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Autor: Majer, Karel
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Subfamilial classification of the family Malachiidae (Coleoptera, Cleroidea)

by †**Karel Majer**[*)]

Abstract. The family Malachiidae is divided into five subfamilies: (1) Carphurinae, (2) Lemphinae stat.nov., (3) Amalthocinae subfam.nov., (4) Pagurodactylinae stat.nov., (5) Malachiinae stat.nov. The following taxa are synonymised: the genus *Asiocarphurus* WITTMER, 1981 with *Carphuroides* CHAMPION, 1923; *Carphurus* subg. *Brevecarphurus* PIC, 1950 and subg. *Scelocarphurus* WITTMER, 1961 with *Microcarphurus* PIC, 1917; *Carphurus* subg. *Paracaraphurus* WITTMER, 1953 and *Thoraxocarphurus* WITTMER, 1957 with *Brachyhedybius* PIC, 1917; *Flabellolemphus* WITTMER, 1976, *Pygolemphus* WITTMER, 1976 and *Oxylemphus* WITTMER, 1976 with *Engilemphus* WITTMER, 1976; *Falsoanthocomus* PIC, 1912 with *Amalthocus* FAIRMAIRE, 1886; the species *Carphuroides ovambo* WITTMER, 1985 with *Apteromalachius namibensis* WITTMER, 1960; the species *Pygolemphus fossulatus* WITTMER, 1976 with *Oxylemphus azureus* WITTMER, 1976. Important body parts are figured and a possible phylogeny of the family Malachiidae is outlined.

Key words. Coleoptera – Malachiidae – new subfamily – morphology

Introduction

The family Malachiidae is one of the largest families of the Cleroidea, comprising more than 4,000 described species. Unfortunately, their major subgrouping has almost exclusively been based upon cuticular modifications in the male sex: the so-called "excitators" (most probably associated with the pheromone glands), tarsal combs or reduction of front tarsomeres, i.e. characters of an exclusively parallel nature and apparently not correlated even with coloration, body shape and other superficial characters. These "excitators" are in principle ignored whenever erecting major taxa within the present paper, which is based upon current examination of the mouthparts, wings, tarsi, terminalia, etc., as in other families of the superfamily Cleroidea.

Larvae of the Malachiidae are completely omitted from the present paper since I had no material at my disposal, although some larvae have been described by COSTA & CASARI-CHEN (1988) (*Lemphus* sp.) and by GARDNER (1931) (*Carphurus* sp.) Very precise illustrations in the latter paper significantly support my giving full family rank to the Malachiidae. The Malachiid larvae in general are treated within the definitions of the families of the "Melyrid stock" (MAJER 1994).

*) Editorial note: The paper was written by the author in 1993 and updated in 1998. After the death of Karel Majer, the editor made some corrections in the text which are based on reviews and his own reading of the manuscript. The figure numbers 254 and 255 were omitted by the author and unused.

Abbreviations and symbols used

Taxonomic criteria

a ..... homoplasy within Cleroidea
A1 ..... autapomorphy within Malachiidae
A2 ..... autapomorphy within Melyridae s. lato ("Melyrid stock")
A3 ..... autapomorphy within Cleroidea
p ..... symplesiomorphy within Cleroidea
P1 ..... unique plesiomorphy within Malachiidae
P2 ..... unique plesiomorphy within Melyridae s. lato ("Melyrid stock")
P3 ..... unique plesiomorphy within Cleroidea

Morphology and anatomy

1A ..... anal vein 1
2A ..... anal vein 2
3A ..... anal vein 3
4A ..... anal vein 4
Ac ..... anal cell
M ..... medial vein
M1 ..... medial vein 1
RM ..... radiomedial vein
Rc ..... radial cell
Rs ..... vein in radial sector
acs ..... antecoxal suture
ade ..... anterior (ventral) dens of mandible
aff ..... anterior foraminal flange
agl ..... accessory gland
ame ..... articulating membrane
ans ..... anus
axl ..... axillary lobe
bco ..... bursa copulatrix
bcp ..... basal corners of male pygidium
bga ..... basigalea
bst ..... basistipes
bta ..... basitarsus
car ..... cardo
ces ..... cervical sclerites
cla ..... claw, appendages
clw ..... claws
col ..... colon
crs ..... cryptosternum
dga ..... distigalea
dil ..... discriminal line
ejd ..... ejaculatory duct
eme ..... epimeron (hypomeral projection)
emp ..... empodium
epp ..... epipleuron
eso ..... esophagus
fba ..... front basitarsus
fla ..... flagellum (antenna)
fua ..... furcal arms
fvs ..... first visible abdominal sternite
hco ..... hind coxa
hme ..... hypomeron (pronotal epipleuron)
icp ..... intercoxal process on sternite 1

ile . . . . . ileum
inp . . . . . inner cardal process
ins . . . . . internal sac
lac . . . . . lacinia
lag . . . . . lateral accessory glands
lig . . . . . ligula
mag . . . . . medial accessory gland
map . . . . . posterior attachment of malpighian tubules
mcc . . . . . middle coxal cavities
men . . . . . mentum
mes . . . . . mesosternum
mke . . . . . medial keel
mlt . . . . . malpighian tubules
mpa . . . . . maxillary palp
mpm . . . . . metepimeron
msn . . . . . mesepisternum
msp . . . . . mesothoracic intercoxal process
mss . . . . . male sternum VII
mst . . . . . mediostipes
mtn . . . . . metepisternum
mts . . . . . metasternum
mwp . . . . . metapleural wing process
ocp . . . . . outer cardal process
ost . . . . . ostium (phallotreme)
ovi . . . . . oviduct
paf . . . . . palpifer
ped . . . . . pedicel
pen . . . . . penicillus (prostheca)
pff . . . . . posterior foraminal flange
pha . . . . . phallus in general
phy . . . . . pharynx
pip . . . . . prosternal intercoxal process
pra . . . . . prosternal apophysis
prm . . . . . prementum
prn . . . . . premental notch
prs . . . . . prosternum
pta . . . . . praetarsus
pyl . . . . . pylorus
rec . . . . . rectum
rev . . . . . rectal valve
sca . . . . . scape
scl . . . . . scutellum
sct . . . . . sclerites in seminal canal
scu . . . . . scutum
sec . . . . . seminal canal
spc . . . . . spermathecal capsule
spg . . . . . spermathecal gland
sps . . . . . sternopleural suture
sta . . . . . stalk
teg . . . . . tegmen in general
tes . . . . . testes
tmp . . . . . terminal segment of maxillary palp
tsl . . . . . terminal segment of labial palp
ute . . . . . uterus
vag . . . . . vagina
vco . . . . . ventral condyle

Taxonomy

Family Malachiidae

A definition of the family Malachiidae and its position among other families of the "Melyrid stock" of the superfamily Cleroidea may be found in the above-cited paper of mine (MAJER 1994).

Checklist of the subfamilies

Amalthocinae **subfam.nov.** (I)
Carphurinae CHAMPION, 1923 (V)
Lemphinae WITTMER, 1976 **stat.nov.** (IV)
Malachiinae MULSANT & REY, 1867 (III)
Pagurodactylinae Constantin, 2001 **stat.nov.** (II)

Rapid key to subfamilies according to external characters

1. Front basitarsus combed beneath, nearly always strongly elongate (Figs 103–132). Tarsomeres 2–4 nearly always equal, lobate. ..... **V. Carphurinae**
– Front basitarsus not combed, mainly as long as 2. Tarsomeres not lobate, if so, 4 deeply embedded in emargination of 3. ..... 2.
2. Tarsomere 4 very small, embedded in incision of tarsomere 3 (Figs 108–113). ..... 3.
– Tarsomere 4 nearly as big as 3. ..... 4.
3. Pronotum not distinctly transverse; at the least, the disc impressed at sides (Fig. 11). Madagascar. ..... **I. Amalthocinae subfam.nov.**
– Pronotum distinctly transverse, without deep impressions (Figs 6–10). Basitarsus not strongly elongate. South America and Australia. ..... **IV. Lemphinae stat.nov.**
4. Claws very long, strongly asymmetrical in males (Fig. 114), if not, body very slender, cylindrical, beset with very long hairs (Fig. 13). Excitators absent, at the most on antennal segments 4–6. Extrusible glands strongly reduced and difficult to locate in dried specimens. Central and South Africa. ..... **II. Pagurodactylinae stat.nov.**
– Claws shorter and broader, more or less swollen at base (Fig. 116), at the most slightly asymmetrical, body never extended cylindrical with very long hairs. Extrusible glands clearly visible even in dried specimens. Worldwide. ..... **III. Malachiinae stat.nov.**

Analytical key to subfamilies (see Tabs 1, 2)

1. Tentorial crossbar complete (P1); anterior margin of prosternum forms a common collar with that of pronotum (P1); wing with minute Rc and 4 anal veins (P1); spicular fork ring-shaped (P2); tegmen with ciliate and more or less emarginate apex (P1); 4 Malpighian tubules (unknown in Amalthocinae though expected to be the same as in Pagurodactylinae) (A2). ..... 2.

– Tentorial crossbar strongly reduced to absent (A1); prosternum elevated and more or less divided from hypomera (A1); wing with moderately big Rc and at the most with 3 anal veins (P1); spicular fork not ring-shaped (a); tegmen with bare, mostly non-emarginate apex (a); 5 or 6 Malpighian tubules (unknown in Lemphinae but expected the same as in Carphurinae) (P1). ..... 3.

2. Tormal processes incurved (p); palpifer as large as basistipes (P2); sternopleural suture absent (A1); wing with indicated Ac (P1), anal veins complete (P1); epipleuron well developed (p); tarsomeres 1–3 lobate (p), 4 diminished (a), 1–4 unarmed in male; male sternum VIII simple (p); apex of tegmen reduced and bare (A1); tegmen without basal appendage (p); phallus without defined base (p). ..... **I. Amalthocinae subfam.nov.**

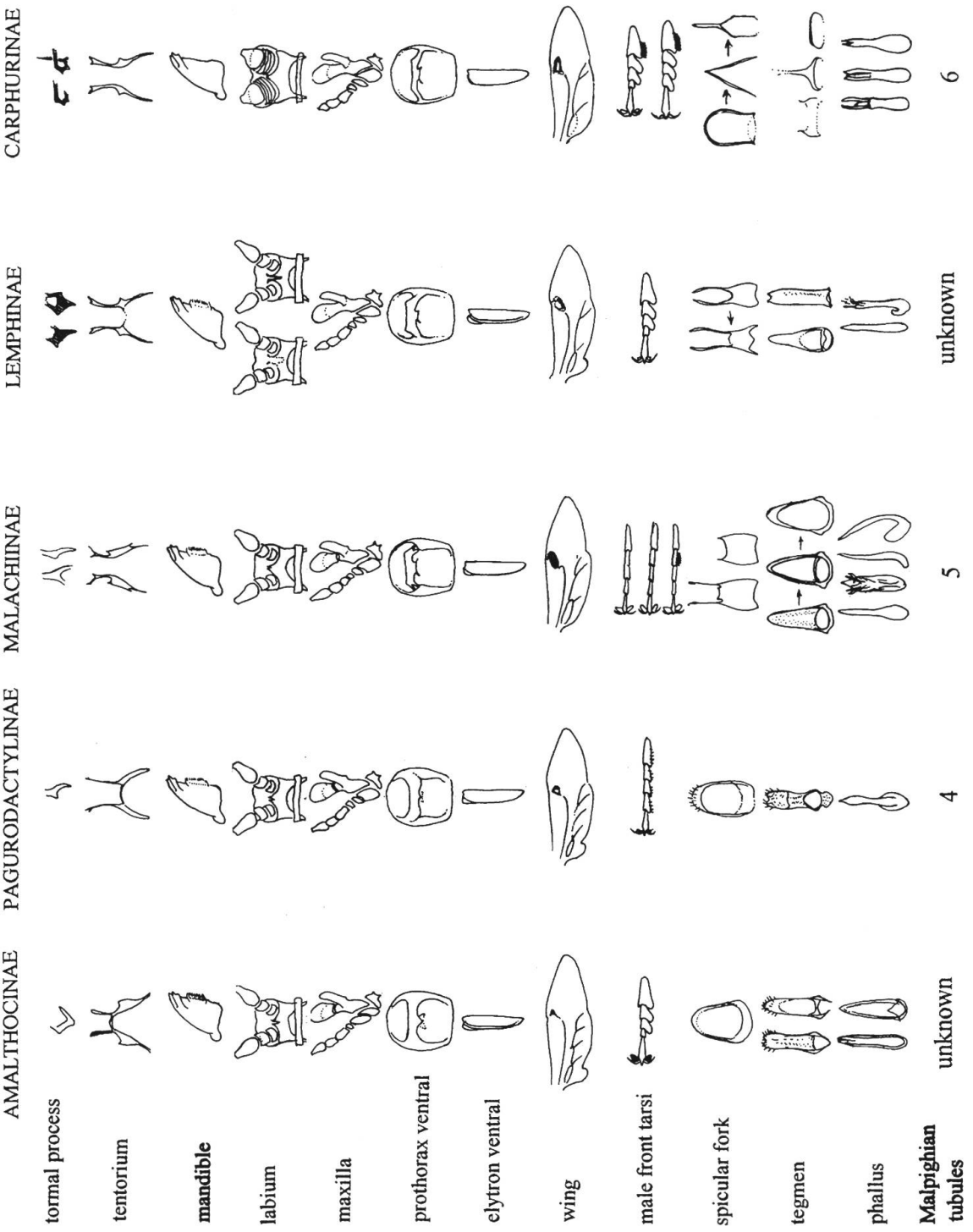
– Tormal processes not incurved (a); palpifer much smaller than basistipes (a); sternopleural suture present (p); wing without indicated Ac (a), anal veins incomplete (a); epipleuron strongly reduced (a); tarsomeres 1–3 not lobate (a), 4 not diminished (p), 1–4 spinulose in male (a); male sternum VIII modified (a); apex of tegmen entire and pubescent (P1); tegmen with basal appendage (A2); phallus with strongly defined base (a). .... **II. Pagurodactylinae stat.nov.**

3. Labial palpi with normal segments (p); hypomeron well developed (p); wing with short Ac (p), basal veins in anal sector not reduced (p); male basitarsus unarmed (p); spicular fork plate-shaped with diverging arms (A3); tegmen complete (p); phallus neither pyriform nor with divided apex (p). ..... 4.

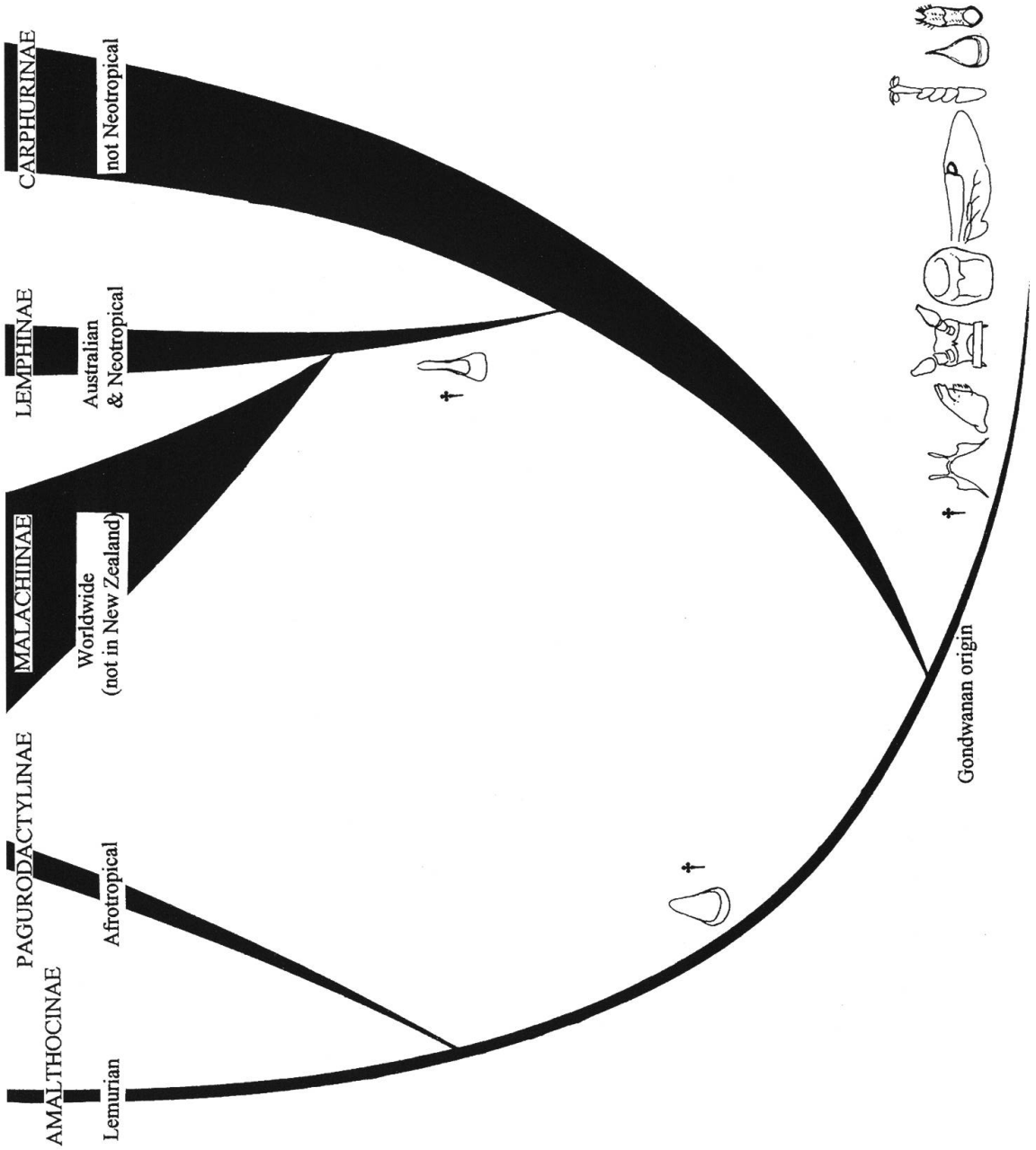
– Labial palpi with annular segments (A3); hypomeron strongly reduced (A3); wing with elongate Ac (P1), basal veins in anal sector reduced (A2); male basitarsus combed (A1); spicular plate of common Dasytine type or derived (P1); tegmen extremely reduced (A3); phallus pyriform with bi- or tripartite (secondarily divided) apex (A3). ..... **V. Carphurinae**

4. Tormal processes not strongly incurved (p); tentorial crossbar completely absent (a); prementum simple (p); basigalea defined (p); Rc in wings without defined inner area (A1); tarsomeres 1–3 not lobate (a), 4 not diminished (p). ..... **III. Malachiinae stat.nov.**

– Tormal processes strongly incurved (a); tentorial crossbar strongly reduced (p); prementum more or less modified (A 2); basigalea fused with mediostipes (A1); Rc in wings with defined inner area (p); tarsomeres 1–3 lobate (p), 4 strongly diminished (a). ..... **IV. Lemphinae stat.nov.**



Tab. 1. Morphological table of the significant body parts of the Malachiidae subfamilies.



Tab. 2. Subfamily classification of the family Malachiidae. Time is not regarded at the diverging points of the branches; the widths of their ends very approximately imply the number of described species. The dagger indicates hypothetical state of a body part. The branches correspond with names of subfamilies in Tab. 1.

I. Amalthocinae subfam.nov.

(Figs 11, 17, 32, 38, 47, 58, 67, 76, 81, 87, 97, 98, 110–113, 121, 127, 134, 168, 213–215, 221, 250, 251, 260–264, 303–306)

Type genus: *Amalthocus* FAIRMAIRE, 1886.

Description. General facies: Species rather resembling some Melyridae, they are the most heavily sclerotised of all the Malachiidae, with very short pubescence, Melyrid-like in texture and in tendency to form elytral costae, with very typical antenna in which antennal segments 6–10 are gradually enlarged and tend to form a loose club (Fig. 17). In addition, segments 5(6)–10 are, probably with no exception, darkened. Only quite exceptionally (e.g. *Falsoanthocomus cyaneonotatus* PIC) do the front femora possess a short ciliate projections.

Habitus (Fig. 11) mostly not very elongate, with entire elytra, integument usually densely punctate, shortly and densely pubescent; excitators do not occur, exceptionally on front femora, extrusible glands hard to locate.

