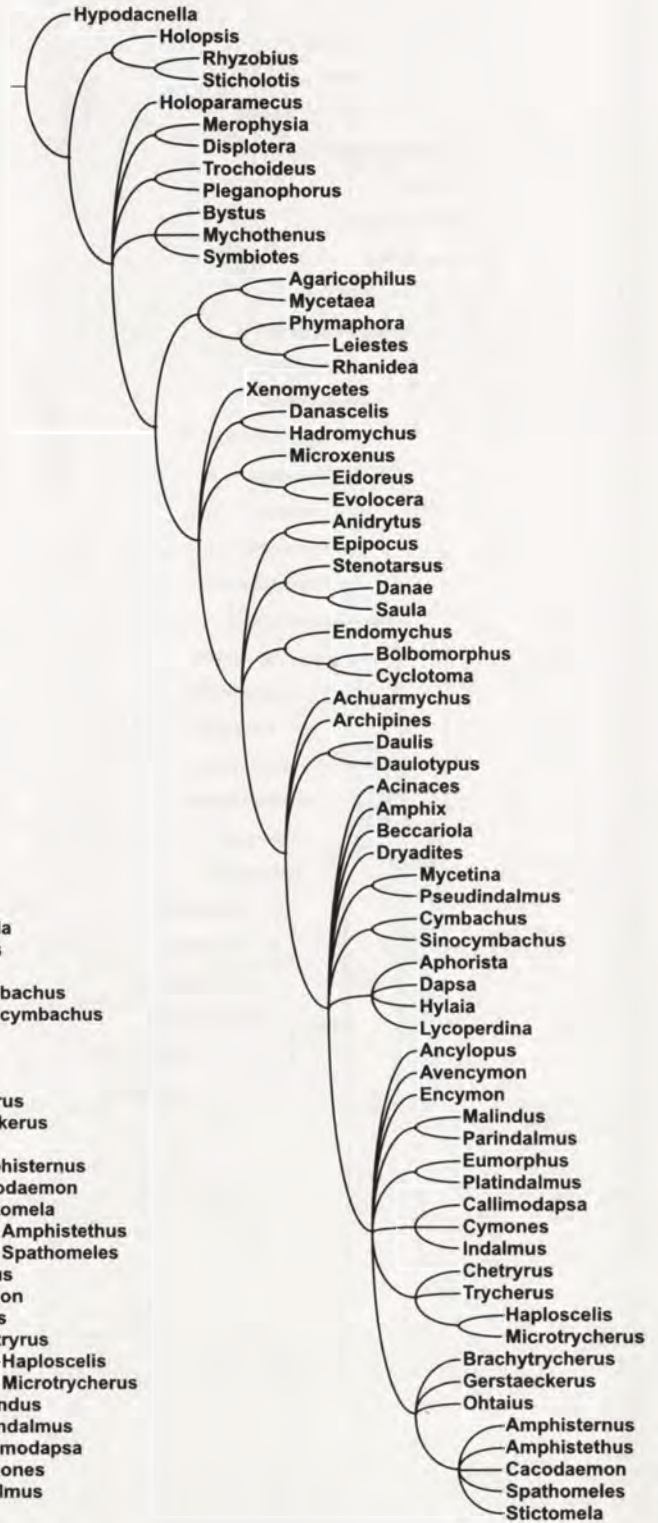


Figure 1058. Adult characters. Heuristic searches. Strict consensus of 10000 equally parsimonious trees (L=152, CI=54, RI=85). Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.