Head without strongly prominent eyes, excitators on cranium never occur, occipital foramen transverse, tentorial cross- bar well developed (Fig. 38), antenna in general (Fig. 17) long, excitators on antenna never present, scapus and pedicel simple, flagellum uniformly serrate (P1), apical antennal segment ovate, always lighter, antennal club slightly indicated; labrum transverse, tormal process simple (Fig. 47); mandible with penicillus; maxilla (Fig. 58) with strongly transverse basistipes, palpifer very big (P2), excitators on maxillary palpi never occur, terminal segment of maxillary palp longer than preceding, mediostipes with well divided basigalea, lacinia fully moveable; labium (Fig. 67) with mentum not reduced, prementum with premental notch, ligula with longer pubescence, labial palpus composed of strongly elongate segments, terminal segment of labial palpus very long.

Prothorax never with pronotal collar, pronotum never with excitators but always with deep impressions (A1), hypomeron strongly developed and fused with broad prosternum (P1), epimeron (hypomeral process) absent, sternopleural suture absent (A1), prosternal intercoxal process absent, cryptosternum well developed, prosternal apophysis long (Fig. 76); mesosternum (Fig. 134) only slightly reduced mesothoracic intercoxal process; elytron complete, rather heavily sclerotised (P1), never with excitators, sometimes with costae (P1), puncturation dense, epipleuron complete (Fig. 87).

Wing (Figs 97–98) with typically reduced radial cell (as in the Melyridae) (A1), radiomedial vein in radial sector indistinct, medial vein M1 not indicated, anal veins 4A–1A occur, anal cell absent, axillary lobe distinct.

Legs (front femora in ♂) very rarely with excitators, tarsomeres (Figs 111–113) with strongly elongate basitarsus, tarsomeres 2–4 lobate (A1), 4 always strongly diminished (as in the Lemphinae), claws without complete membranous appendages, which are more or less sclerotised (A1), front tarsomeres never with tarsal comb.

♂: Pygidium (Fig. 162) simple, sterna II–VII never with excitators; sternum VIII (Figs 213–214) simple; spicular fork (Figs 250, 251) without setae, almost annular; tegmen (Figs 260–264) with more or less developed dorsal wall, with more or less

reduced basal ring, apex with numerous setae, sometimes emarginate (P1); phallus (Figs 303–306) very simple, resembling that in some Melyridae (e.g. *Melyrodes*) (P1).

♀: pygidium (Fig. 168) simple, sternum VIII simple, too (Fig. 221); reproductive organs resemble those in the Pagurodactylinae (see Fig. 316).

Malpighian tubules unknown but most probably 4 in number as in the Pagurodactylinae.

Differential diagnosis. See Analytical key and Tabs 1, 2.

Remarks. The subfamily is undoubtedly the most ancestral group of the Malachiidae. Amalthocinae seem to have direct common ancestors with the Melyridae (s.str.) and close relationships to Pagurodactylinae. The latter are allopatric with Amalthocinae and occur in South and Central Africa together with most species of the genus *Melyris* s. lato, whereas Amalthocinae occur in the Lemurian region. The Afrotropical region might be just the place of origin of the common Melyrid-Malachiid ancestors, where the greatest number of species of both groups is situated. In addition, the most primitive Malachiidae-Malachiinae, the genus *Apalochrus* ERICHSON, together with allied genera, are also the most distributed taxon in this region.

The genus *Amalthocus* FAIRMAIRE was listed by PIC (1929g) in the family Melyridae and is placed in this paper in the family Malachiidae for the first time.

Distribution. Madagascar.

Checklist of genera

- *Amalthocus* FAIRMAIRE, 1886: 40. **Type species:** *Amalthocus tetraspilus* FAIRMAIRE, 1886: 40, by monotypy. [Figs 214, 251, 264, 306]
  Falsoanthocomus PIC, 1912: 3. **syn.nov. Type species**: *Falsoanthocomus cyaneonotatus* PIC, 1912: 3, by original designation. [Figs 11, 112, 113, 213, 250, 261, 262, 304]

Remarks. The genus *Amalthocus* was listed in the world catalogue in the Melyridae-Melyrinae (PIC 1929), whereas *Falsoanthocomus* was in the Malachiidae (GREINER 1937). In *Falsoanthocomus*, there is no correlation between the elytral costae and terminalia, likewise any other bodyparts. In addition, the structure and coloration of the antenna is very uniform in all species of this subfamily.

II. Pagurodactylinae stat.nov.

(Figs 12–13, 33, 39, 48, 52, 59, 68, 77, 82, 88, 88, 99–101, 114–115, 122, 123)

Pagurodactylini: CONSTANTIN, 2001: 6–8 [in Malachiidae].

Type genus: *Pagurodactylus* GORHAM, 1900.

Description. General facies: Mostly variegated, rather heavily sclerotised species without cuticular modifications and with extrusible glands hard to locate on dried specimens; resemble at the first sight some Dasytidae, with which they have been associated for a long time.

Habitus (Figs 12, 13) mostly elongate, mostly with complete elytra, integument variably punctate and pubescent; excitators rarely occur on antennae, extrusible (defensive) glands present though reduced.

Head with moderately prominent eyes, excitators on cranium never occur, occipital foramen not transverse (Fig. 33), tentorial cross-bar well developed (Fig. 39), antenna in general long, excitators on antenna sometimes present, scapus and pedicel simple, flagellum sometimes modified, apical antennal segment mostly ovate, antennal club never indicated; labrum transverse, tormal process simple (Fig. 48); mandible (Fig. 52) with penicillus; maxilla (Fig. 59) with elongate basistipes, palpifer minute, excitators on maxillary palpi never occur, terminal segment of maxillary palp as long as preceding, mediostipes with well-divided basigalea, lacinia fully moveable; labium (Fig. 68) with unreduced mentum, prementum with premental notch, ligula with longer pubescence, labial palpus consists of more or less elongate segments, terminal segment of labial palpus long.

Prothorax never with pronotal collar, pronotum never with excitators, sometimes with deeper impressions (Fig. 12), hypomeron well developed, epimeron (hypomeral process) absent, sternopleural suture present, prosternum not narrow, prosternal intercoxal process present, cryptosternum well developed, prosternal apophysis long (Fig. 77); mesosternum (Fig. 134) with defined mesothoracic intercoxal process; elytron mostly complete, weakly sclerotised, neither with excitators nor with costae, puncturation variable, epipleuron almost absent (Fig. 88).

Wing (Figs 99–101) with reduced (Figs 98, 101) or complete (Fig. 99) radial cell, radiomedial vein in radial sector mostly distinct, medial vein M1 not indicated, anal veins 4A–1A occur, anal cell absent, axillary lobe distinct.

Legs (front femora in ♂♂) with scattered short spinules along innerside, tarsomeres (Figs 114–115) with basitarsus not markedly elongate, tarsomeres 2–4 neither lobate nor diminished, claws (Figs 122, 123) asymmetrical, with or without membranous appendages, which are never sclerotised, front tarsomeres never with typically common tarsal comb.

♂: Pygidium mostly modified, sterna II–VII never modified; sternum VIII (Fig 216) always modified; spicular fork (Fig. 252) with setae, almost annular, nearly as in the Amalthocinae; tegmen (Figs 265, 266) always with enlarged and divided base, with developed dorsal wall, with reduced basal ring, apex always emarginate, with setae; phallus (Figs 308, 309) in side view with bent enlarged base and distinctive structure of inner sac.

♀: pygidium and sternum VIII slightly modified; reproductive organs with compact spermathecal capsule (Fig. 316).

Malpighian tubules 4 in number (Fig. 320).

Differential diagnosis. See Analytical key and Tabs 1, 2.

Remarks. This is a sister group to the Amalthocinae but they make the latter monophyletic with the Malachiinae. Recently the group was revised by R. Constantin (CONSTANTIN 1989, 2001), which is why the number of illustrations is very limited here; they are to be found in the above papers.

Both genera, *Pagurodactylus* and *Dasytophasis*, were listed by PIC (1937g) and all subsequent authors in the Dasytidae, and are placed now in the Malachiidae.

Distribution. Southern and Central Africa.

Checklist of genera

- *Capidactylus* CONSTANTIN, 2001: 14. **Type species**: *Capidactylus cleroides* CONSTANTIN, 2001: 15, by original designation.

Remarks. The number of 4 in the male front tarsi is a homoplasy among many of the Malachiinae but obviously autapomorphy within the Pagurodactylinae.

- *Championytes* CONSTANTIN, 2001: 16. **Type species:** *Dasytes stellatus* CHAMPION, 1923b, by original designation.
- *Dasytophasis* CHAMPION, 1923b: 384. **Type species:** *Dasytophasis capicola* CHAMPION, 1923b: 385 [synonym to *Pagurodactylus donceeli* PIC, 1907e: 132], by monotypy.

Remarks. This is the most derived genus of the Pagurodactylinae, due to the strongly modified antenna and sternum VIII. Similarly, there is no implication of an Amalthocinae-like pronotum (as in some *Pagurodactylus*).

- *Endroedygitus* CONSTANTIN, 2001: 13. **Type species:** *Endroedygitus gibbosus* CONSTANTIN, 2001: 13, by original designation.

Remarks. The apomorphicaly angled temples seem correlated with the simple structure of the internal sac and weakly lobate front tarsi.

- *Pagurodactylus* GORHAM, 1900: 78. **Type species:** *Pagurodactylus vitticeps* GORHAM, 1900: 79, by monotypy.

Remarks. The immense variability of habitus is in no way correlated with the internal (terminalia) characters. Several species "point" habitually towards Amalthocinae whereas others towards Malachiinae.

III. Malachiinae stat.nov.

(Figs 34, 40, 49, 53, 60, 69, 70, 78, 83, 84, 89, 102, 116, 124, 128, 129, 136, 253, 267, 268, 311, 317, 319)

Malachiidae: EVERS, 1968: 19.
Malachiina: MAJER, 1987: 807.

Type genus: *Malachius* FABRICIUS, 1775.

Description. General facies: This group has always been recognised as the true Malachiidae with typical malacodermiform body shape and strongly diversified cuticular modifications.

Habitus variable, with complete or strongly abbreviate elytra, integument variably punctate and pubescent; diverse excitators very often occur on various bodyparts, extrusible (defensive) glands clearly visible.

Head with more or less prominent eyes, excitators may occur on cranium, occipital foramen transverse (Fig. 34), tentorium mostly with crossbar absent (Fig. 40) (A1), antenna variable, excitators often present on antenna (A1), scapus and pedicel simple or modified, flagellum often modified (A1), apical antennal segment ovate or short, antennal club sometimes indicated; labrum more or less transverse, tormal processes rather simple (Fig. 49) (A1); mandible (Fig. 53) with penicillus; maxilla (Fig. 60) with big basistipes, palpifer minute, excitators sometimes occur on maxillary palps (A1), terminal segment of maxillary palp about as long as preceding, mediostipes with more or less divided basigalea, lacinia fully moveable; labium (Fig. 68) with unreduced mentum, prementum nearly always with premental notch, ligula with longer pubescence, labial palpus composed of more or less elongate segments, terminal segment of labial palpus more or less elongate.

Prothorax never with distinct pronotal collar, pronotum sometimes with excitators (A1), sometimes with deeper impressions, hypomeron well developed, epimeron (hypomeral process) absent or reduced, sternopleural suture present but prosternum often lies through forks on hypomera (A1), prosternum not very narrow, prosternal intercoxal process diverging, cryptosternum developed or not, prosternal apophysis short or longer; mesosternum (Fig. 136) with more or less defined mesothoracic intercoxal process; elytron complete to reduced to some degree, weakly or rather heavily sclerotised, often with excitators, never with costae, puncturation variable, epipleuron nearly reduced (Fig. 89) otherwise nearly complete.

Wing (Fig. 102) with more or less ovate radial cell (A1), radiomedial vein in radial sector mostly indistinct, medial vein M1 often indicated, anal veins 4A–2A occur, 1A may be present as a mere rudiment, anal cell absent and axillary lobe absent.

Legs (front femora in ♂♂) diversified, tarsomeres (Fig. 116) with basitarsus not strongly elongate, tarsomeres 2–4 never lobate (P1), 4 never distinctly diminished (P1), claws (Fig. 124) with complete (P1), rarely reduced membranous appendages; these are never sclerotised, front tarsomeres often with typical tarsal comb on tarsomere 2 (A1).

♂: Pygidium and sterna II–VII often modified; sternum VIII always modified; spicular fork (Fig. 253) always plate-shaped (A1), its arms more or less reduced, exceptionally with setae; tegmen (Fig. 267) diverse, with more or less reduced basal ring and dorsal wall, sometimes reduced (but never to such degree as in the Carphurinae) and/or fused with the base of phallus, never with enlarged and divided base as in the Pagurodactylinae, never with setae and/or emargination at apex (A1); phallus in side view exceptionally with enlarged base (A1), very often with distinctive structure of inner sac.

♀: Pygidium and sternum VIII sometimes modified; reproductive organs with compact spermathecal capsule (Fig. 317) or moniliform.

Malpighian tubules 5 in number (Fig. 320) (A1).

Differential diagnosis. See Analytical key and Tabs 1, 2.

Remarks. The most important characters of this subfamily are reduced anal veins, typically sclerotised oval Rc, equal tarsomeres and claws nearly always appendiculate; this is all accompanied by typically shaped spiculum and tegmen, with the latter possessing a basal ring which is very often more or less reduced, and the upper wall of

the tegmen is also homologically complete to reduced. The presence of a tarsal comb on the second tarsomere in the male protarsi is a homoplasy among several tribes of the Malachiinae.

The possibility cannot be excluded that the present definition of the subfamily will be slightly changed in the future even though I have examined a comprehensive range of source material for the species.

IV. Lemphinae stat.nov.

(Figs 6–10, 31, 36, 37, 44–46, 51, 56, 57, 63, 66, 74, 75, 86, 94–96, 108, 109, 118, 119, 126, 132, 133, 159–162, 165, 166, 167, 169, 202, 212, 219, 220, 239–249, 256–259, 289–302, 313–315)

Lemphini WITTMER, 1976: 427.

Type genus: *Lemphus* ERICHSON, 1840.

Description. General facies: Habitually very uniform taxa, mainly without excitators.

Habitus (Figs 6–10) mostly not very elongate, resembling the family Dasytidae, with complete elytra, integument mostly sparsely punctated, with long pubescence; cuticular modification occurs very rarely (e.g. *Hypattalus*) on hind legs or abdominal segments, extrusible (defensive) glands usually hard to locate.

Head without strongly prominent eyes, excitators never occur on cranium, occipital foramen transverse, tentorial crossbar strongly reduced (Figs 36, 37), antenna generally not very long, excitators on antenna never present, scapus and pedicel simple, flagellum strongly serrate to longly pectinate, apical antennal segment more or less ovate, antennal club never indicated; labrum transverse, tormal processes (Figs 44, 45) resembling those in the Carphurinae but turned back (A1); mandible (Fig. 51) with penicillus; maxilla (Figs 56, 57) with triangular basistipes, palpifer small, excitators on maxillary palps never occur, terminal segment of maxillary palp longer than preceding, mediostipes with fused basigalea, lacinia moveable; labium (Figs 63, 65) with not reduced mentum, prementum sometimes membranous (A2), with deep premental notch, ligula with longer pubescence, labial palpus consists of more or less elongate segments, terminal segment of labial palpus elongate.

Prothorax (Figs 74, 75) never with pronotal collar, pronotum never with excitators, almost evenly convex, hypomeron well developed, epimeron (hypomeral process) absent, sternopleural suture absent (Fig. 74) or reduced (Fig. 75), prosternum not narrow, prosternal intercoxal process absent, cryptosternum more or less developed, prosternal apophysis long; mesosternum (Fig 132, 133) with only slightly reduced mesothoracic intercoxal process; elytron complete, not heavily sclerotised, neither with excitators nor with costae, puncturation sparse, epipleuron mostly complete (Fig. 86).

Wing (Figs 93–96) with weakly reduced, ovate radial cell, radiomedial vein in radial sector obsolete, medial vein M1 mostly indicated, anal veins 4A–2A to 1A occur, anal cell sometimes indicated (Figs 93, 96), axillary lobe distinct.

Legs (hind tibiae in ♂) very rarely with excitators, tarsomeres (Figs 111–113) with non-elongate basitarsus, tarsomeres 2–3 lobate, 4 strongly diminished (as in the

Amalthocinae), claws with incomplete to absent membranous appendages, front tarsomeres never with comb.

♂: Pygidium (Fig. 162) simple, sterna II–VII rarely with excitators (Fig. 169); sternum VIII (Figs 202–212) very strongly modified; spicular fork (Figs 239–248) more or less modified (A1), often similar to that in the Malachiinae; tegmen (Figs 256–258, 289–291, 292, 295–300) with more or less complete dorsal wall, sometimes even cylindrical (Figs 256, 257) (A1) often fused with phallus at base (Figs 289–292, 295–300), dorsal wall sometimes incomplete but basal ring always complete (e.g. Figs 258, 297–300), apex exceptionally (Fig. 258) with several reduced setae, never emarginate; phallus (Figs 289–302) mostly with complex inner structure of spines in internal sac,

♀: pygidium (Figs 165–166) modified (as correlated in this way with that in the males), sternum VIII (Fig, 218–219) often modified as well; reproductive organs (Figs 313–315), probably always with a vermicular spermathecal capsule that is sometimes sclerotised; seminal canal bears sclerites (Fig. 314) (A1).

Malpighian tubules most probably 6 in number, as in the Carphurinae.

Differential diagnosis. See Analytical key and Tabs 1, 2.

Remarks. This is a distinct sister group to the Carphurinae, clearly ancestral, of "marsupial" distribution, possibly including predecessors of the Carphurinae, but their terminalia are Malachiinae-like. The Lemphinae are very poorly diversified in habitus, but very strongly in the terminalia.

Distribution. Neotropical and Australian regions.

Checklist of genera

- *Brachidia* SOLIER, 1849: 433. **Type species:** *Brachidia ruficollis* SOLIER, 1849: 433, by monotypy [Figs 6, 202, 239, 289, 290].

Remarks. A small, easily recognised taxon with one transformation series of the terminalia only. There is an interesting parallel character in the length of the antennal scape which is stable in *Brachidia* but only tends to be so in *Hypattalus* BLACKBURN, 1894.

- *Engilemphus* WITTMER, 1976: 438. **Type species:** *Cryptotarsus metallicus* WITTMER, 1942 [synonym to *Attalus boliviensis* PIC, 1907c] by original designation [Figs 9, 95, 210, 247, 299, 314].
  Flabellolemphus WITTMER, 1976: 439. **syn.nov. Type species:** *Dromanthus minutus* PIC, by original designation [Figs 211, 248].
  Oxylemphus WITTMER, 1976: 444. **syn.nov. Type species:** *Oxylemphus azureus* WITTMER, 1976, by original designation [Figs 161, 169, 208, 245, 297].
  Pygolemphus WITTMER, 1976: 445. **syn.nov. Type species:** *Pygolemphus fossulatus* WITTMER, 1976 (♂), by original designation. *Pygolemphus fossulatus* WITTMER, 1976 (♀) is **syn.nov.** to *Oxylemphus azureus* WITTMER, 1976 (♂).

Remarks. There are probably only two transformation series of each pygidium and sternum VIII; *Engilemphus* has the closest relationships to *Lemphus*. The type species of the genera *Engilemphus*, *Oxylemphus*, and *Flabellolemphus* share

common morphocline of sternum VIII and pygidium (compare Figs 161–163, 208–211). Moreover, there is a synonymy between the type species of *Oxylemphus* and *Pygolemphus*.The latter is a female whereas the former is a male of the same species. An example of the inapplicability of the pectinate antenna as a lone character through which to erect a genus occurs in the species *E. atrocinctus* and *E. minutus*. They have different transformation series of sternum VIII, ♂, but almost identical antennae. If subgenera in *Engilemphus* were to be erected, then all the generic names above would be out of use.

- *Hypattalus* BLACKBURN, 1894: 208. **Type species:** *Hypattalus punctulatus* BLACKBURN, 1894: 208 (♀), by monotypy [Figs 167, 315].

Remarks. There is a single autapomorphy only *viz*. the broadly lobate ends of sternum VIII, ♂. Together with the long basal corners of the pygidium, this represents a special morphocline. The two characters seem correlated with the antenna. Both the phallus and the pronotum are strongly variable.