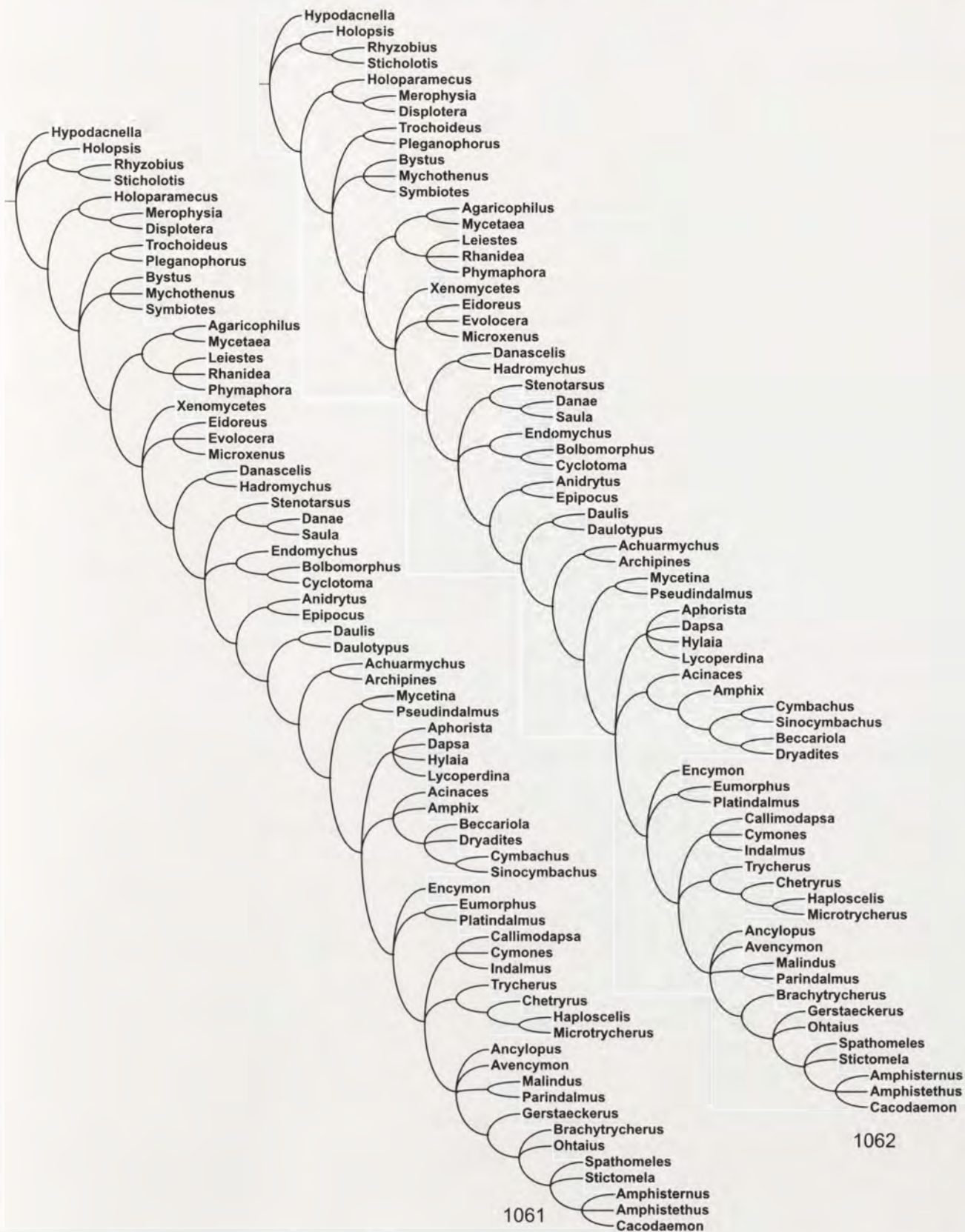


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Figures 1059–1060. Adult characters. 1059. Heuristic searches. Majority consensus of 10000 equally parsimonious trees (L=124, CI=66, RI=91); 1060. Ratchet. Strict consensus of 623 equally parsimonious trees (L=144, CI=57, RI=86).



Figures 1061–1062. Adult characters. 1061. # 1 of 2 trees, reached after successive weighting (L=123, CI=57, RI=91); 1062. # 2 of 2 trees, reached after successive weighting (L=123, CI=57, RI=91).

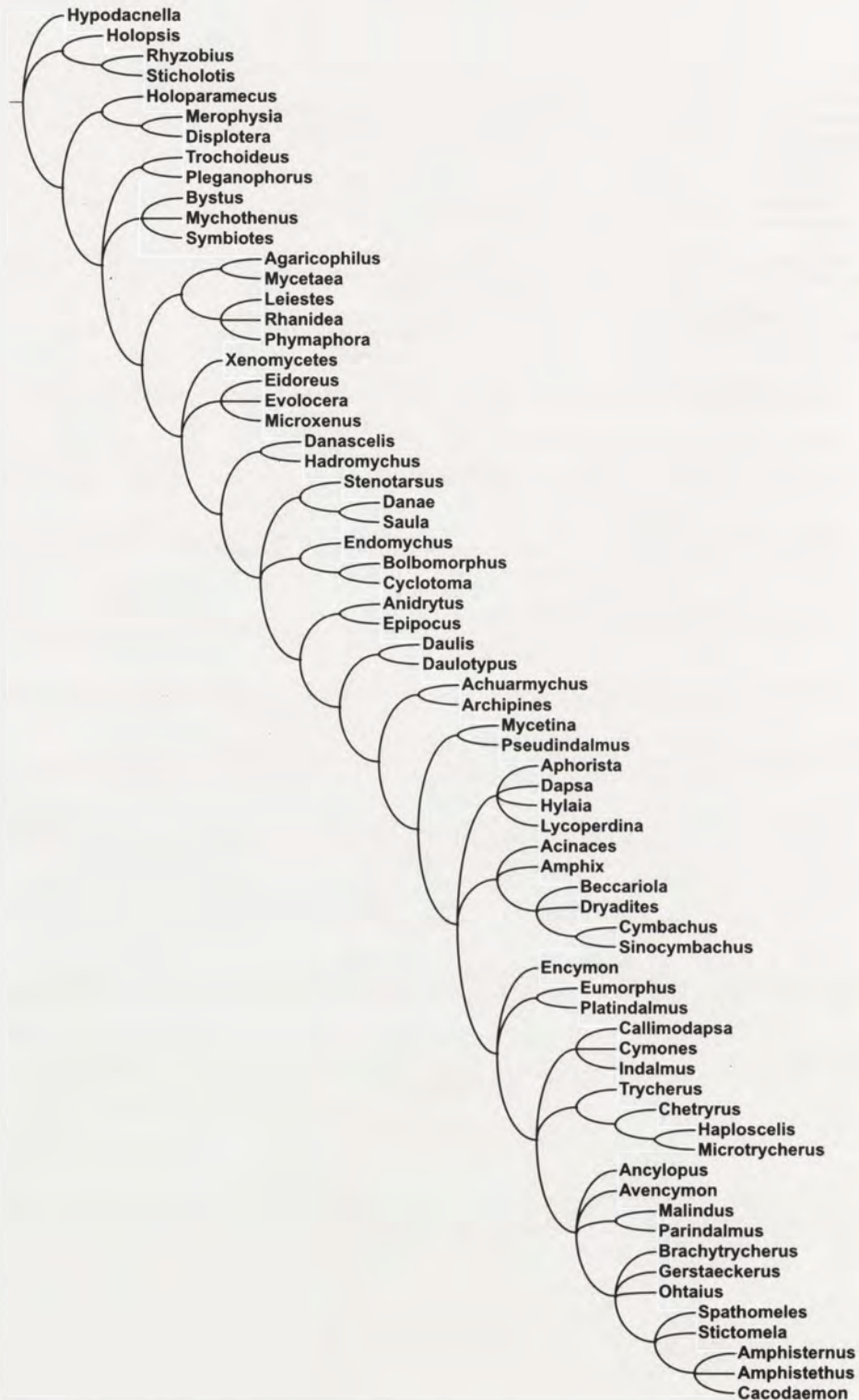


Figure 1063. Adult characters. Strict consensus of 2 trees, reached after successive weighting (L=124, CI=66, RI=91).