- *Lemphus* ERICHSON, 1840: 131. **Type species:** *Lemphus mancus* ERICHSON, 1840, by monotypy [Figs 31, 51, 86, 118, 160, 205, 242, 256, 293].
  Syn. *Cryptotarsus* KIRSCH, 1865: 88. **Type species:** *Cryptotarsus tropicus* KIRSCH, 1865, by monotypy [Figs 109, 206, 243, 257, 294, 295].
  Syn. *Dromanthus* GORHAM, 1882: 121. **Type species:** *Dromanthus opacus* GORHAM, 1882: 122, by original designation [Figs 166, 219, 313].

Remarks. This is a very variable and diversified taxon with close relationships to *Neolemphus* WITTMER, 1976. There seem to be at least three transformation series of sternum VIII. The female transformation of the hind leg in many species is not correlated with internal characters, but it seems to be a unique paradox in all the Malachiidae , where the modifications are in principle associated with the male sex.

The genera *Cryptotarsus* and *Dromanthus* have not only been very reasonably synonymised with *Lemphus* but, in addition, they belong in the latter genus s.str., as they share the same morphocline of sternum VIII and pygidium. If subgenera were to be erected, other generic names would have to be used.

- *Neolemphus* WITTMER, 1976b: 440. **Type species:** *Neolemphus varipes* WITTMER, 1976: 441, by original designation [Figs 7, 44, 74, 159, 203, 240, 291].

Remarks. There are several species (e.g. *N. ruficeps* PIC), that tend to have a typical *Lemphus*-like appearance, likewise a longer tegmen and more explanate elytral sides. The reduced basal corners of the pronotum and totally different transformation series of sternum VIII, ♂ should be enough to separate *Neolemphus* from *Lemphus*. There are at least two transformation series of sternum VIII and one of the pygidium in *Neolemphus*.

V. Carphurinae

(Figs 1–5, 14–16, 18–29, 30, 35, 41–43, 50, 54, 55, 61, 62, 71–73, 79, 80, 85, 90–92, 103–107, 117, 125, 130, 131, 137–158, 164, 170–201, 217, 222–238, 269–288, 310, 312, 318)

Carphurinae CHAMPION, 1923a: 1 [in Melyridae]
Carphuridae: EVERS, 1968: 21 [in Cleroidea]
Carphurini: WITTMER, 1968: 348 [in Malachiidae]
Carphurina: MAJER, 1987: 807 [in Melyridae Malachiinae]

Type genus: *Carphurus* ERICHSON, 1840.

Description. General facies: Many species resemble some Cantharidae; females of Carphurinae are sometimes confused with Dasytidae. Nevertheless, because of reasonably easily visible extrusible glands and male basitarsi, Carphurinae are mostly easily recognised.

Habitus (Figs 1, 2, 4) mostly elongate, cylindrical, with significantly abbreviate elytra (A1), integument mostly sparsely punctate and sparsely pubescent; excitators sometimes occur, extrusible glands not very distinct, usually more than two pairs on abdomen (see EVERS 1968) (A4).

Head usually with prominent eyes, excitators on cranium sometimes occur, occipital foramen rather ovate (Fig. 30) (A1), tentorium of clear outline (A3), tentorial crossbar completely absent (Fig. 35), antenna in general (Figs 2, 14–16) long, excitators on antenna never present, scapus often modified (Figs 14–16, 18–29), pedicel of variable size, flagellum filiform to pectinate, apical antennal segment elongate to shortly ovate, antennal club never indicated; labrum transverse, tormal process acuminate and more or less turned up (Figs 14–16); mandible (Fig. 50) often without penicillus (A1); maxilla (Figs 54, 55) with transverse basistipes, palpifer extensive, excitators on maxillary palps never occur, terminal segment of maxillary palp smaller than preceding, mediostipes fused with basigalea (Figs 54, 55), lacinia sometimes fused with the former (Fig. 54); labium (Figs 61, 62) with reduced mentum (A1), prementum without premental notch, ligula with short pubescence, labial palpus composed of annulate segments (A3), terminal segment of labial palpus very short.

Prothorax sometimes with pronotal collar (Fig. 72) (A1), pronotum rarely with excitators, hypomeron extremely reduced (A3), hypomeral process absent, sternopleural suture absent, prosternum very narrow (A3), prosternal intercoxal process and cryptosternum absent, prosternal apophysis long (Figs 71, 73); mesosternum (Figs 130, 131) with reduced mesothoracic intercoxal process; elytron abbreviate, sometimes with excitators, never with costae, puncturation mostly sparse, epipleuron nearly absent.

Wing (Figs 90–93) with mainly distinct elongate radial cell (P1), radiomedial vein in radial sector mostly reduced, medial vein M1 mostly indicated, anal veins 4A–2A present, anal cell reduced, axillary lobe absent.

Legs rarely with excitators, tarsomeres (Figs 103–107) with elongate basitarsus, tarsomeres 2–4 lobate (A1), 4 exceptionally (Fig. 106) diminished (as in the Lemphinae), claws without appendages, front basitarsi (♂, exceptionally also ♀) with tarsal comb (A1) which could be strongly reduced.

♂: Male pygidium mostly transverse, sometimes reduced and/or modified (Figs 137–158) sterna II–VII never with excitators; sternum VIII (Figs 170–201) often transverse, reduced, but not strongly modified; spicular fork (Figs 222–238) more or less roof-shaped (A1); tegmen (Figs 269–288) very strongly reduced (A1), without dorsal wall (exceptionally present as very reduced, e. g. Figs 273, 275), with very strongly reduced basal ring; phallus (Figs 269–288) with broadened, ovate base and more or less open dorsally (A1), exceptionally (secondarily) divided in 4 parts (Fig. 269) (A3).

♀: pygidium (Fig. 164) sometimes modified, sternum VIII sometimes modified as well (Fig. 217); reproductive organs with moniliate spermathecal capsule, seminal canal probably always membranous.

Malpighian tubules six in number (P1).

Differential diagnosis. See Analytical key and Tabs 1, 2.

Remarks. There is no doubt about the placement of this subfamily in the family Malachiidae: the Carphurinae are monophyletical through the Lemphinae and Pagurodactylinae with the Malachiinae. For example, one significant character is the concealed mediostipes and basigalea in both the Carphurinae and the Lemphinae. An absence of the penicillus in some species likewise the unusual morphology of the ventral side of the prothorax and, the terminalia, cannot provide full family rank for the Carphurinae. Similarly, the paired and numerous extrusible glands on the abdomen are of no value at family rank. The number of abdominal sterna (EVERS 1968) is irrelevant as it is the same (six) over the whole "Melyrid stock". Particularly, wings in general and tarsi, together with some tendency in the terminalia, make the Carphurinae a sister group to the Lemphinae. I consider the Carphurinae the group deviating most from the basic evolutionary plan of the Malachiidae, as a mixture of some almost plesiomorphic (e.g. spicular fork) and many autapomorphic characters. This group is, together with the Lemphinae, of Gondwanan origin.

Distribution. In all temperate zones excepting the Neotropical; only a very few species occur in the Nearctic region.

Checklist of genera

Most of the type species (even the type specimens) of respective genera have been dissected and illustrated, which should make any further revision of this group much easier, but the number of species dissected here did not allow the provision of particular generic definitions. As in other groups of the Malachiidae, respective genera should be erected primarily upon different transformation series of the terminalia, especially the male sternum VIII.

- *Apteromalachius* WITTMER, 1960: 123. **Type species:** *Apteromalachius namibensis* WITTMER, 1960: 123, by original designation.

Remarks. *Carphuroides ovambo* WITTMER, 1985: 394 (♂) [Figs 1, 19, 171, 225, 271, 271], is a **syn.nov.** to *Apteromalachius namibensis* WITTMER, 1960: 124 (♀).

Apteromalachius is very similar to *Carphuroides* but has different antennal base and terminalia. *Apteromalachius* was erected upon a single staphylinoid-like

female, whereas winged male specimens were described as a new *Carphuroides* species.

- *Balanophorus* MCLEAY, 1872: 267. **Type species:** *Balanophorus mastersi* MACLEAY, 1872: 267, by monotypy [Figs 152, 197, 236, 286].

Remarks. This is a problematic genus as available material for dissection was scarce. The presence of combs in females of the two species examined is unlikely to be correlated with the male terminalia.

- *Brachyhedybius* PIC, 1917b: 10. **Type species:** *Brachyhedybius sinuatus* PIC, 1917b: 10, by monotypy [Figs 156, 199 288].
  Carphurus subg. *Paracaraphurus* WITTMER, 1953: 218. **syn.nov. Type species:** *Carphurus (Paracarphurus) appendicifer* WITTMER, 1953: 219, by original designation [Figs 25, 283].
  Thoraxocarphurus WITTMER, 1957: 351. **syn.nov. Type species:** *Carphurus rhytideres* LEA, 1902: 481, by original designation [Figs 24, 148, 190, 282].

Remarks. Holotype, ♂ of the type species of *Thoraxocarphurus* WITTMER has excitators on pronotum and is extremely similar even in shape and coloration to *Brachyhedybius sinuatus* which is a ♀ with simple pronotum or *B. sinuatus*, which is the reason for my interpretation of this genus. *Paracarphurus* was erected upon modified elytra alone. The species *B. sinuatus* and *B. appendicifer* are very closely allied. Even if subgenera were to be defined some day, *Paracarphurus* still remains synonymous with *Brachyhedybius*. The species *Carphurus productus* WITTMER is the only Carphurinae species known to me so far in which the protarsal comb is so extremely reduced that it is composed only of several tiny spinules. This species is a.o. a representative of a distinct species group with both modified head and elytral sides.

- *Carphuroides* CHAMPION, 1923a: 45. **Type species:** *Helcogaster pectinatus* SHARP, 1885: 157, by original designation [Figs 54, 61, 71, 130, 172, 224, 270].
  Asiocarphurus WITTMER, 1981: 231. **syn.nov. Type species:** *Asiocarphurus bhaktai* WITTMER, 1981: 231, by original designation [Figs 173, 223, 270].

Remarks. Rather heterogeneous taxon that could be further divided into more subgenera according to the morphoclines of the phallus, the shape of which is possibly correlated with that of the antennae, e.g. in the species *Carphuroides talhouki* WITTMER, the latter very strongly resemble a *Lobonyx* species (Prionoceridae). The genus *Asiocarphurus* was defined upon the shape of pronotum alone, not correlated with any other characters.

- *Carphuromorphus* PIC, 1917b: 7. **Type species:** *Carphuromorphus validicornis* PIC, 1917b: 7, by monotypy [Figs 21, 144, 185, 232, 280].

Remarks. The swollen antennal scape is accompanied by distinctive shape of the phallus (Fig. 280), also the shape of male sternum VIII (Fig. 185) seems different. Nevertheless, the genus might be further synonymised with *Microcarphurus*.

- *Carphurus* ERICHSON, 1840: 132. **Type species:** *Carphurus dispar* ERICHSON, 1840: 133 (♂ nec ♀), by subsequent designation (CHAMPION, 1923a) [Figs 4, 15, 153, 193, 234, 284].

Remarks. The genus is based on the transformation series of sternum VIII, ♂ whereas it includes several morphoclines of the pygidium.

- *Choresine* PASCOE, 1860: 36. **Type species:** *Choresine advena* PASCOE, 1860: 36, by monotypy [Figs 228, 275].
  Syn. *Carphurotroglops* PIC, 1917a: 15. **Type species:** *Carphurotroglops pulcher* PIC, 1917a, by monotypy.

Remarks. The transformation series of the male sternum VIII (Fig. 180) is unique within all the Malachiidae.

- *Falsolaius* PIC, 1917b: 6. **Type species:** *Falsolaius curtipennis* PIC, 1917b: 6 (♂), by monotypy [Figs 139, 179, 227, 274].
  Syn. *Luzonotroglops* PIC, 1924: 230. **Type species:** *Luzonotroglops carinatus* PIC, 1924: 230, by monotypy [Figs 178, 226, 273].

Remarks. Synonymization of *Luzonotroglops* is rather problematic, as it has a different phallus (scarcely bent in side view, Fig. 274), and a spiculum (Fig. 226) non-compact at the apex, also sternum VIII is far less transverse. In addition, I have examined only two species from a long species series that have recently been placed in this genus.

- *Helcogaster* BOHEMAN, 1859: 81. **Type species:** *Helcogaster brachypterus* BOHEMAN, 1859, by monotypy [Figs 154, 238, 287, 310].

Remarks. The uniquely modified sternum VIII is an autapomorphy although the original conception of this genus was quite different. No type specimen of the type species has been examined, but several specimens from the Lea collection identified by him as *H. brachypterus*.

- *Microcarphurus* PIC, 1917b: 7, **genus validated. Type species:** *Microcarphurus borneensis* PIC, 1917b, by monotypy [Figs 141, 182, 277].
  Carphurus subg. *Brevecarphurus* PIC, 1950: 6. **syn.nov. Type species:** *Carphurus* (*Brevecarphurus*) *latetestaceus* PIC, 1950: 6 (♀), by monotypy.
  Scelocarphurus WITTMER, 1961: 179. **syn.nov. Type species:** *Carphurus tibiellus* WITTMER, 1955: 218, by original designation [Figs 143, 184, 231, 279].

Remarks. *Microcarphurus* was synonymised by WITTMER (1973b: 300) with *Carphurus*. I consider the genus *Microcarphurus* very distinct because of its completely different terminalia, antennal segments, body size, etc. The genus is quite well defined not only by its particular transformation series of antenna, pronotum and protarsal comb, but chiefly by its pygidium and sternum VIII. The modified hind tibiae in *Scelocarphurus* are not a subject of generic autapomorphy and, as usual, are not correlated with any other characters. The unique holotype, ♀, of *Brevecarphurus latetestaceus* that I have seen undoubtedly belongs in *Microcarphurus*.

- *Neocarphurus* LEA, 1898: 580. **Type species:** *Neocarphurus chlorops* LEA, 1898: 580 (♂), by present designation [Figs 312–326].

Remarks. Three species were usable as type species: *Carphurus impunctatus* LEA, 1895: 249, *Helcogaster tuberculatus* LEA, 1895: 246, and *Neocarphurus chlorops* LEA, 1898: 580.

The unique female holotype of *Neocarphurus impunctatus* is of the same size, body-shape and coloration as the species *Carphurus dentaticornis* CHAMPION and might belong in the proximity of *Brachyhedybius*.

The unique holotype male of *Helcogaster tuberculatus* has a badly damaged abdomen (probably eaten by *Anthrena*) and only a basal part of the phallus is preserved. Its less constricted pronotum and more serrate antenna should place it rather near to *Helcogaster*.

The unique holotype male of *N. chlorops* is so far the only well-preserved male specimen for examination. Lea, in his original description of *Neocarphurus*, emphasises the very strongly constricted pronotum, which is just the case with this species. Thus, *Neocarphurus* seems to be a valid genus related (according to both the terminalia and habitus) to *Choresine* and *Falsolaius*.

- *Telocarphurus* WITTMER, 1939: 30. **Type species:** *Telocarphurus drescheri* WITTMER, 1939: 31, by original designation [Figs 174, 272, 272].

Remarks. Very closely allied with *Carphuroides*, with which it even shares a common transformation series of sternum VIII, but the antenna and other terminalia are different. This genus might be synonymised after a revision of the group. The species *T. eglini* WITTMER shows a Lemphinae-like sternum VIII and phallus, but other terminalia and other bodyparts display common *Telocarphurus* characters. *T. drescheri* is a rather anomalous species, due to its large, almost glabrous eyes, but the terminalia comport with those in other species.

Conclusions

The present paper is the first contribution towards a knowledge of the Malachiidae based on current morphological analysis. [*A situation in 1998; editorial note.*] It is paradoxical that dissection of Malachiidae specimens has been adopted in for almost the first time within the present paper, although this approach has been quite normal in most coleopteran families for at least fifty years. The amazing proliferation of new genera and species during a century and half, often with scrawny descriptions by some describers as M. Pic, are not among the least reasons which made this difficult before the setting of modern collections.

The task of adults is first of all reproduction so that morphological diversification, at least up to generic rank, is passed through the structure of copulatory organs, while the larvae points towards feeding and the most modified structures occur on the head, chiefly mouthparts.

It is worth mentioning that there are some genera, especially in the subfamily Malachiinae, that display analogical complexity of the terminalia as do, for example, the family Cantharidae. Extrusible glands are possibly of defensive function as one of the autapomorphies of the Malachiidae within the "Melyrid stock", but they also occur in some other coleopteran families outside of Cleroidea. However, in the subfamilies Amalthocinae and Pagurodactylinae, they are reduced in size. From the viewpoint of their function, a very simple explanation may be offered: the more heavily the body is

sclerotised the less easily are the glands seen. This applies neatly within the five subfamilies.

The paper of mine already mentioned (MAJER 1994), contribute a familial classification of the Melyridae as formerly conceived (i.e. the so-called "Melyrid stock") and emphasize the familial rank given to the family Malachiidae. A comprehensive account of the Malachiidae would now need the revision of the particular tribes of the subfamily Malachiinae.

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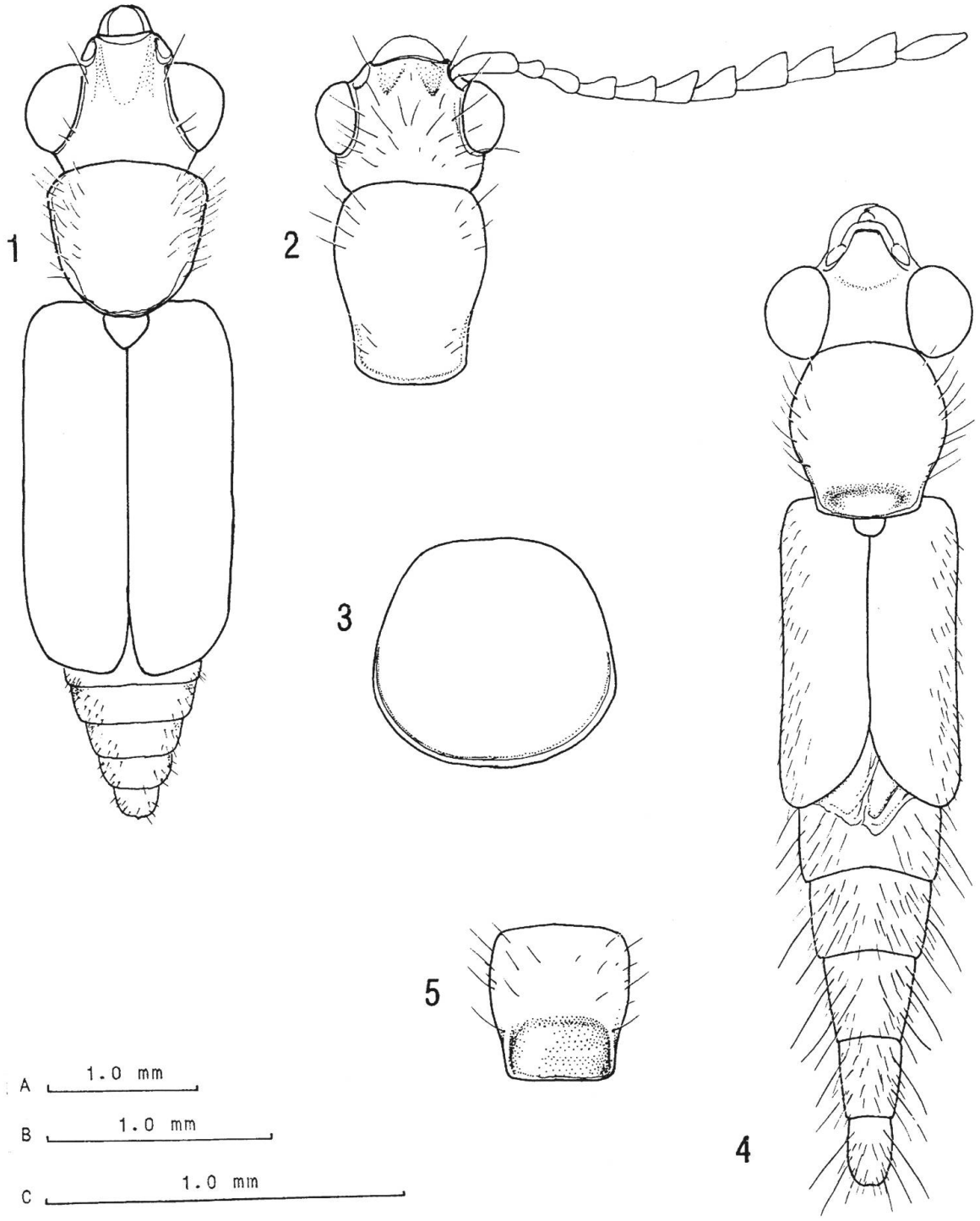
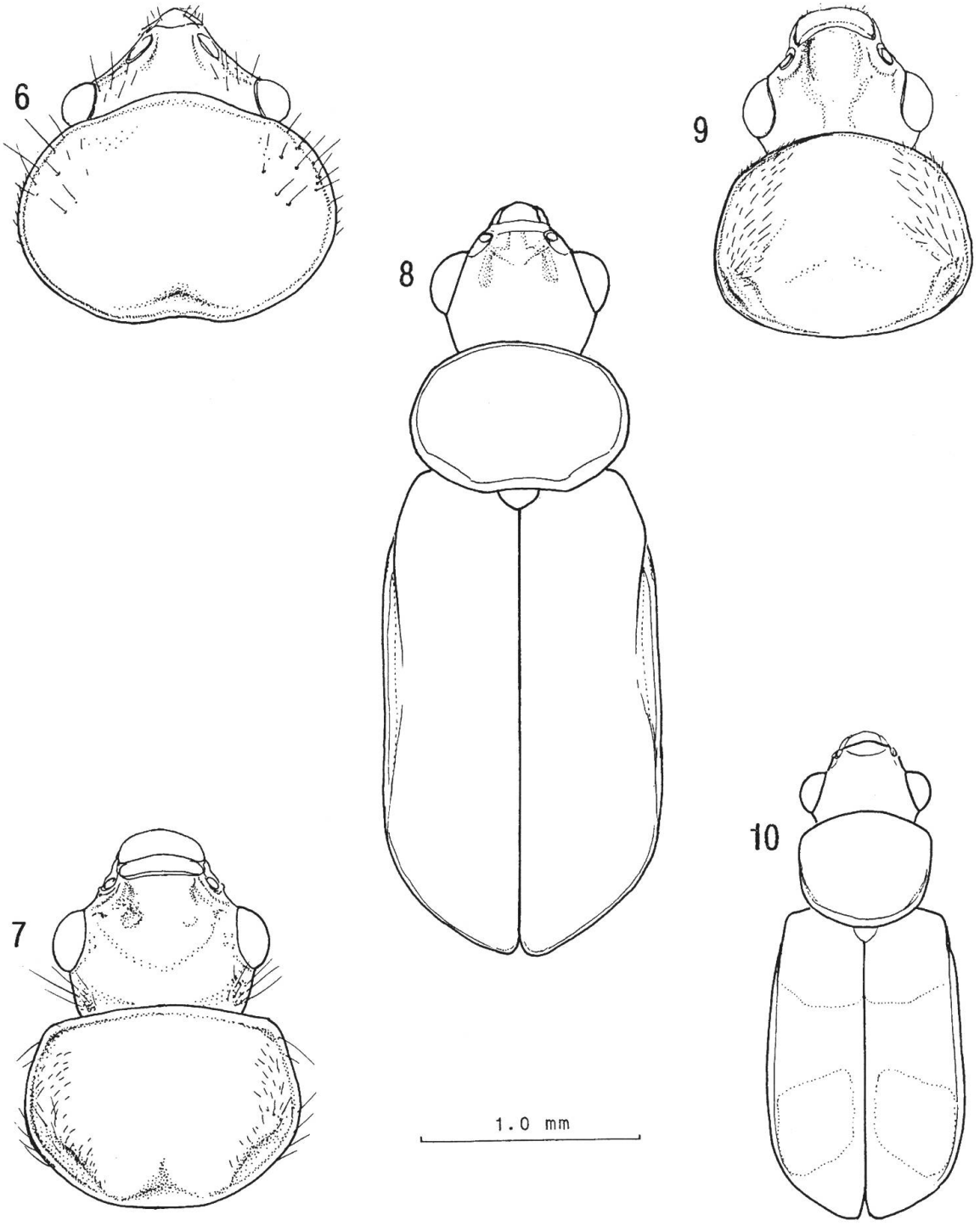
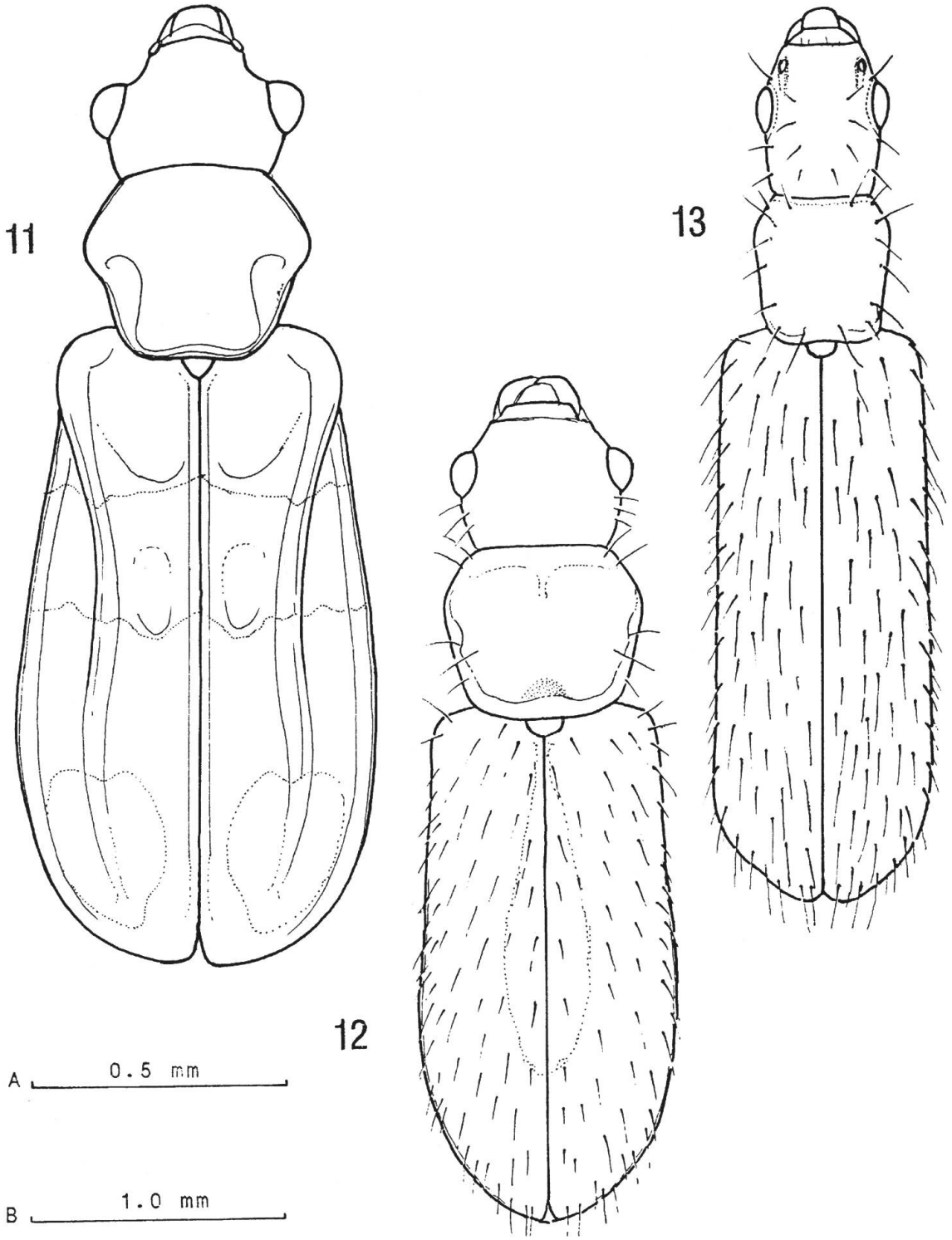
Address of author's family:
The Majer's
Osová 4
625 00 Brno
CZECH REPUBLIC



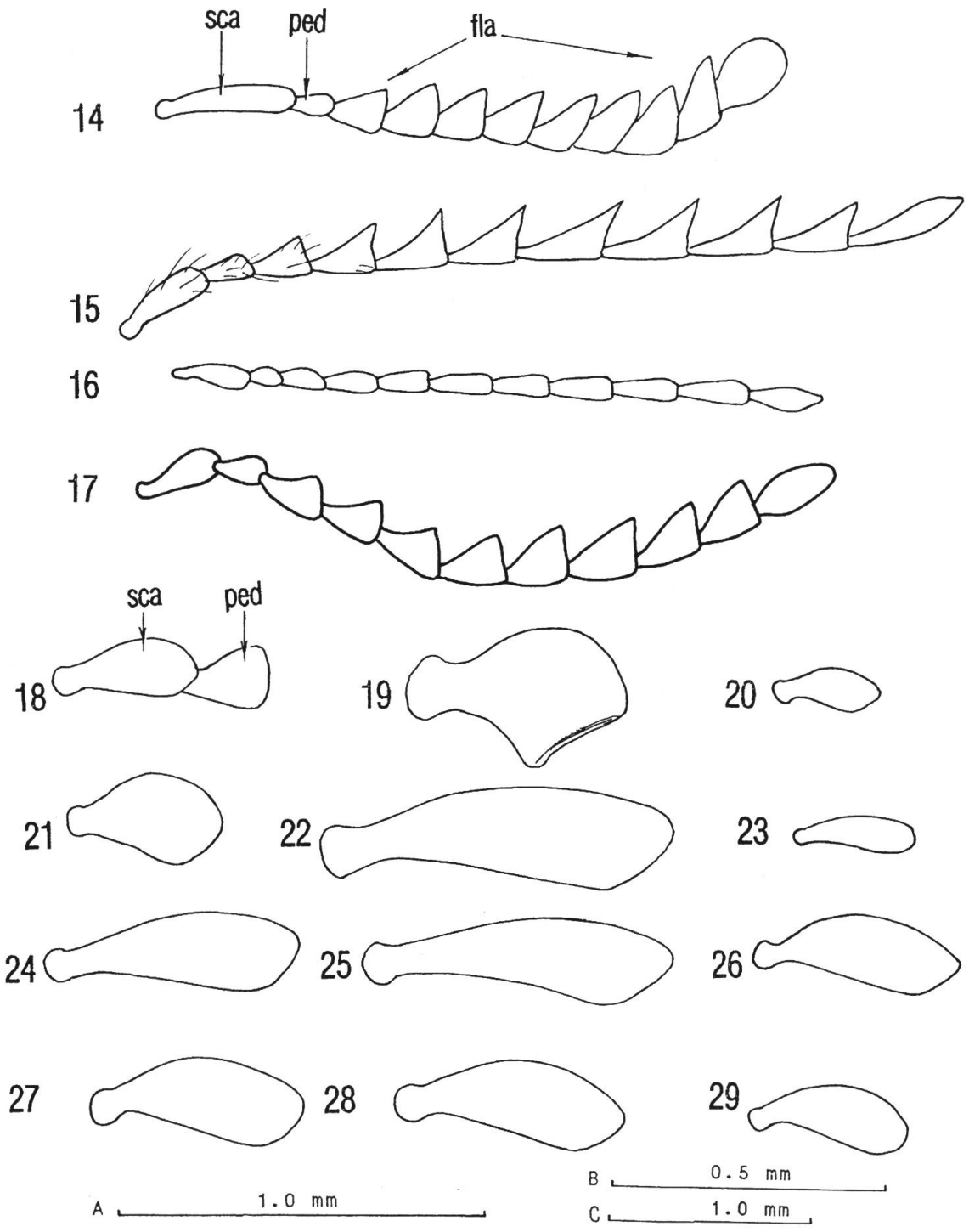
Figs 1–5 (1, 2, 4 habitus; 3, 5 pronotum)**:** 1, *Apteromalachius namibensis* WITTMER, ♂; [paratype of *C. ovambo* WITTMER]. 2, *Carphurus testaceolimbatus* WITTMER, paratype ♂. 3, *Carphurus coriaceipennis* WITTMER, paratype ♂. 4, *Carphurus dispar* ER., lectotype ♂. 5, *Carphurus vittiensis* WITTMER, paratype ♂. Scales: A = 1; B = 4, C = 2, 3, 5.



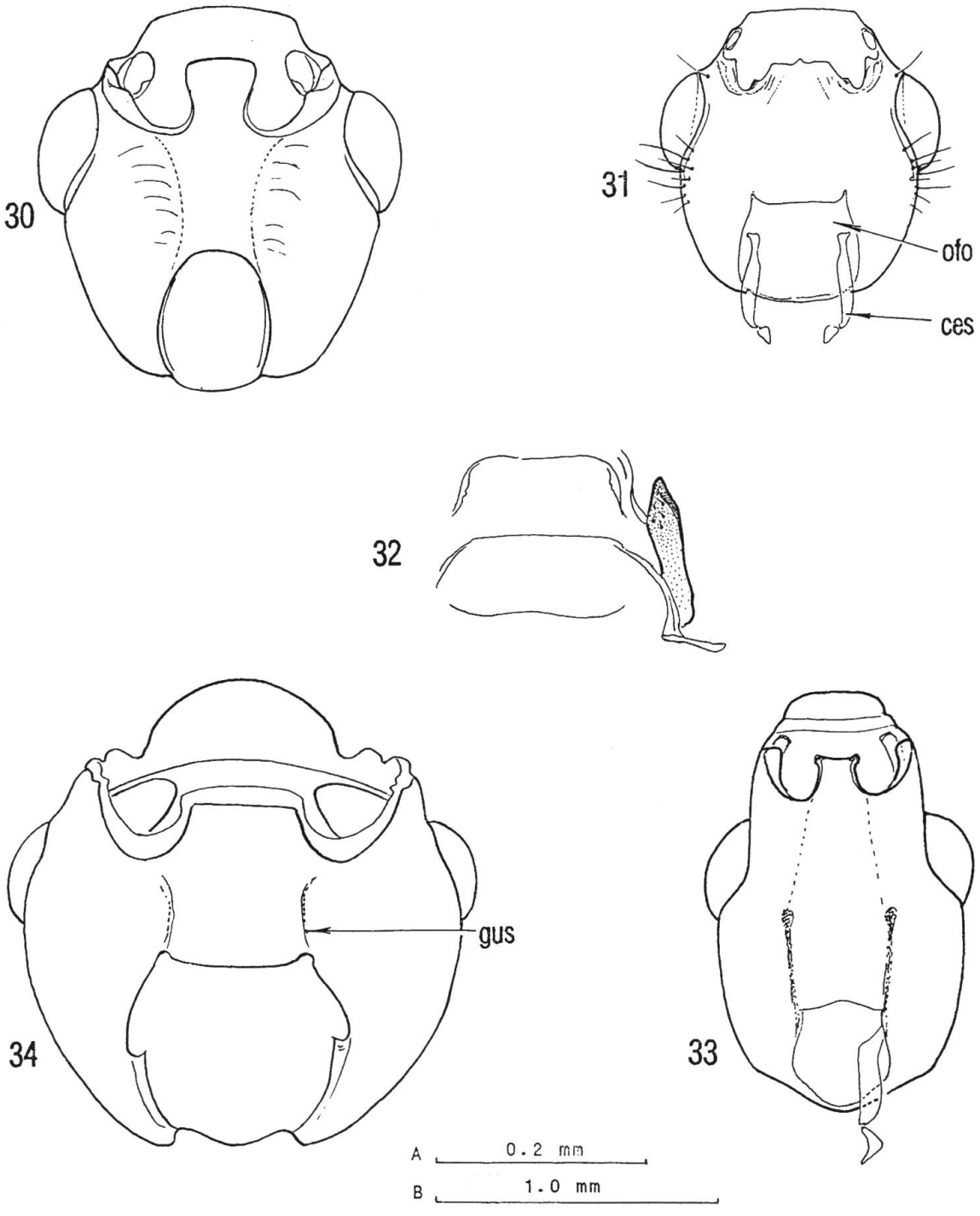
Figs 6–10, habitus: 6, *Brachidia ruficollis* SOLIER, ♂. 7, *Neolemphus varipes* WITTMER, paratype ♂. 8, *Lemphus rubricollis* WITTMER, paratype ♂. 9, *Engilemphus boliviensis* (PIC), ♂. 10, *Hypattalus alphabeticus* LEA, ♂.



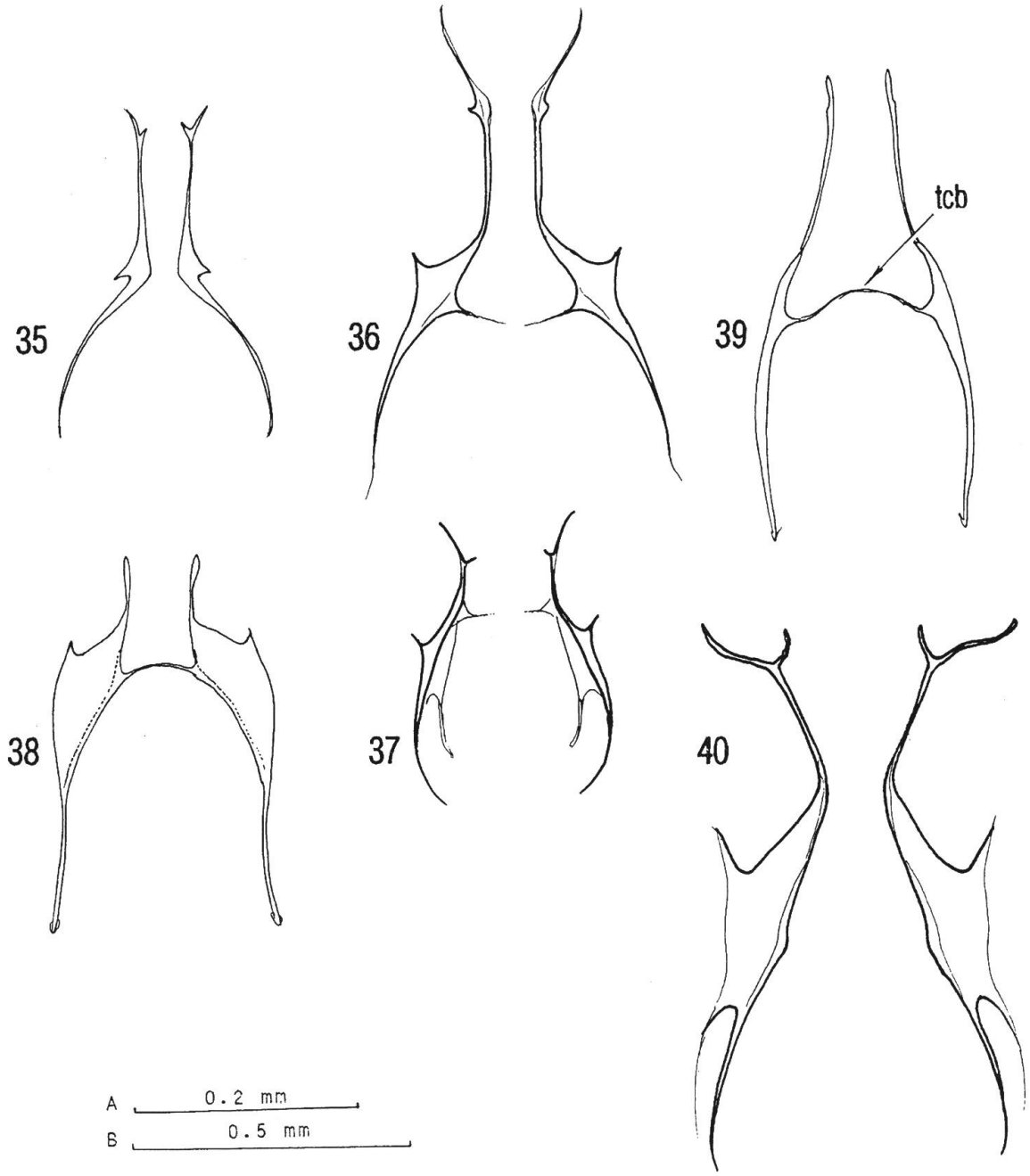
Figs 11–13, habitus: 11, *Falsoanthocomus cyaneonotatus* PIC, paralectotype ♂. 12, *Pagurodactylus fibulatus* CHAMP., ♂. 13, *Dasytophasis wittmeri* CONSTANTIN, ♂. Scales: A = 12, B = 11, 13.