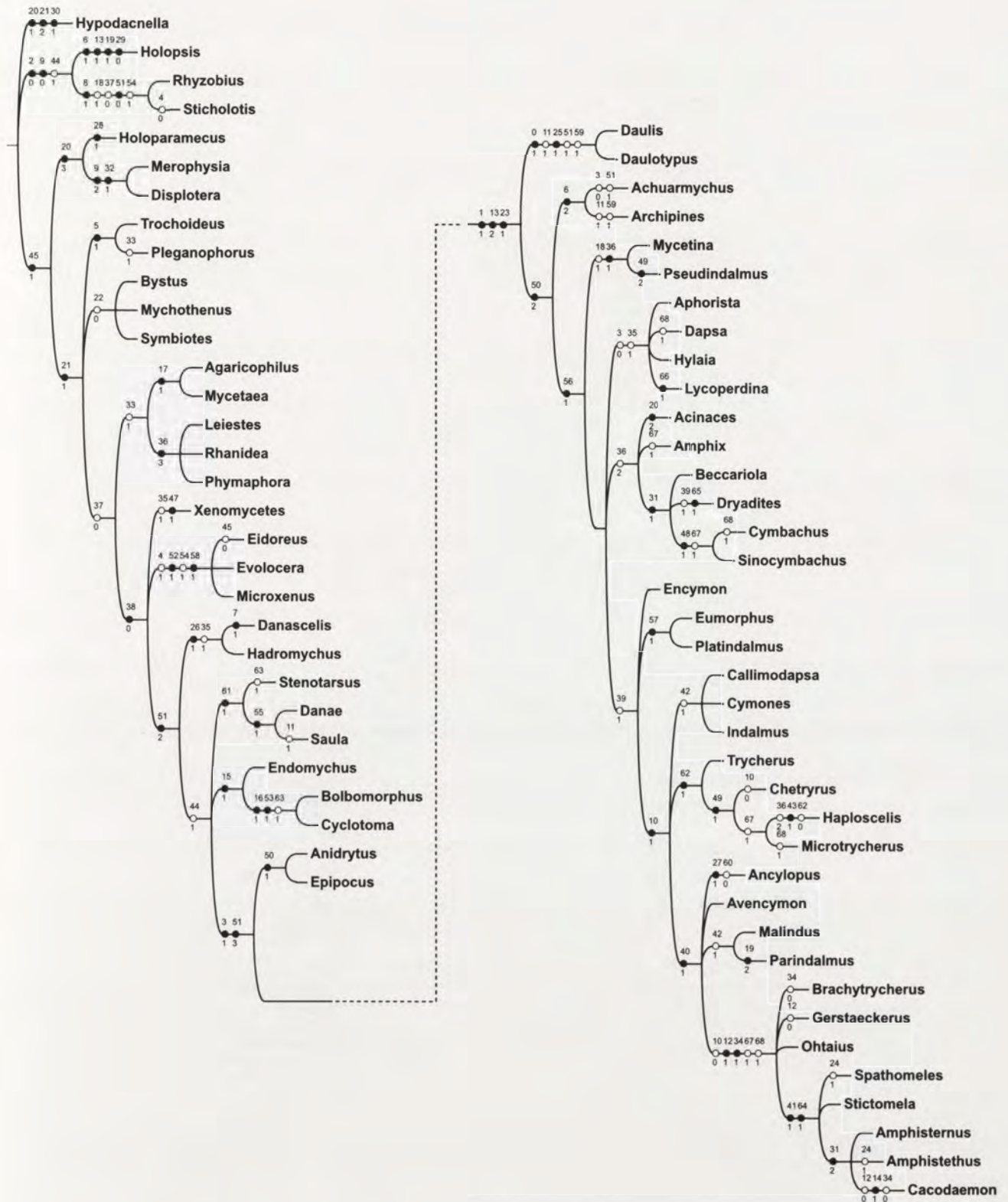


Figure 1064. Adult characters. Strict consensus-map of 2 trees, reached after successive weighting (L=124, CI=66, RI=91). Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.

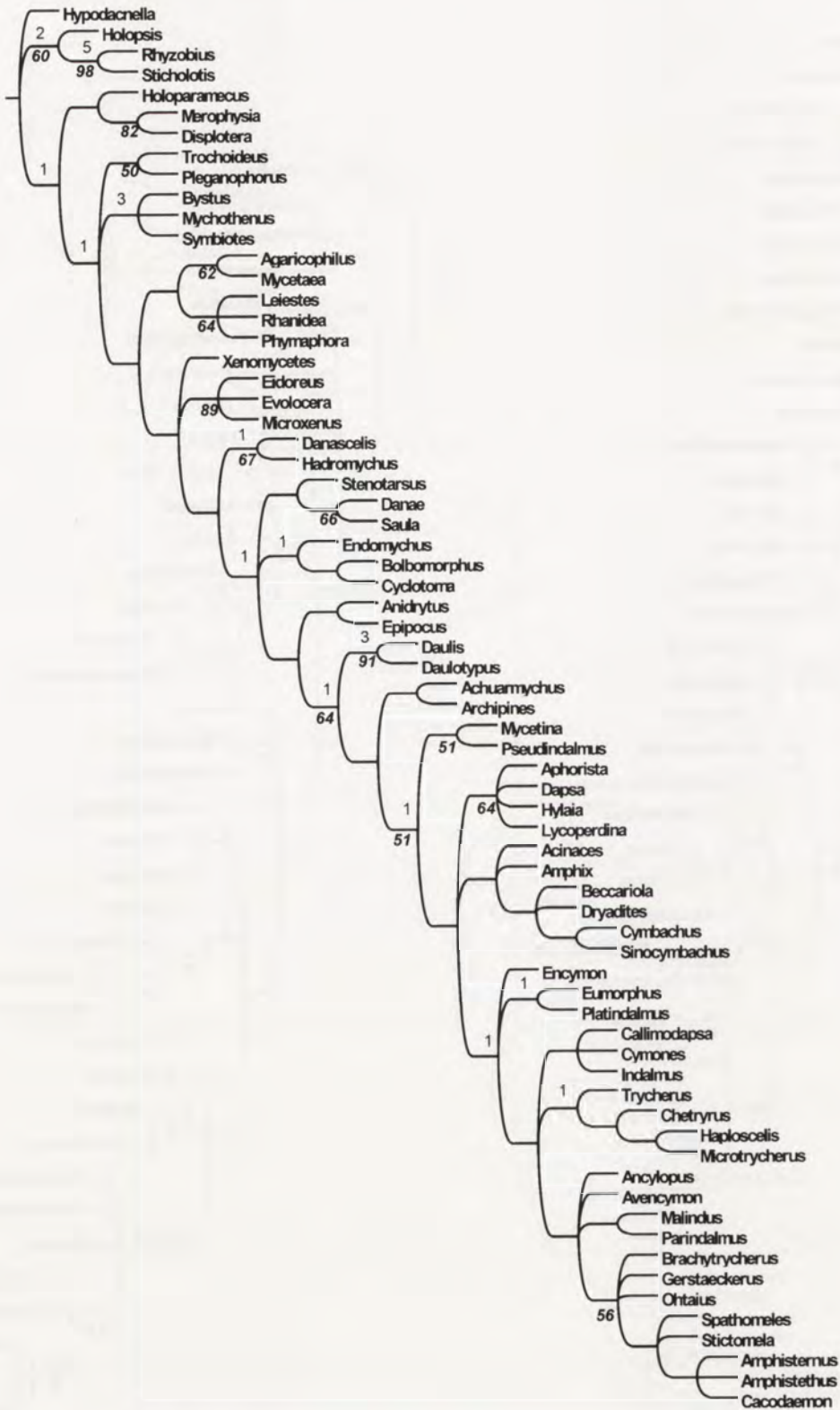


Figure 1065. Adult characters. Bootstrap values and Bremer support values of the consensus cladogram. Above branch – Bremer support value; below branch, italic – bootstrap value.