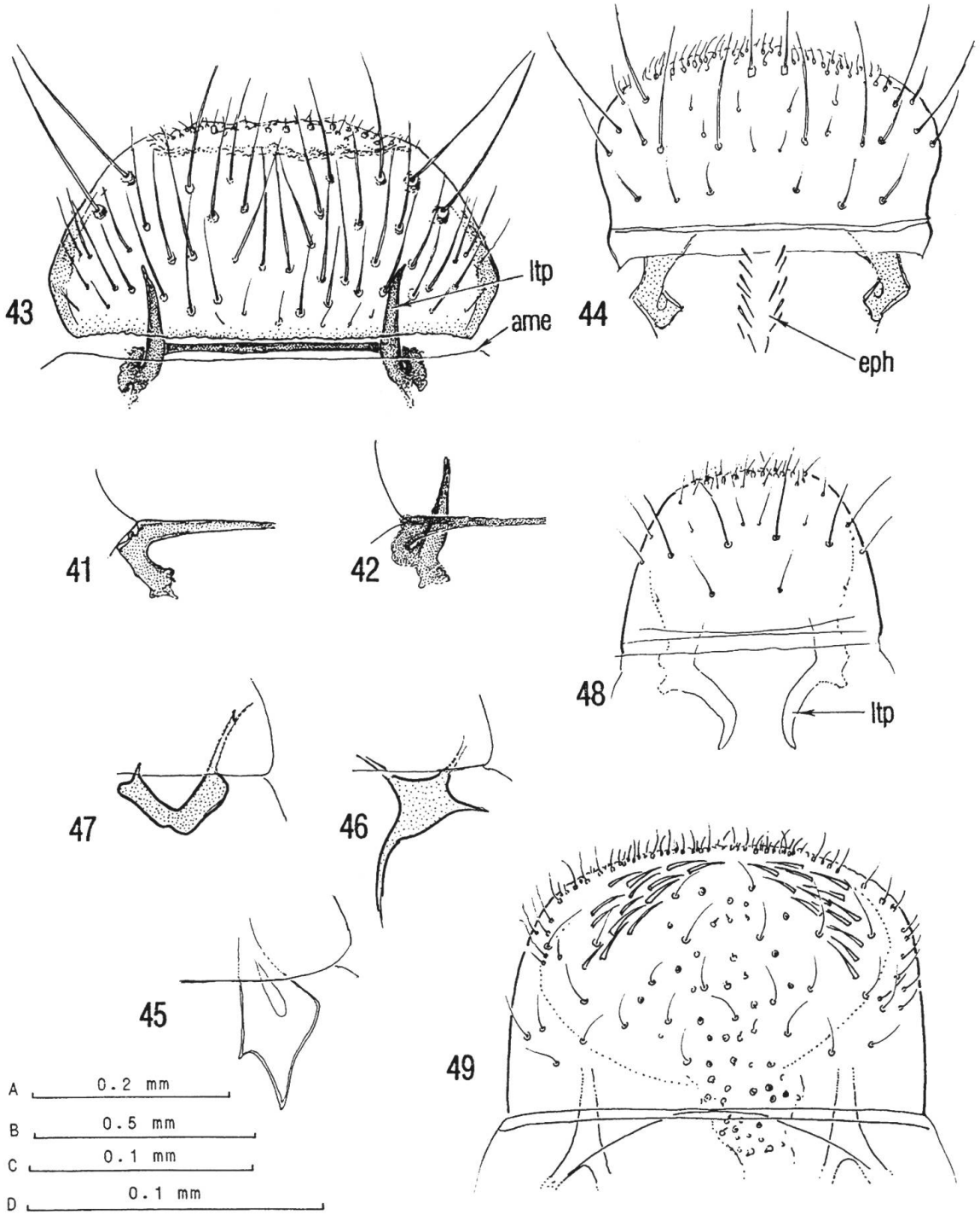
Figs 14–29 (14–17 antenna; 18–29 scapus)**:** 14, *Carphurus notaticollis* PIC, ♂. 15, *Carphurus dispar* ER., lectotype ♂. 16, 28, *Carphurus sayeri* CHAMP., ♂. 17, *Falsoanthocomus humerosus* ABEILLE, ♂. 18, *Carphuroides lopchuensis* WITTMER, ♂. 19, *Apteromalachius namibensis* WITTMER [paratype ♂ of *Carphuroides ovambo* WITTMER]. 20, *Carphurus semiplicaticollis* PIC, ♂. 21, *Carphuromorphus validicornis* PIC, lectotype ♂. 22, *Carphurus rubrosegmentatus* FAIRM., ♂. 23, *Carphurus malaccanus* PIC, paralectotype ♂. 24, *Thoraxocarphurus rhytideres* LEA, ♂. 25, *Carphurus appendicifer* WITTMER, holotype ♂. 26, *Carphurus deminutioplicatus* WITTMER, paratype ♂. 27, *Carphurus basitinctus* WITTMER, paratype ♂. 29, *Carphurus luzonicus* CHAMP., ♂. Scales: A = 14, 15, B = 17–29, C = 16.



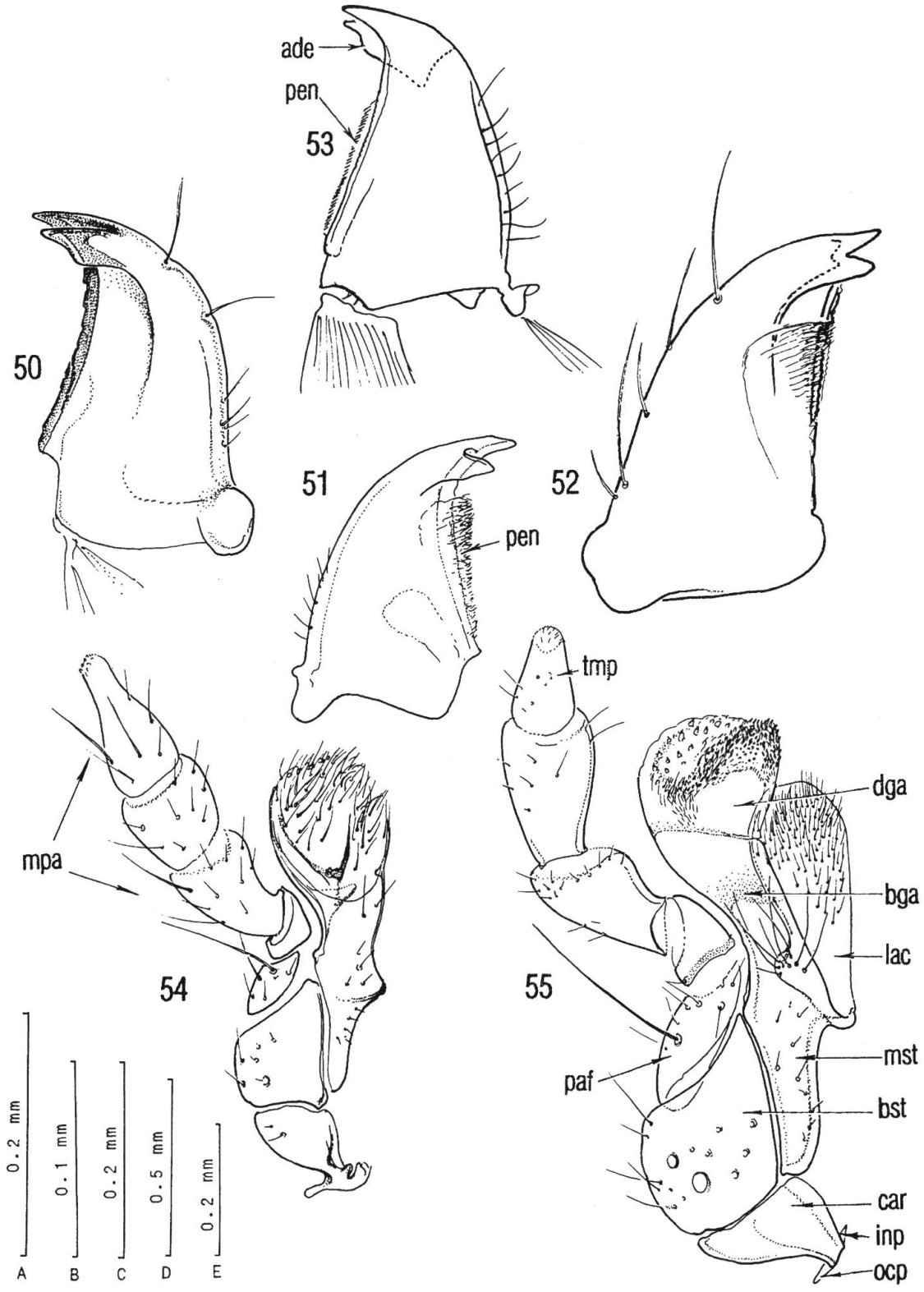
Figs 30–34 (30, 31, 33, 34, cranium ventral; 32, cervical sclerites)**:** 30, *Carphurus cyaneipennis* MACLEAY, ♀. 31, *Lemphus mancus* ER., ♂. 32, *Falsoanthocomus humerosus* ABEILLE, ♂. 33, *Pagurodactylus rostralis* CHAMP., ♂. 34, *Malachius aeneus* (L.), ♂. Scales: A = 32, B = 30, 33, 34, C = 31.



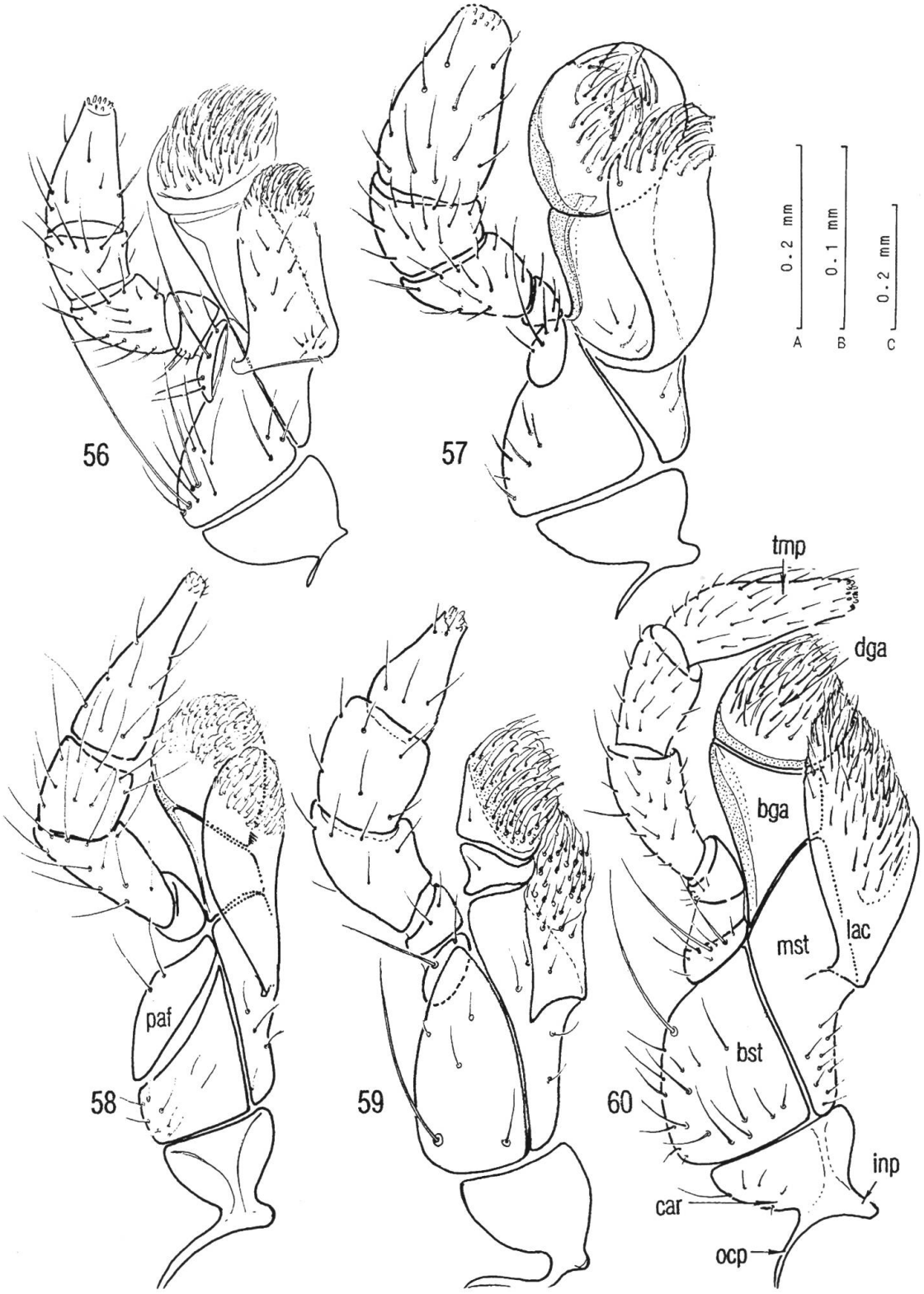
Figs 35–40, tentorium: 35, *Carphurus cyaneipennis* MACLEAY, ♀. 36, *Lemphus inlateralis* PIC, ♀. 37, *Hypattalus alphabeticus* LEA, ♂. 38, *Falsoanthocomus humerosus* ABEILLE, ♂. 39, *Pagurodactylus rostralis* CHAMP., ♂. 40, *Malachius aeneus* (L.), ♂. Scales: A = 36, 38, 39, B = 35, 37, 49.



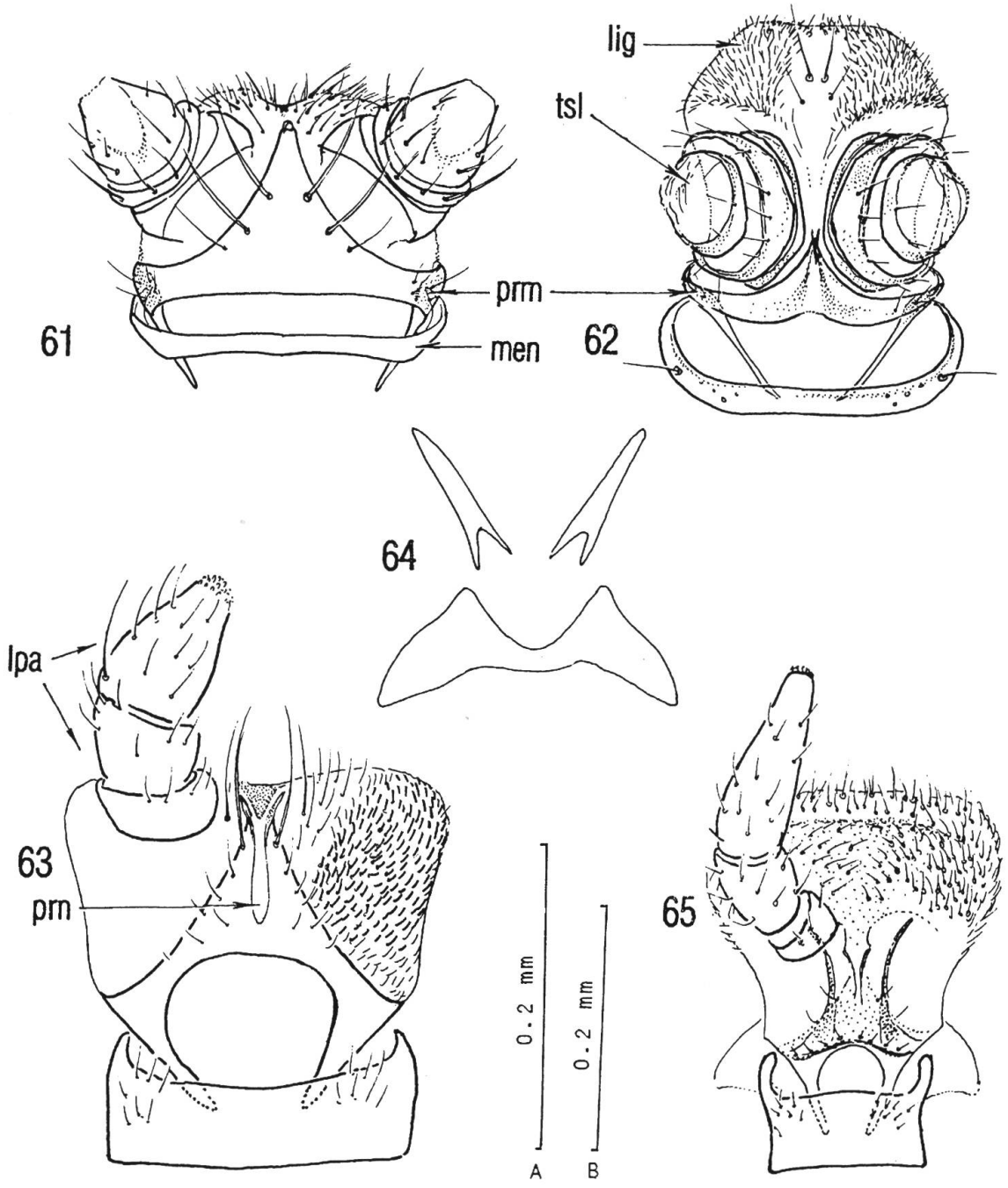
Figs 41–49 (41, 42, 45–47 tormal processes; 43, 44, 48, 49, labrum)**:** 41, *Carphuroides pectinatus* (SHARP), ♂. 42, *Choresine rugiceps* WITTMER, ♂. 43, *Carphurus cyaneipennis* MACLEAY, ♂. 44, *Neolemphus varipes* WITTMER, paratype ♂. 45, *Lemphus inlateralis* PIC, ♀. 46, *Hypattalus alphabeticus* LEA, ♂. 47, *Falsoanthocomus humerosus* (ABEILLE), ♂. 48, *Pagurodactylus rostralis* CHAMP., ♂. 49, *Malachius aeneus* (L.), ♂. Scales: A = 43, B = 49, C = 41, 42, 44, 48, D = 45–47.



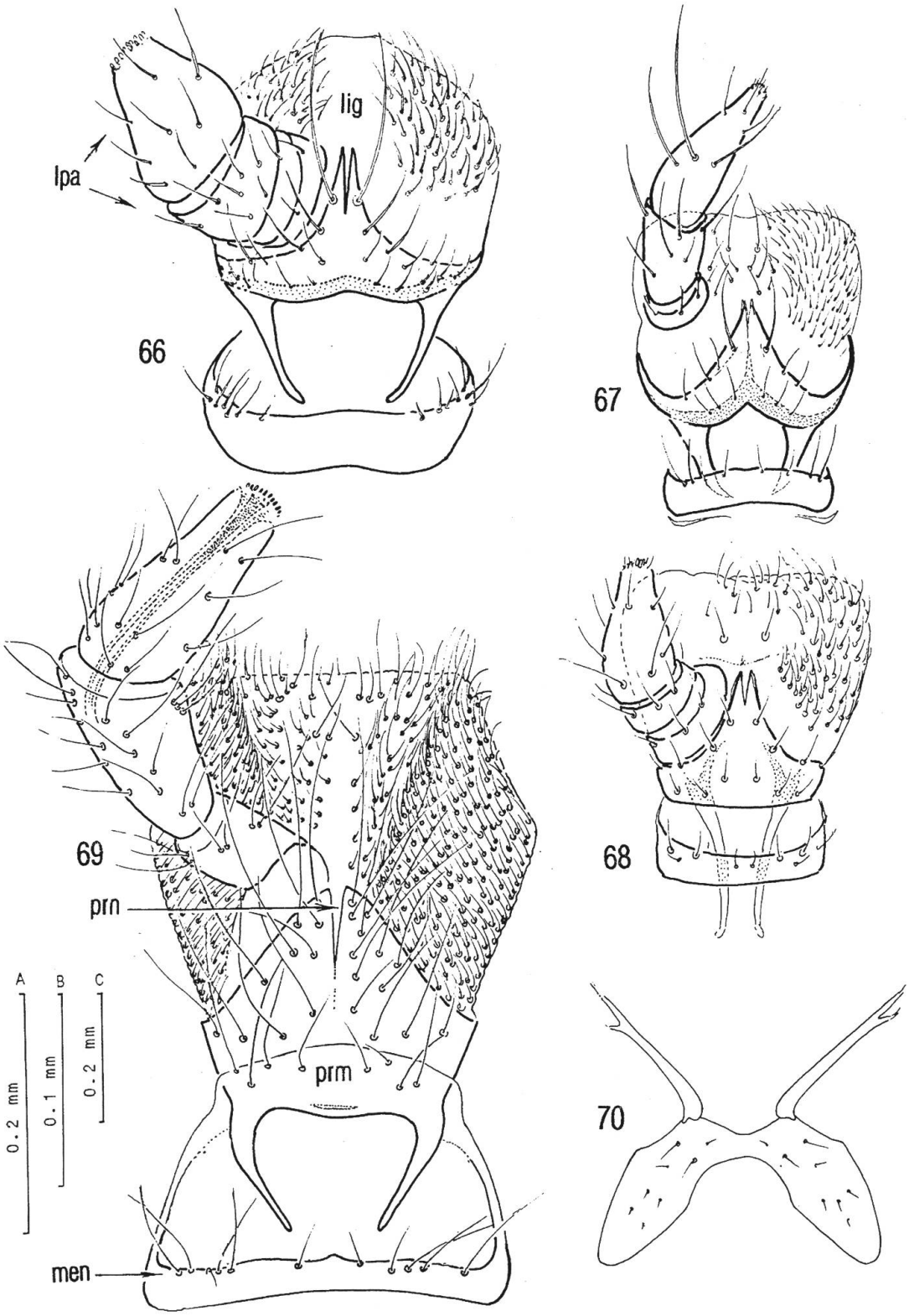
Figs 50–55 (50–52, mandible ventral; 53, mandible dorsal; 54, 55, maxilla)**:** 50, *Carphurus cyaneipennis* MACLEAY, ♂. 51, *Lemphus mancus* ER., ♂. 52, *Pagurodactylus rostralis* CHAMP., ♂. 53, *Malachius aeneus* (L.), ♂. 54, *Carphuroides pectinatus* (SHARP), ♂. 55, *Carphurus cyaneipennis* MACLEAY, ♂. Scales: A = 54, B = 52, C = 51, 52, D = 53, E = 50.



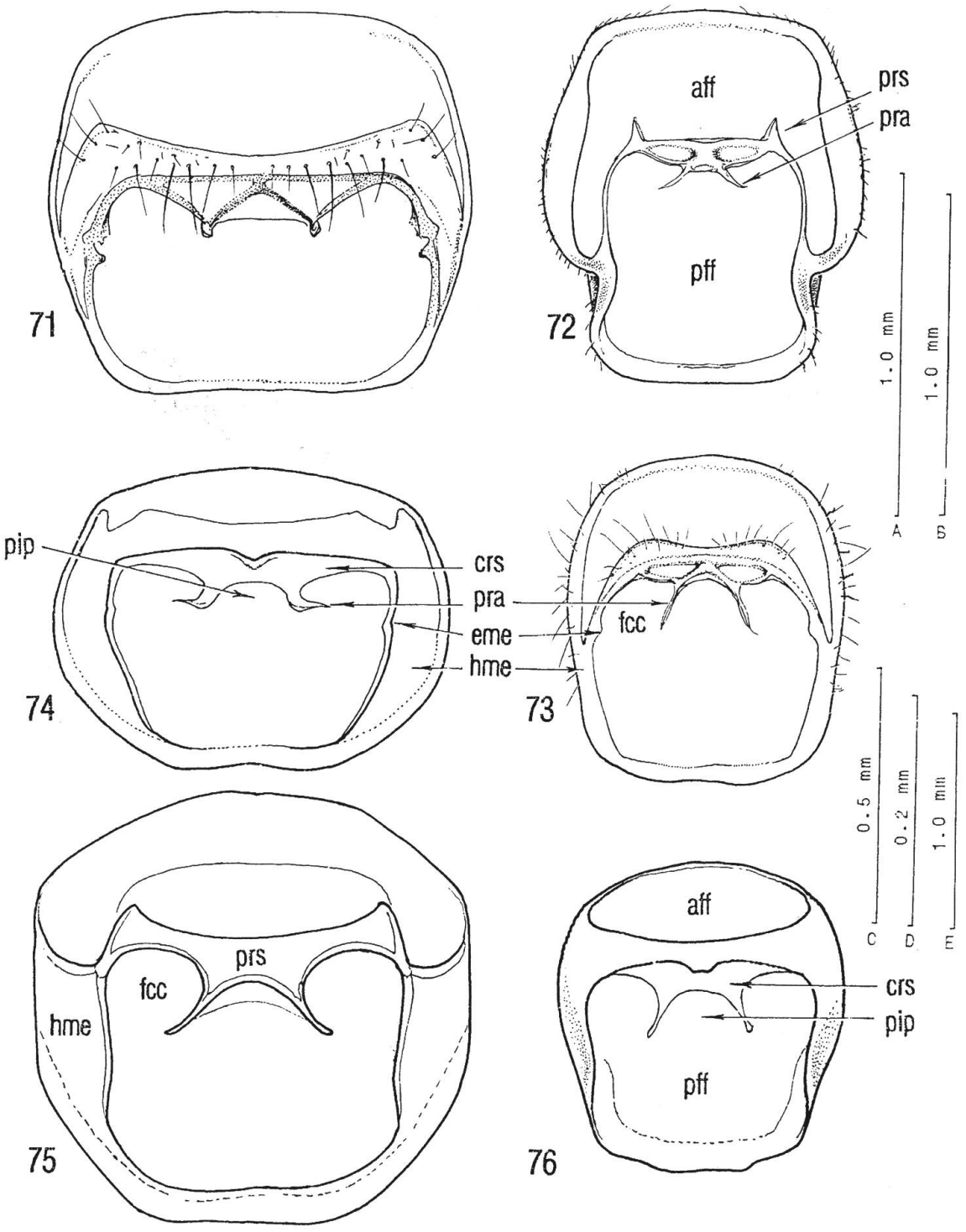
Figs 56–60, maxilla: 56, *Lemphus inlateralis* PIC, ♀. 57, *Hypattalus alphabeticus* LEA, ♂. 58, *Falsoanthocomus humerosus* ABEILLE, ♂. 59, *Pagurodactylus rostralis* CHAMP., ♂. 60, *Malachius aeneus* (L.), ♂. Scales: A = 56, B = 57, 58, 59, C = 60.



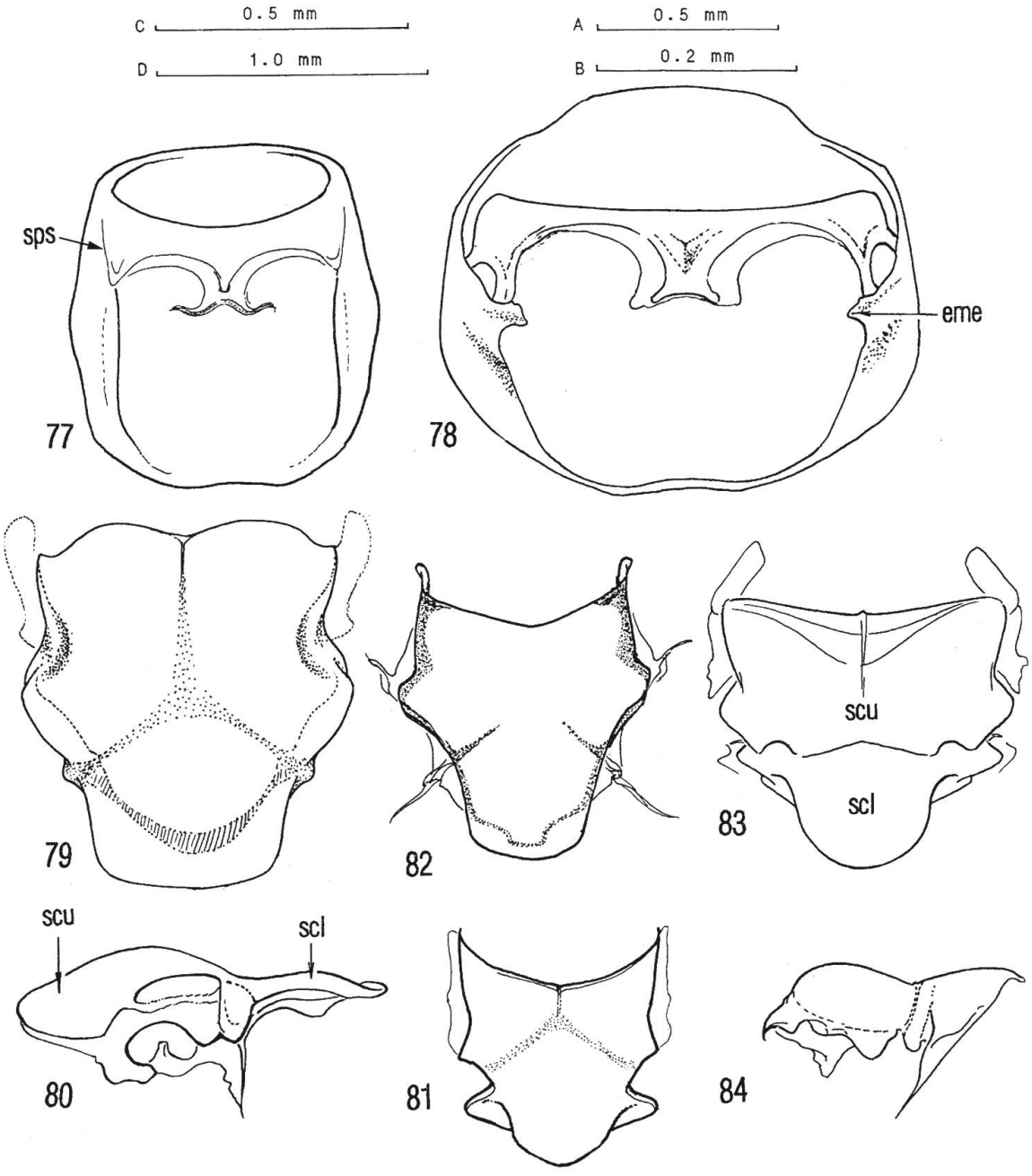
Figs 61–65 (61–63, 65 labium; 64, hypopharyngeal sclerites)**:** 61, *Carphuroides pectinatus* (SHARP), ♂. 62, *Carphurus cyaneipennis* MACLEAY, ♂. 63, 64, *Neolemphus varipes* WITTMER, paratype ♂. 65, *Engilemphus boliviensis* (PIC), ♂. Scales: A = 61, 63–65, B = 62.



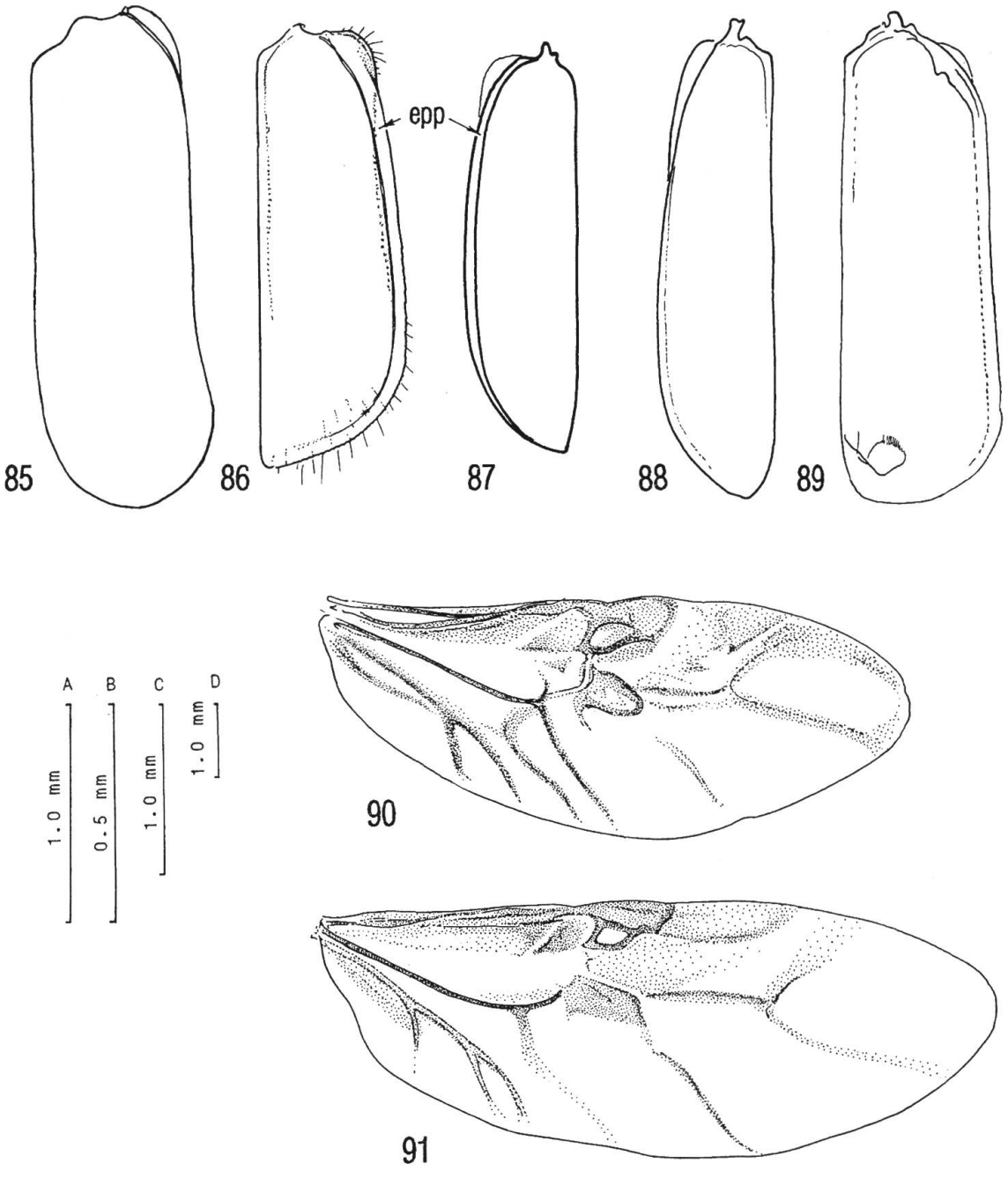
Figs 66–70 (66–68 labium, 70, hypopharyngeal sclerites)**:** 66, *Hypattalus alphabeticus* LEA, ♂. 67, *Falsoanthocomus humerosus* (ABEILLE), ♂. 68, *Pagurodactylus rostralis* CHAMP., ♂. 69, 70, *Malachius aeneus* (L.), ♂. Scales: A = 69, B = 66, 67, 68, C = 70.



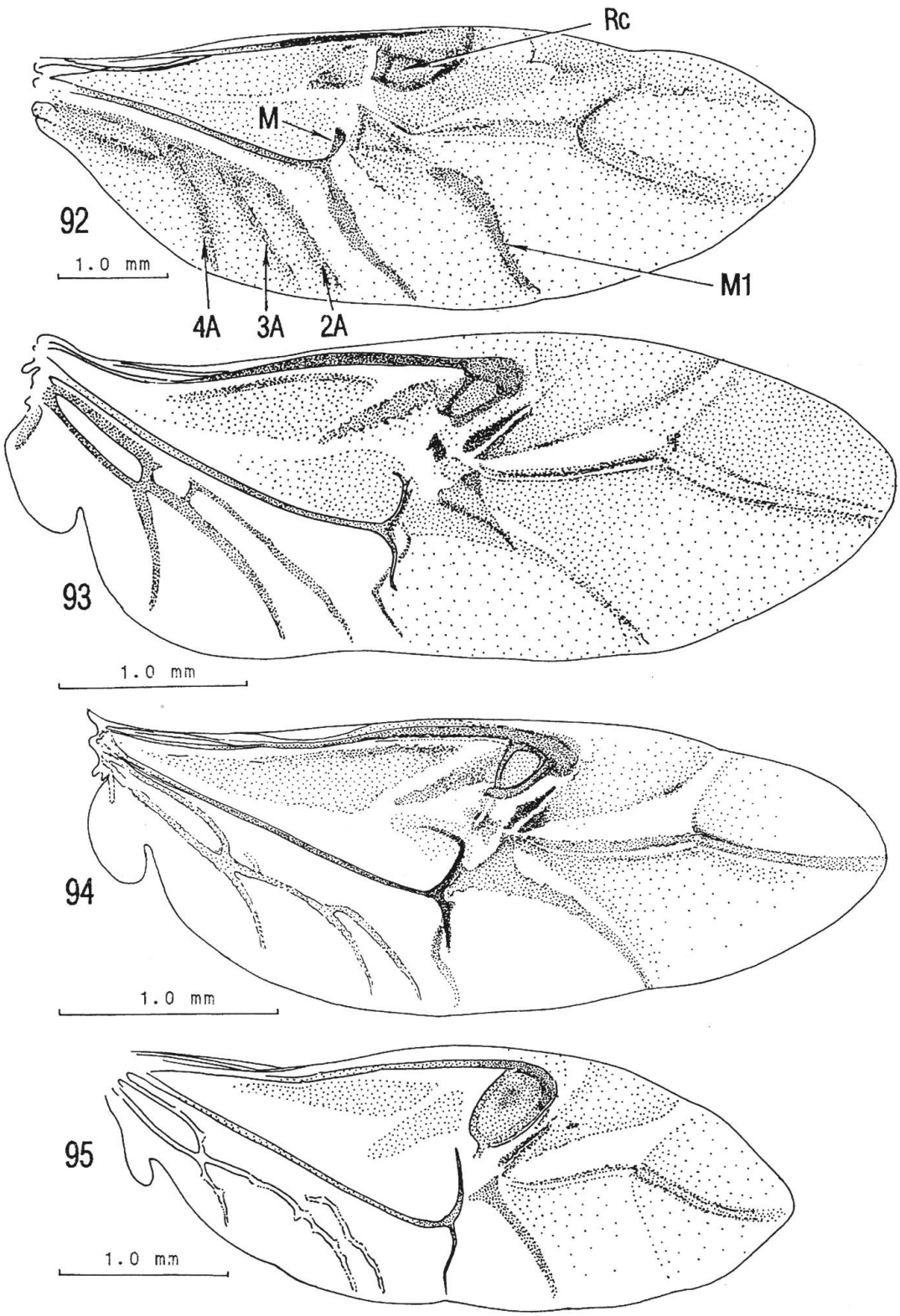
Figs 71–76, prothorax ventral: 71, *Carphuroides pectinatus* (SHARP), ♂. 72, *Choresine rugiceps* WITTMER, ♂. 73, *Carphurus cyaneipennis* MACLEAY, ♂. 74, *Neolemphus varipes* WITTMER, paratype ♂. 75, *Hypattalus alphabeticus* LEA, ♂. 76, *Falsoanthocomus humerosus* ABEILLE, ♂. Scales: A = 74, B = 72, C = 75, 76, D = 71, E = 73.