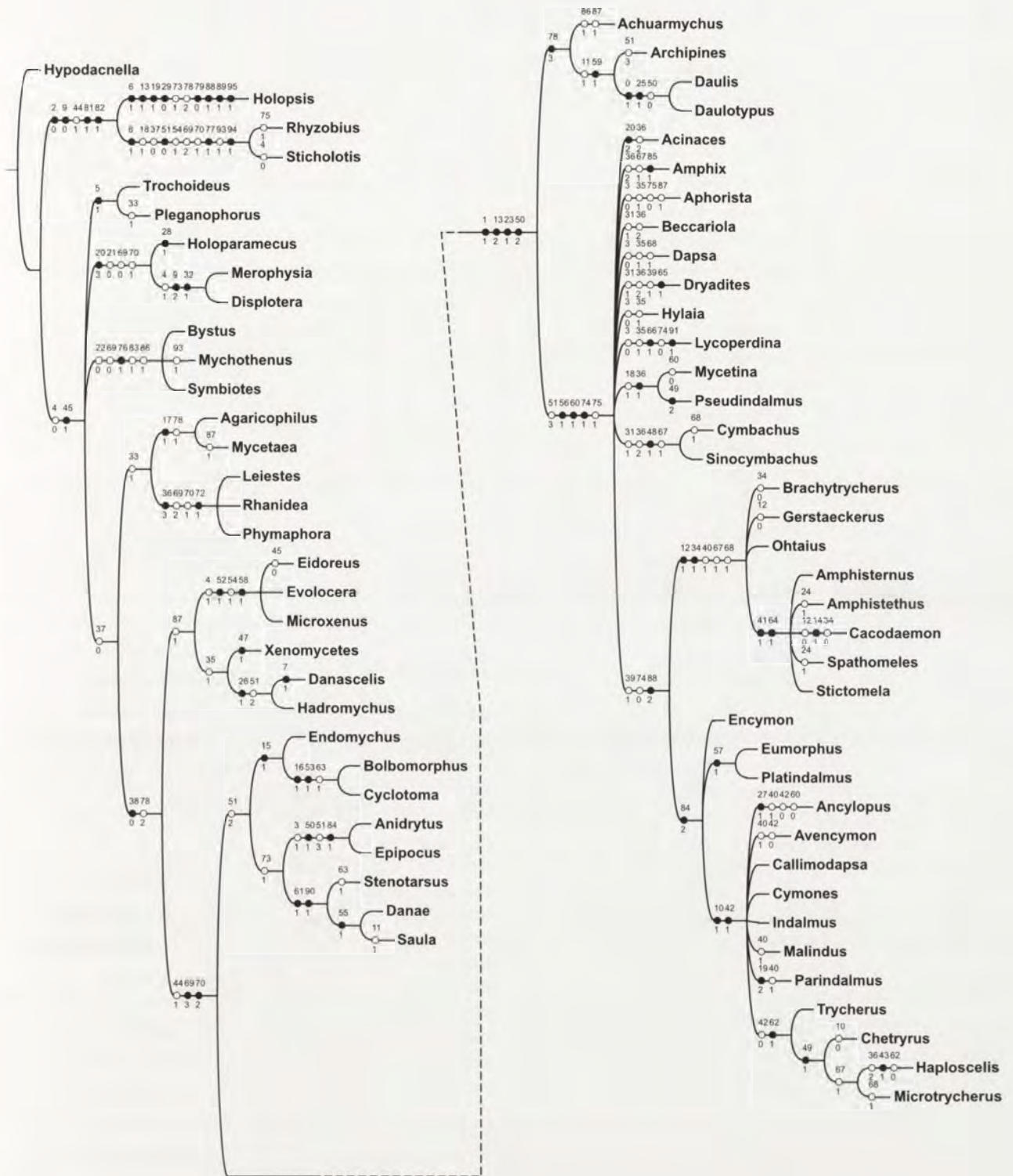


Figure 1066. Adult and larval characters (complete matrix). Heuristic searches. Strict consensus of 7680 equally parsimonious trees (L=208, CI=57, RI=84). Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.