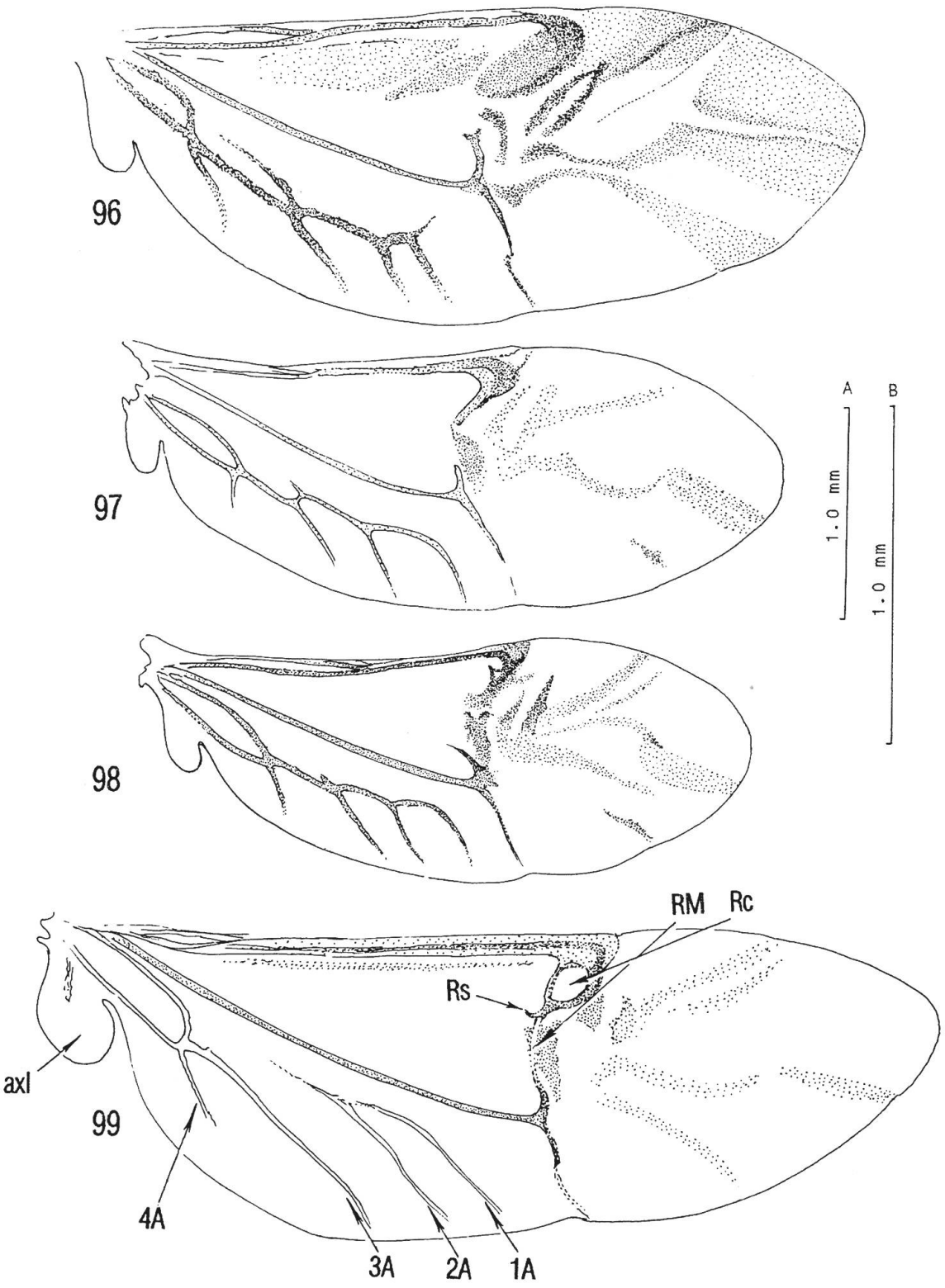
Figs 77–84 (77, 78, prothorax ventral; 79, 81–83, mesoscutellum dorsal; 80, 84, mesoscutellum lateral)**:** 77, 82, *Pagurodactylus rostralis* CHAMP., ♂. 78, 83, 84, *Malachius aeneus* (L.), ♂. 79, 80, *Carphurus cyaneipennis* MACLEAY, ♀. 81, *Falsoanthocomus humerosus* ABEILLE, ♂. Scales: A = 83, 84, B = 81, 82, C = 77, 79, 80, D = 78.



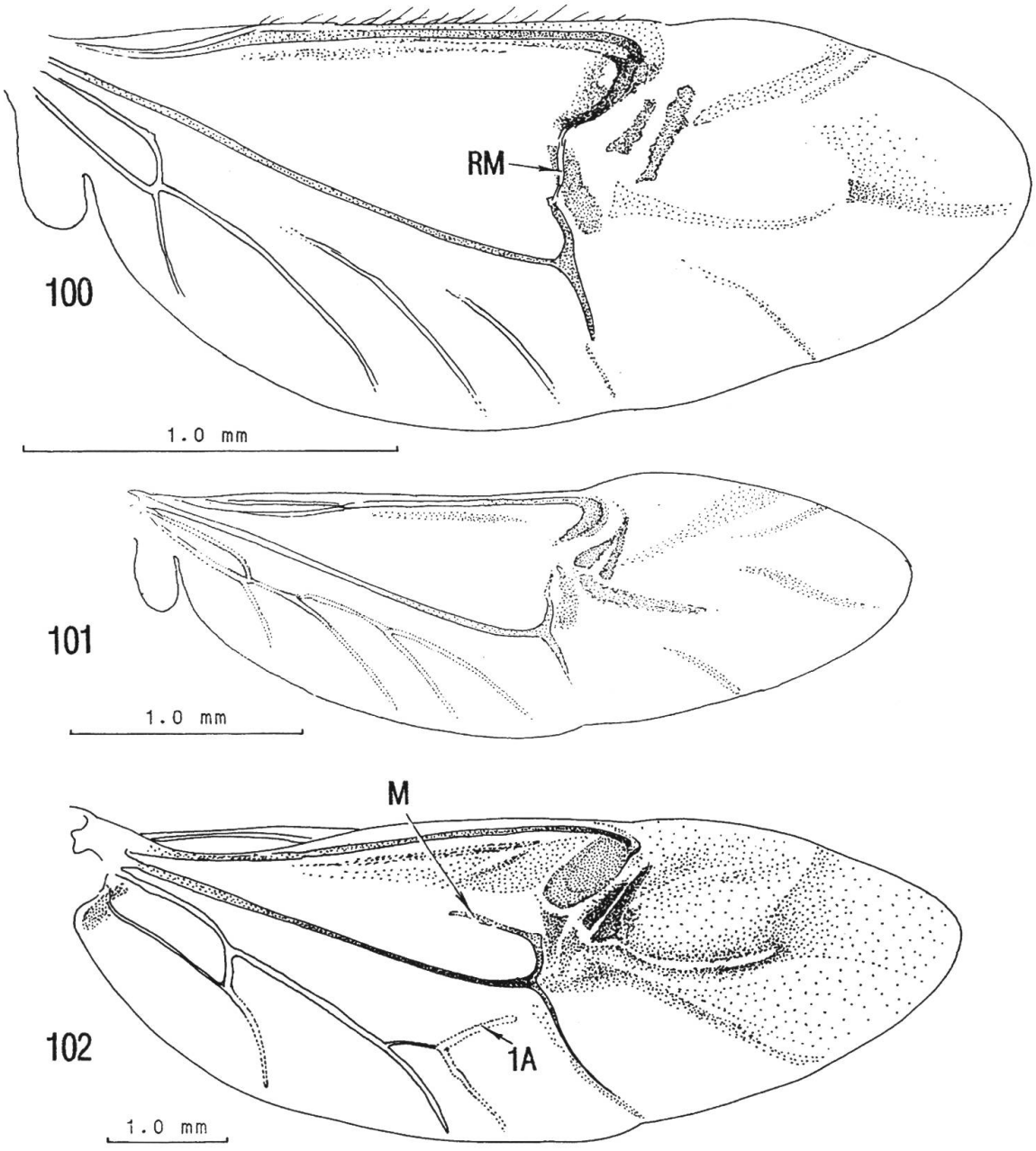
Figs 85–91 (85–89, elytron ventral; 90–91 wing)**:** 85, *Carphurus cyaneipennis* MACLEAY, ♀. 86, *Lemphus mancus* ER., ♂. 87, *Falsoanthocomus humerosus* ABEILLE, ♂. 88, *Pagurodactylus rostralis* CHAMP., ♂. 89, *Malachius aeneus* (L.), ♂. 90, *Carphuroides pectinatus* (SHARP), ♂. 91, *Carphurus dispar* ER., lectotype ♂. Scales: A = 86, 88, 90, 91, B = 87, C = 85, D = 89.



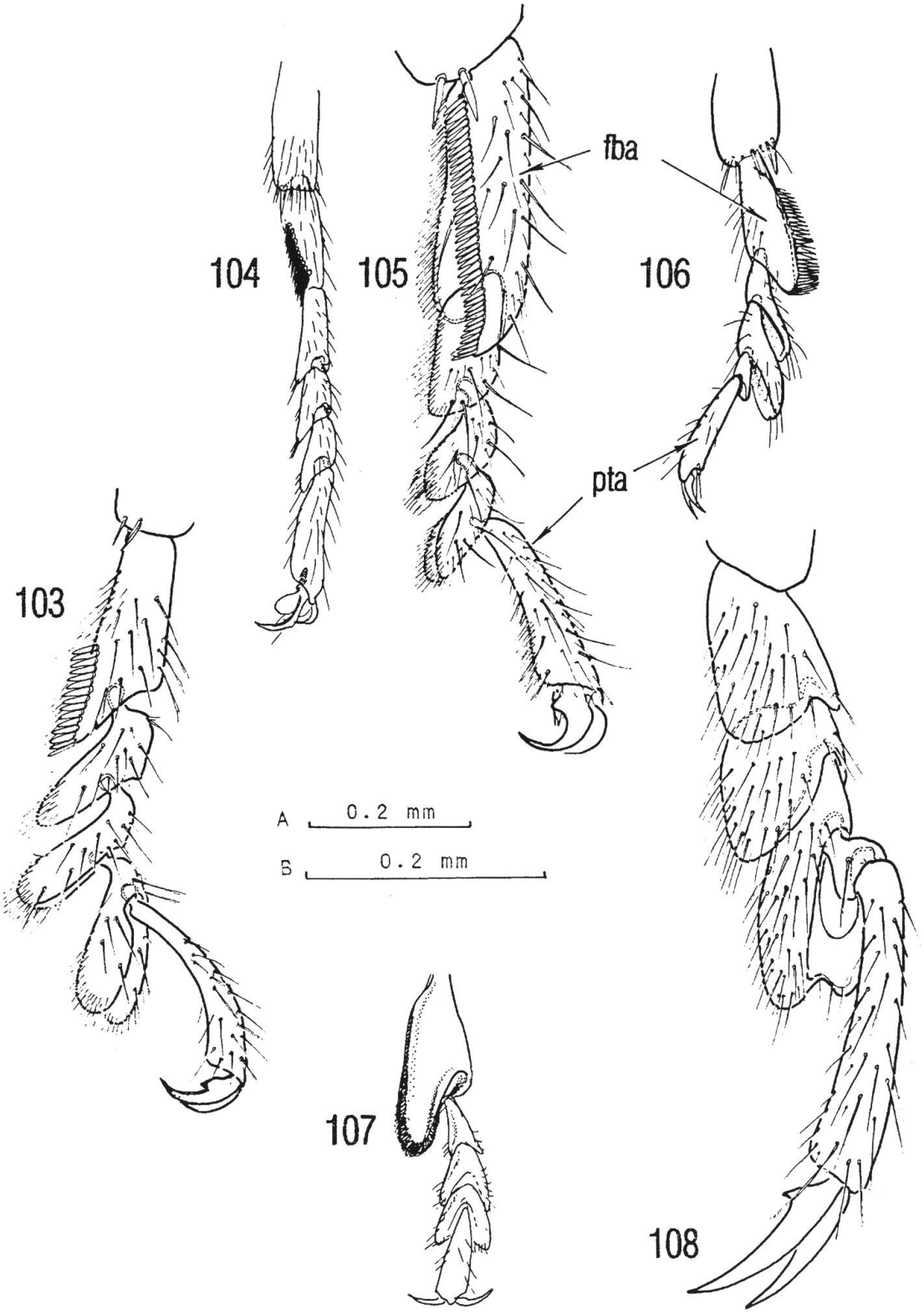
Figs 92–95, wing: 92, *Carphurus cyaneipennis* MACLEAY, ♂. 93, *Neolemphus varipes* WITTMER, paratype ♂. 94, *Lemphus mancus* ER., ♂. 95, *Engilemphus boliviensis* (PIC), ♂.



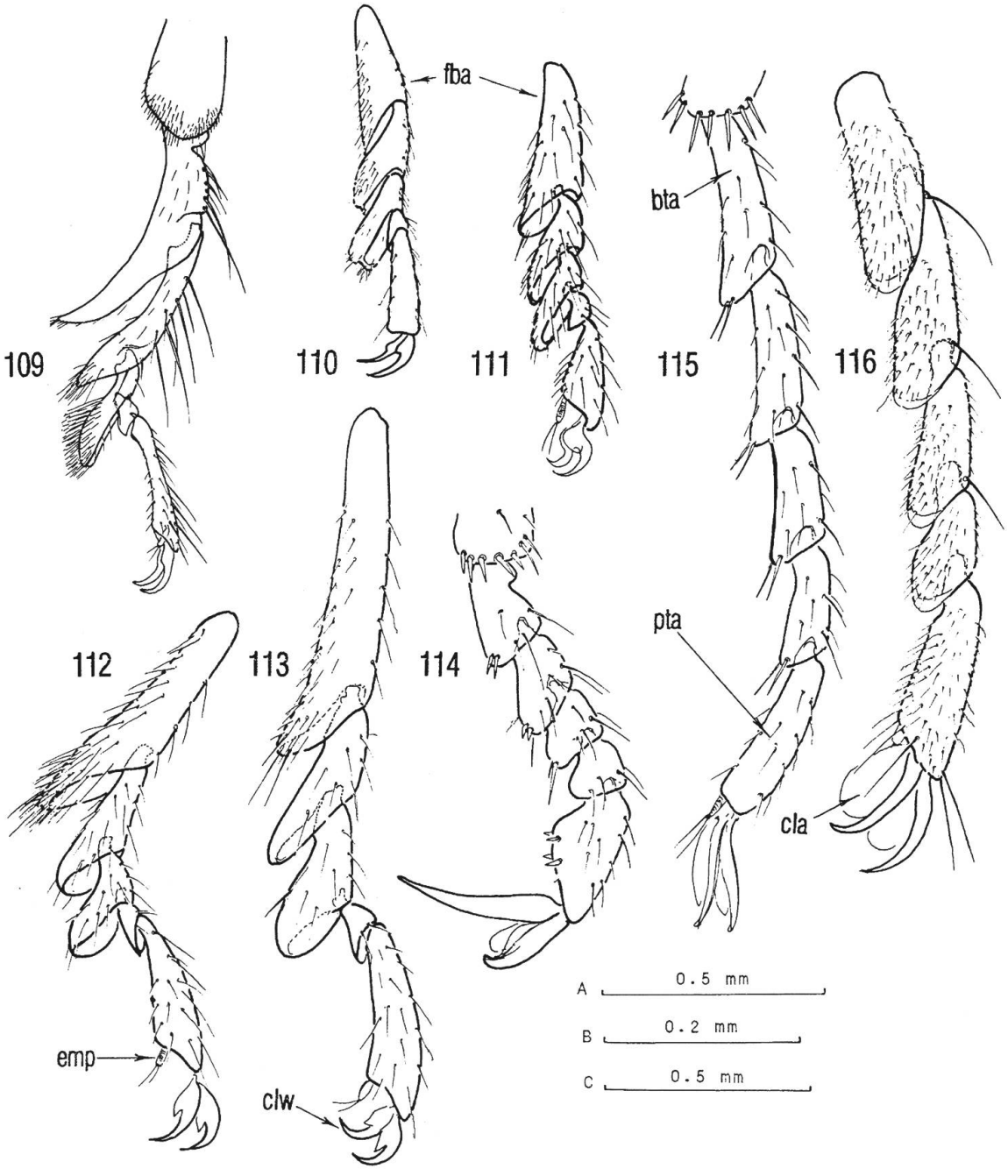
Figs 96–99, wing: 96, *Hypattalus alphabeticus* LEA, ♂. 97, *Falsoanthocomus costipennis* ABEILLE, ♂. 98, *Falsoanthocomus humerosus* ABEILLE, ♂. 99, *Pagurodactylus rostralis* CHAMP., ♂. Scales: A = 97, 98, B = 96, 99.



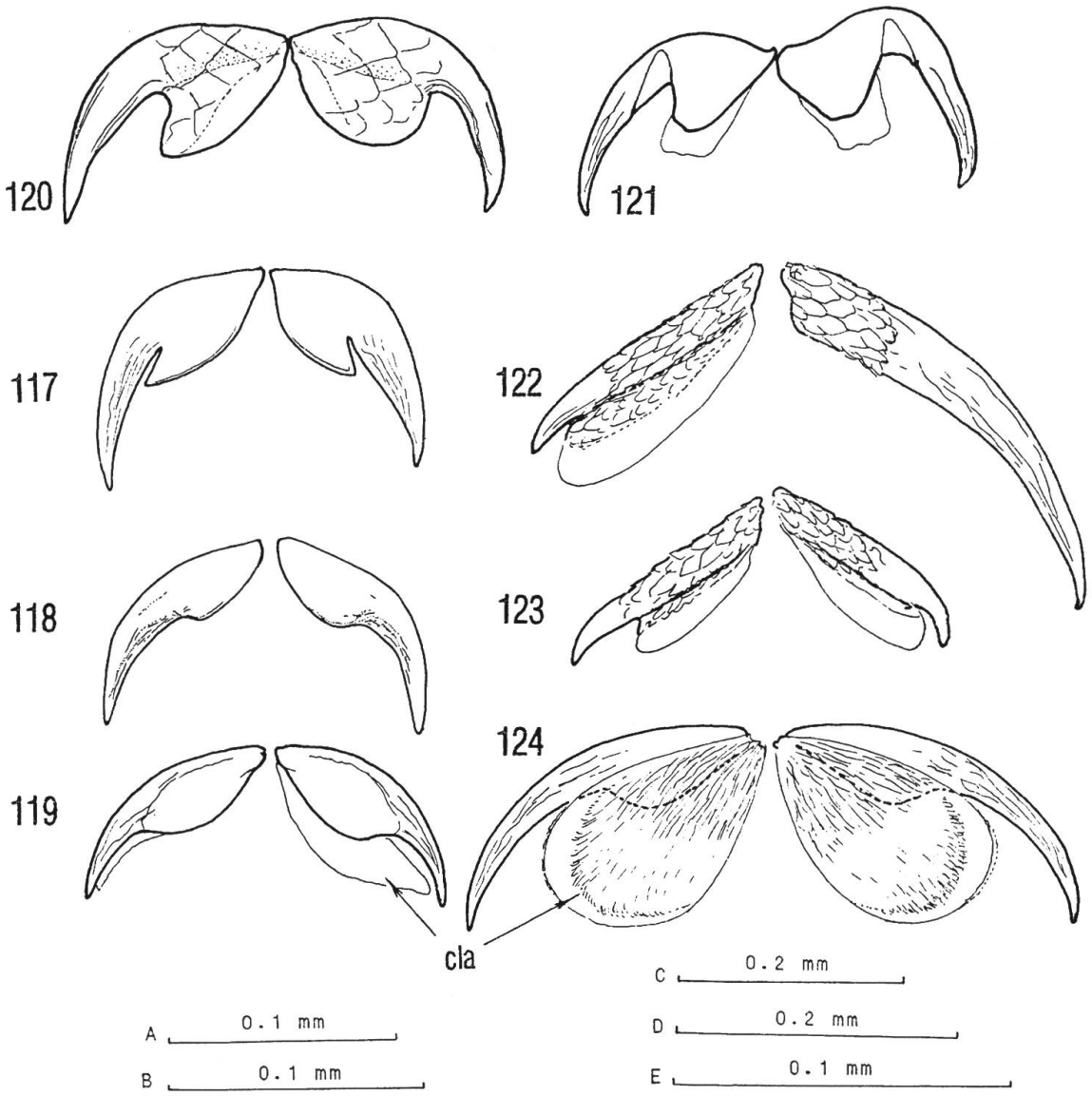
Figs 100–102, wing: 100, *Pagurodactylus rostralis* CHAMP., ♂. 101, *Dasytophasis wittmeri* CONSTANTIN, ♂. 102, *Malachius aeneus* (L.), ♂.