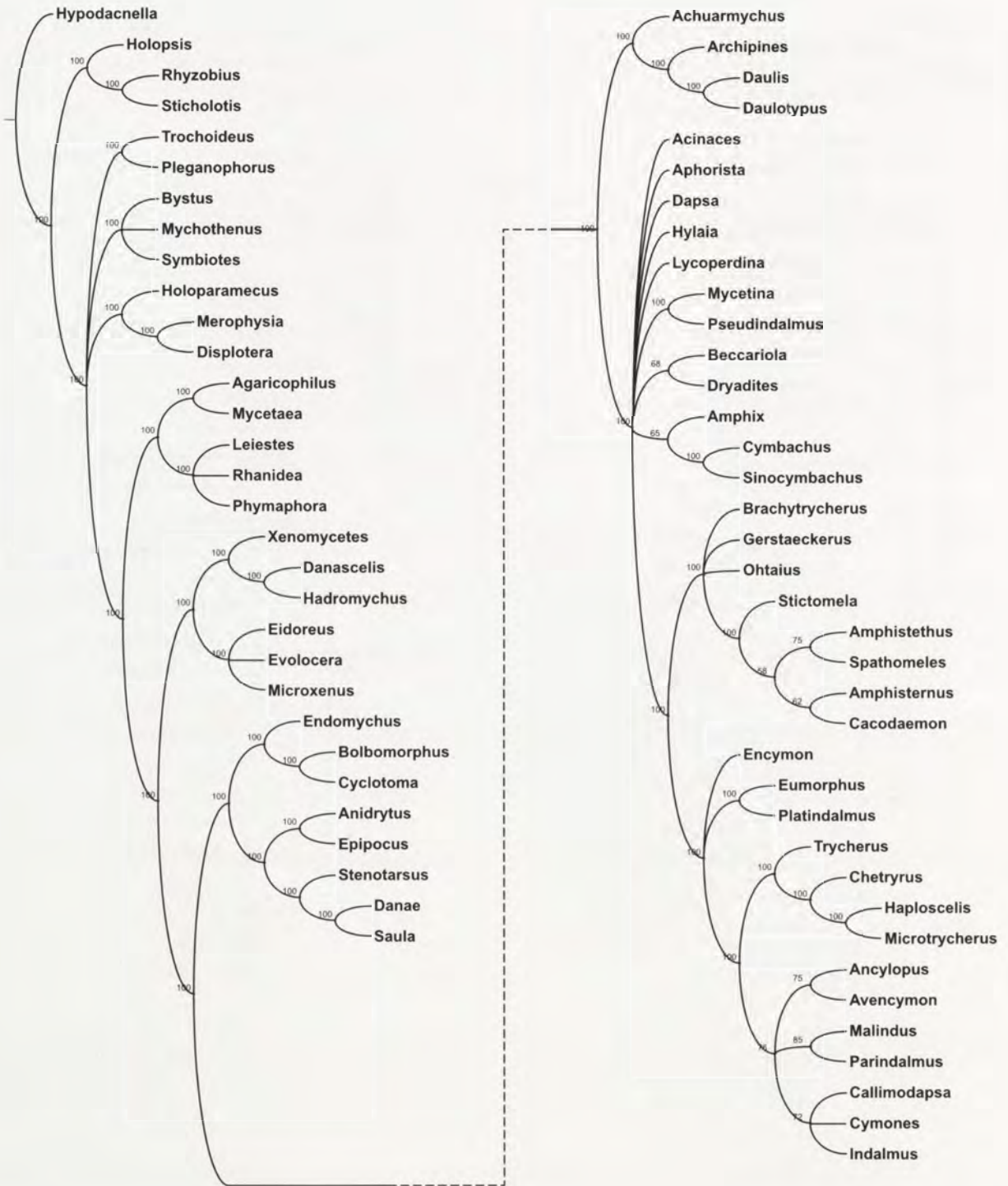


Figure 1067. Adult and larval characters (complete matrix). Heuristic searches. Majority consensus of 7680 equally parsimonious trees (L=198, CI=60, RI=85).

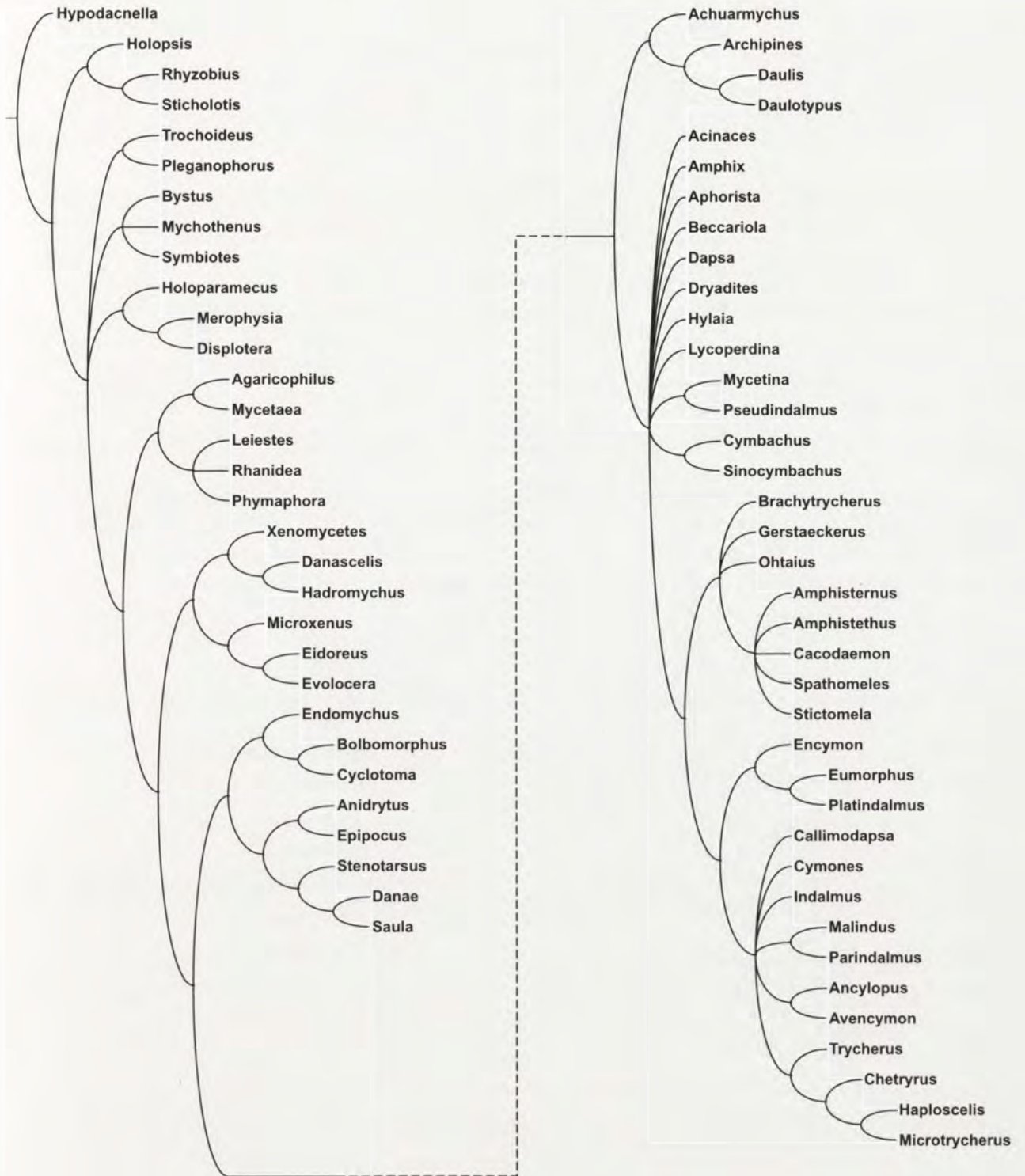


Figure 1068. Adult and larval characters (complete matrix). Ratchet. Strict consensus of 189 equally parsimonious trees (L=197, CI=60, RI=86).

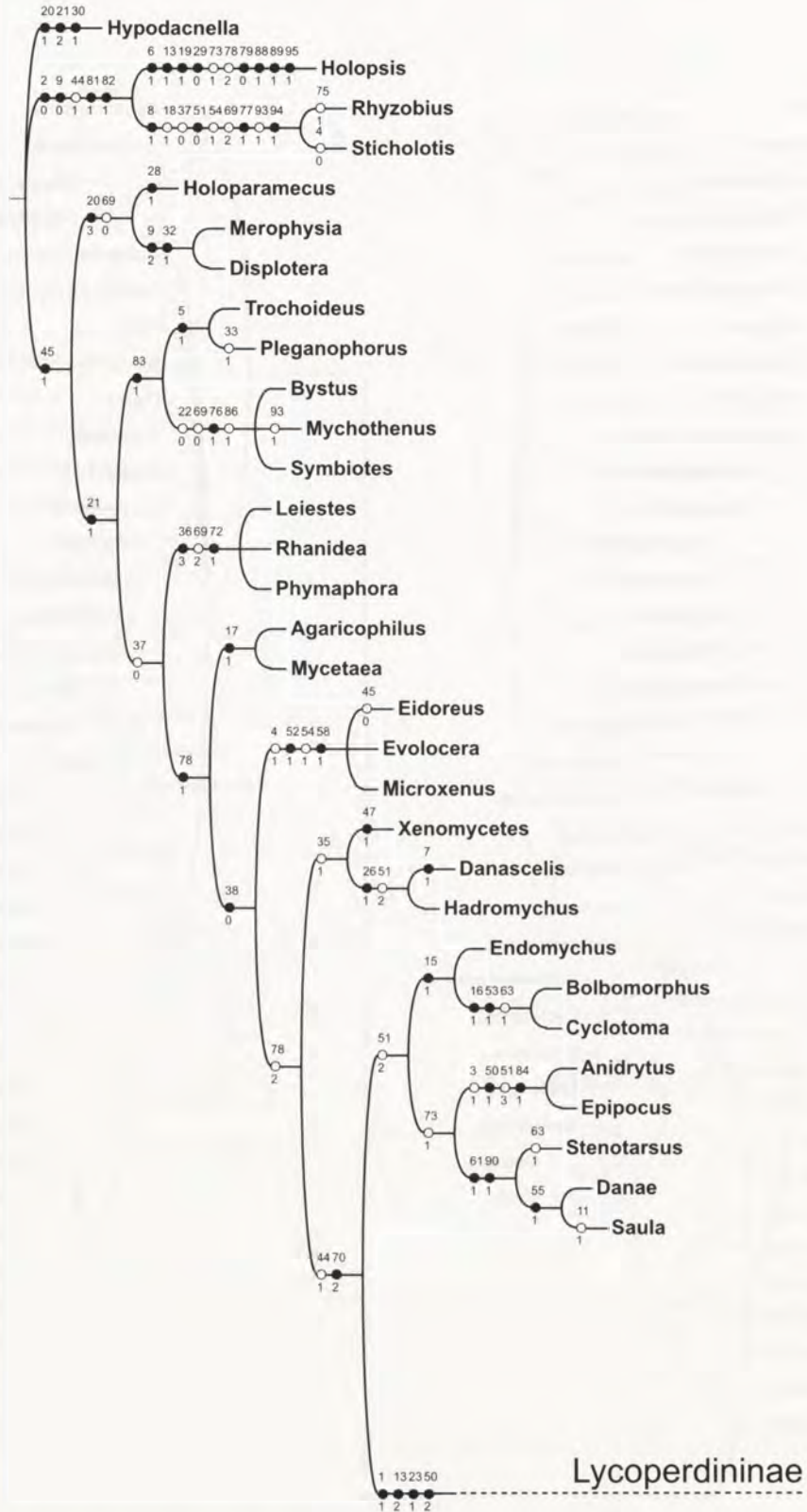


Figure 1069a. Adult and larval characters (complete matrix); part of cladogram, excluding Lycoperdininae clade (see next page). # 1 of 2 trees, reached after successive weighting (L=183, CI=65, RI=88). Preferred cladogram. Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.

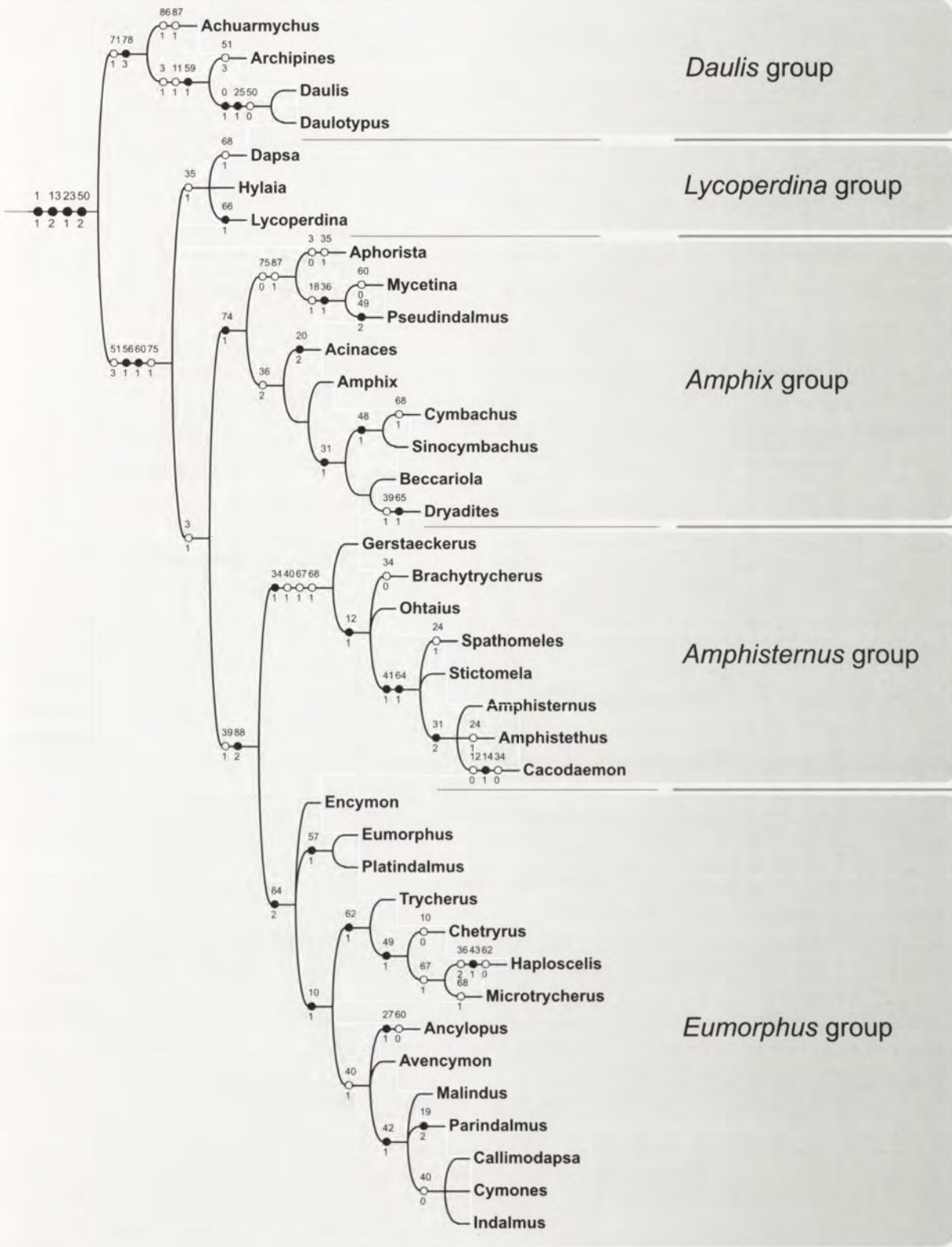


Figure 1069b. Adult and larval characters (complete matrix); part of cladogram, containing Lycoperdininae clade (see previous page). # 1 of 2 trees, reached after successive weighting (L=183, CI=65, RI=88). Preferred cladogram. Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.

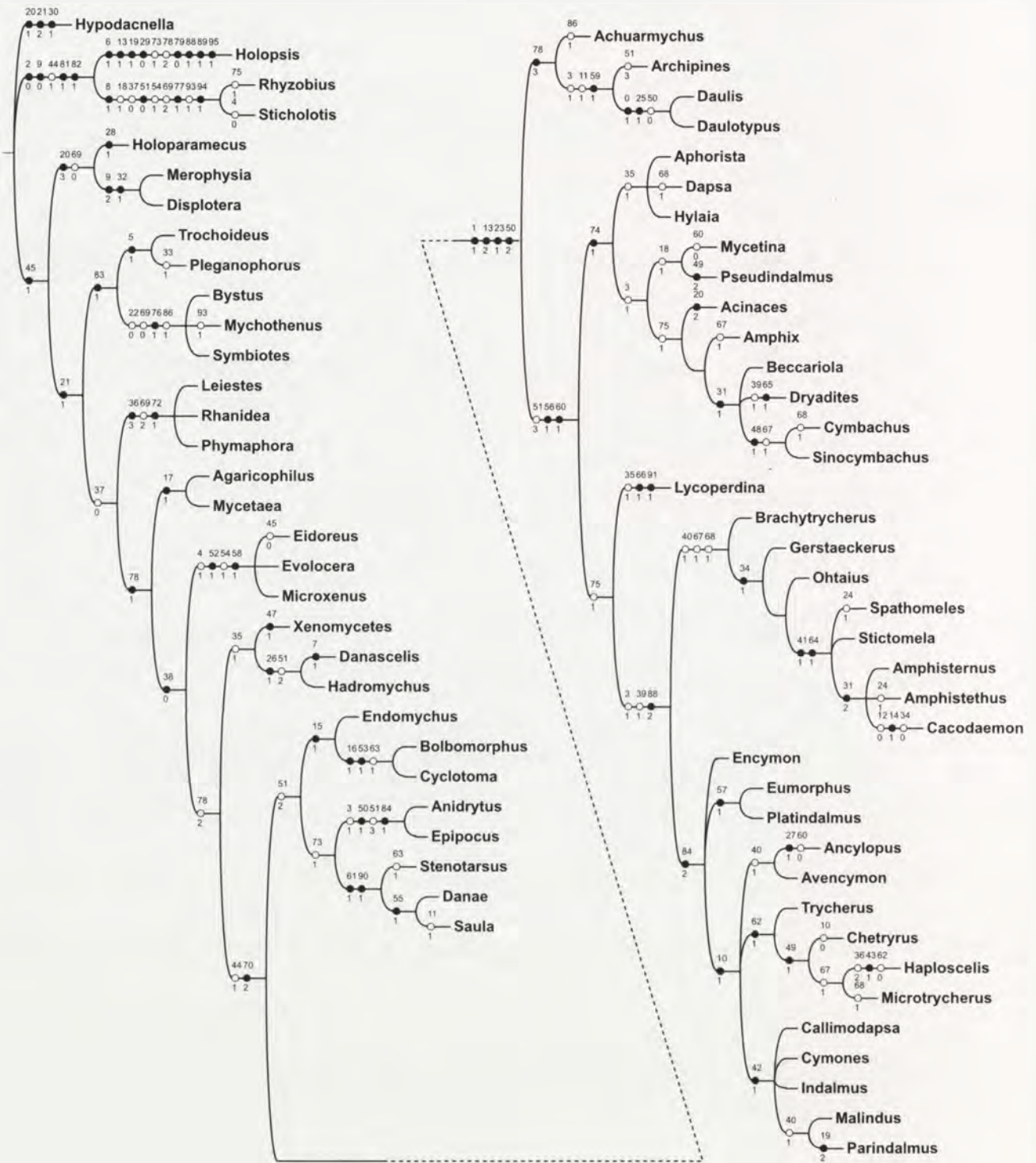
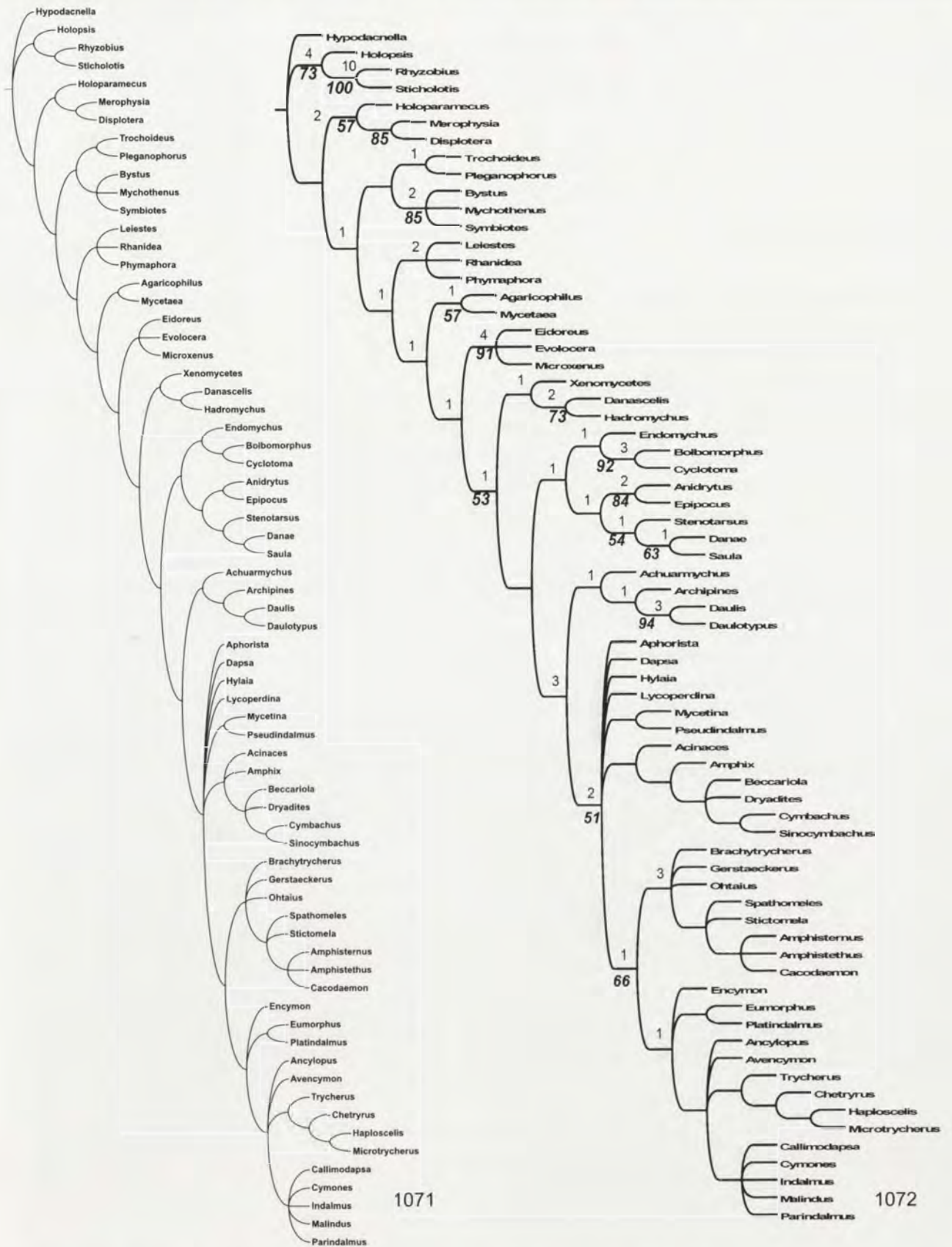
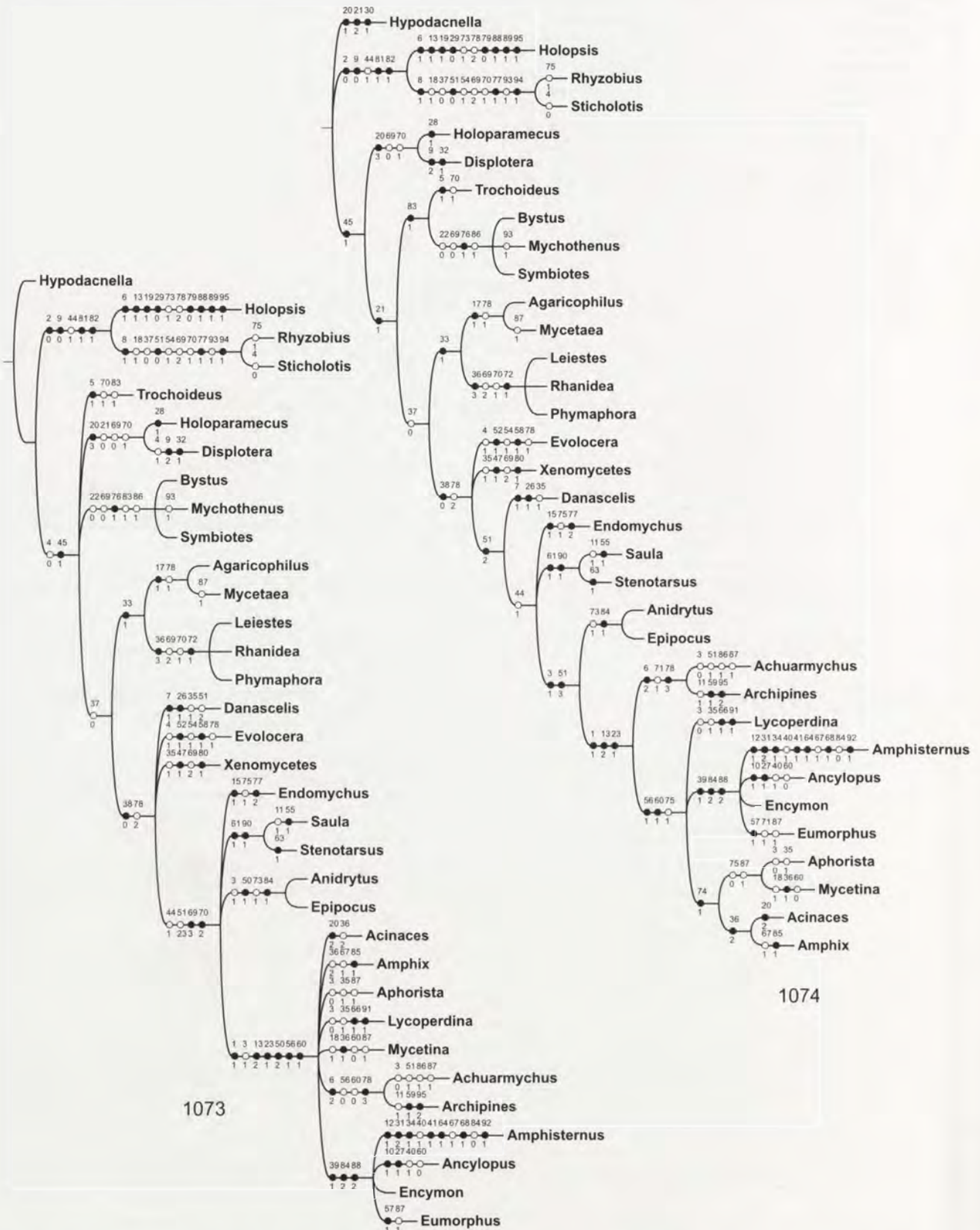


Figure 1070. Adult and larval characters (complete matrix). # 2 of 2 trees, reached after successive weighting (L=183, CI=65, RI=88). Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.



Figures 1071–1072. Adult and larval characters (complete matrix). 1071. Strict consensus of 2 trees, reached after successive weighting (L=194, CI=61, RI=86); 1072. Bootstrap values and Bremer support values of the consensus cladogram. Above branch – Bremer support value; below branch, italic – bootstrap value.



Figures 1073-1074. Adult and larval characters (limited matrix). 1073. Heuristic searches. Strict consensus of 140 equally parsimonious trees (L=165, CI=72, RI=91); 1074. Strict consensus of 11 trees, reached after successive weighting (L=150, CI=79, RI=84). Filled circles indicate synapomorphies or autapomorphies; open circles indicate homoplastic states.