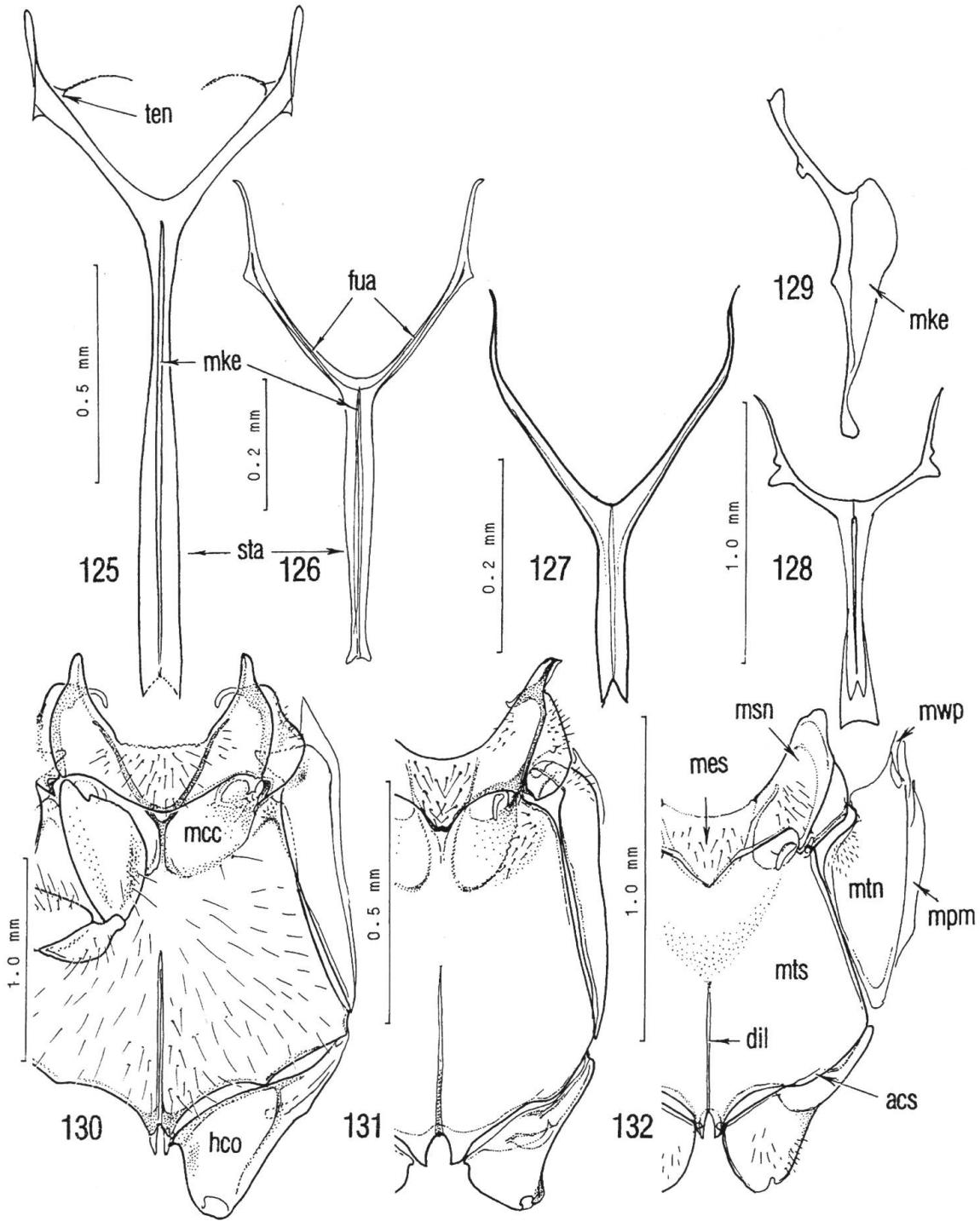
Figs 103–108, front tarsus: 103, *Choresine rugiceps* WITTMER, ♂. 104, *Helcogaster biroi biroi* WITTMER, paratype ♂. 105, *Carphurus cyaneipennis* MACLEAY, ♀. 106, *Carphuroides lopchuensis* WITTMER, ♂. 107, *Carphurus luzonicus* CHAMP., ♂. 108, *Lemphus inlateralis* PIC, ♀. Scales: A = 105, 108, B = 103, 104, 106, 107.



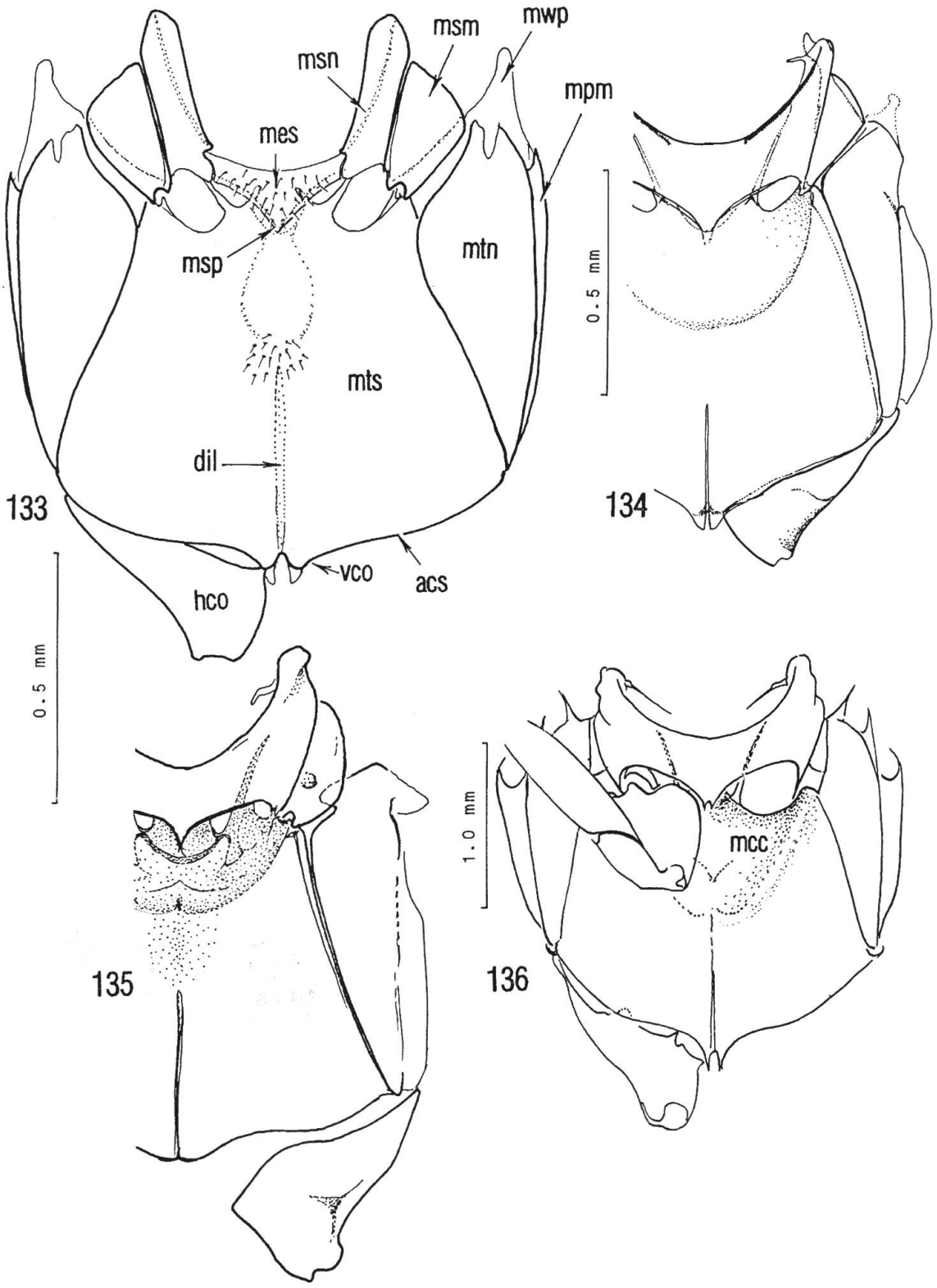
Figs 109–116 (109, 113, 115–116, hind tarsus; 110–112, 114, front tarsus)**:** 109, *Lemphus tropicus* (KIRSCH), ♀. 110, *Hypattalus alphabeticus* LEA, ♂. 111, *Falsoanthocomus humerosus* (ABEILLE), ♂. 112, 113, *Falsoanthocomus cyaneonotatus* PIC, paralectotype ♂. 114, 115, *Pagurodactylus fibulatus* CHAMP., ♂. 116, *Malachius aeneus* (L.), ♂. Scales: A = 109, B = 110–115, C = 116.



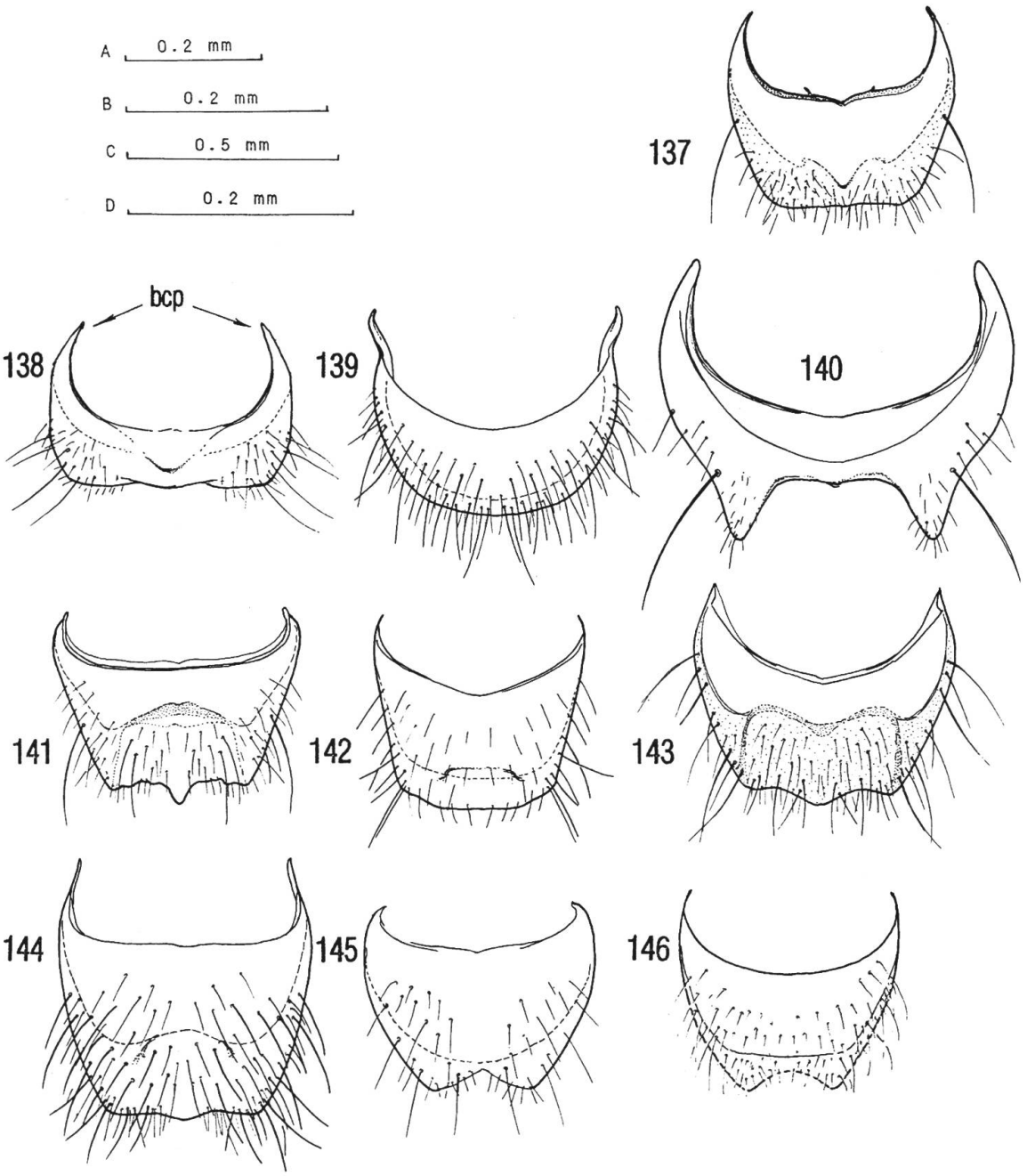
Figs 117–124 (117–122, 124, protarsal claws; 123, hindtarsal claws)**:** 117, *Carphurus cyaneipennis* MACLEAY, ♀. 118, *Lemphus mancus* ER., ♂. 119, *Hypattalus alphabeticus* LEA, ♂. 120, *Falsoanthocomus cyaneonotatus* PIC, paralectotype ♂. 121, *Falsoanthocomus humerosus* ABEILLE, ♂. 122, 123, *Pagurodactylus rostralis* CHAMP., ♂. 124, *Malachius aeneus* (L.), ♂. Scales: A = 122, 123, B = 118, C = 124, D = 117, E = 119, 121, 122.



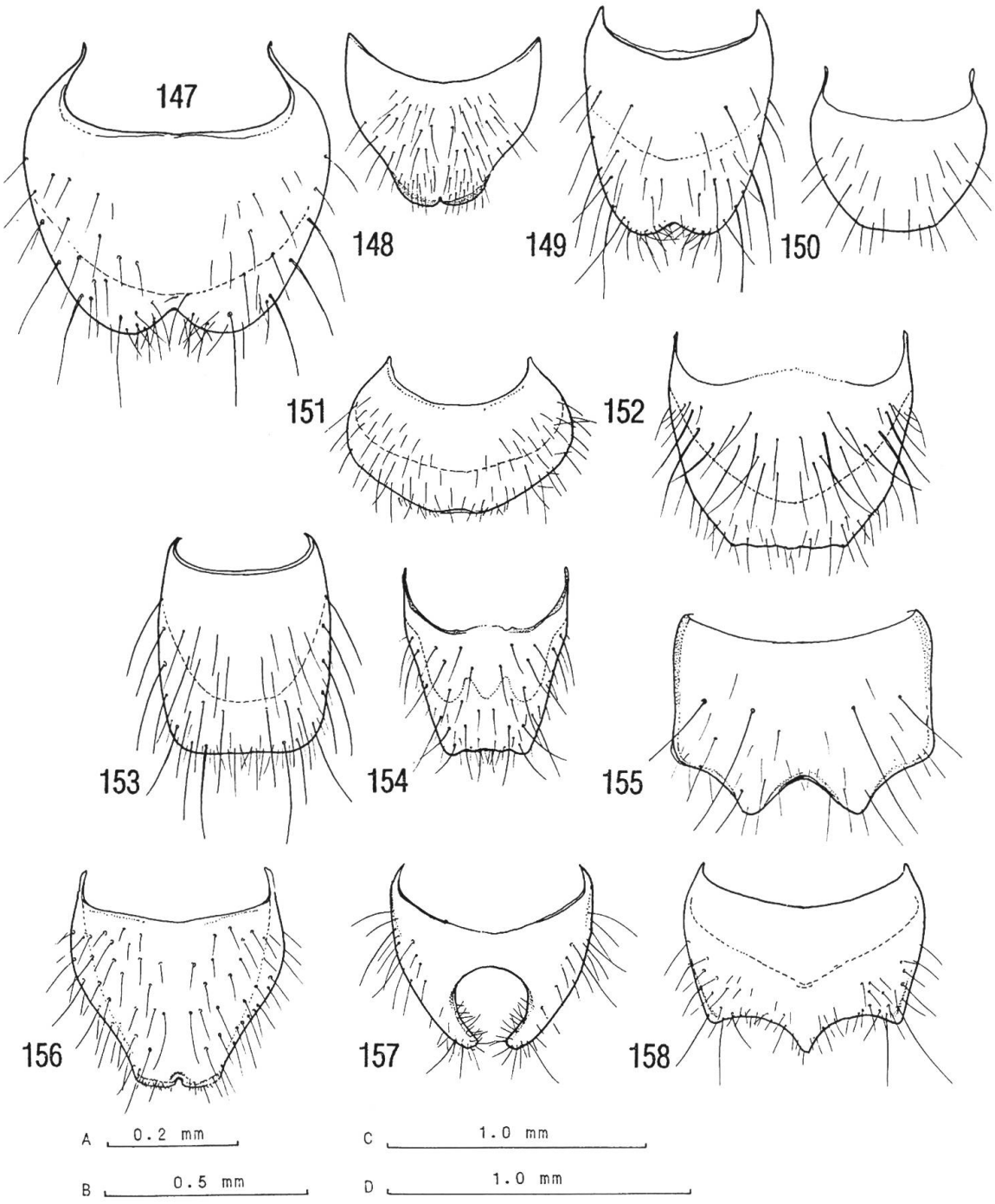
Figs 125–132 (125–128, metendosternite ventral; 129, metendosternite lateral; 130–132, meso–and metathorax ventral)**:** 125, *Carphurus cyaneipennis* MacLeay, ♀. 126, *Lemphus mancus* Er., ♂. 127, *Falsoanthocomus humerosus* Abeille, ♂. 128, 129, *Malachius aeneus* (L.), ♂. 130, *Carphuroides pectinatus* (Sharp), ♂. 131, *Carphurus cyaneipennis* MacLeay, ♀.132, *Lemphus mancus* Er., ♂.



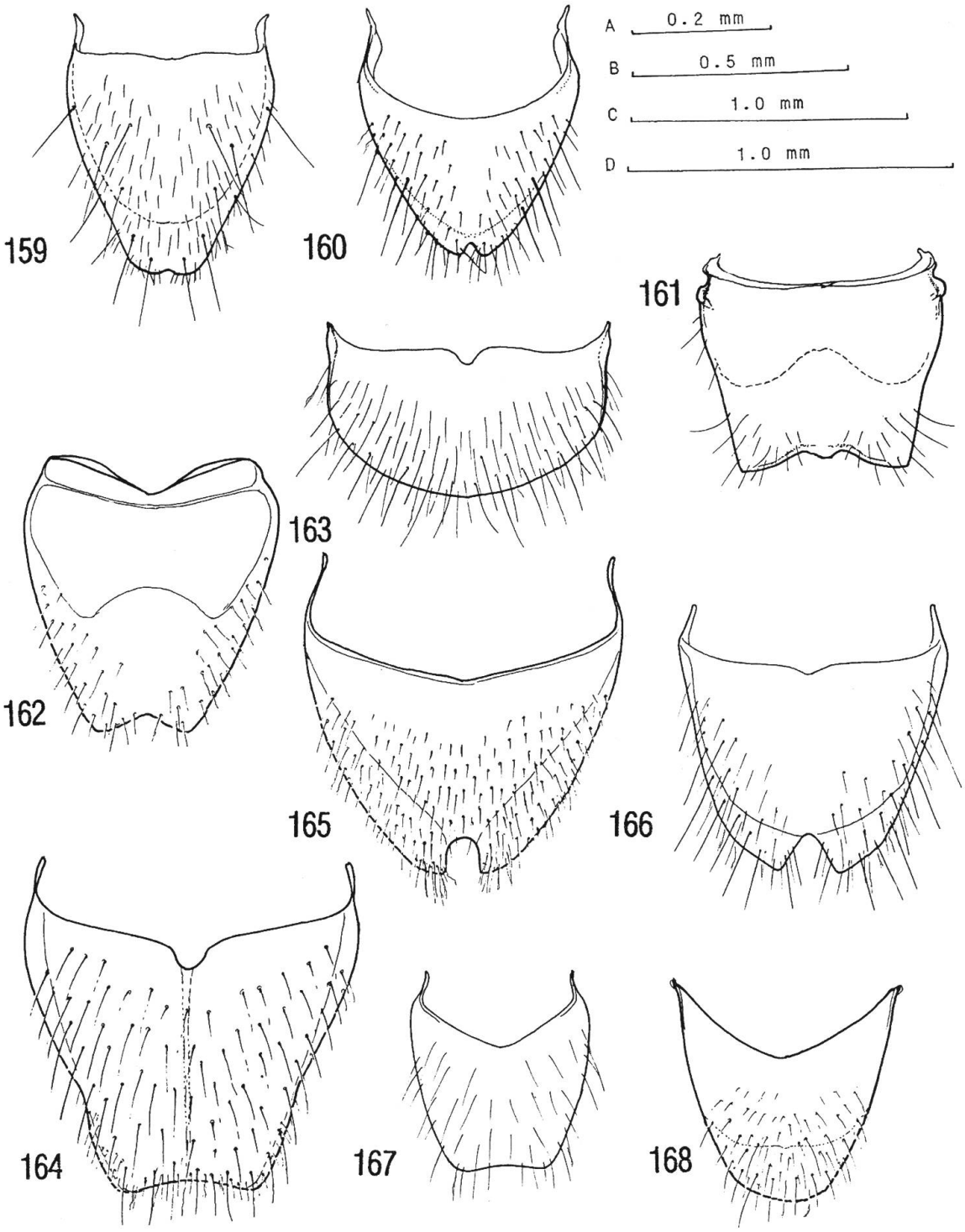
Figs 133–136, meso–and metathorax, ventral: 133, *Hypattalus alphabeticus* LEA, ♂. 134, *Falsoanthocomus humerosus* (ABEILLE), ♂. 135, *Pagurodactylus rostralis* CHAMP., ♂. 136, *Malachius aeneus* (L.), ♂.



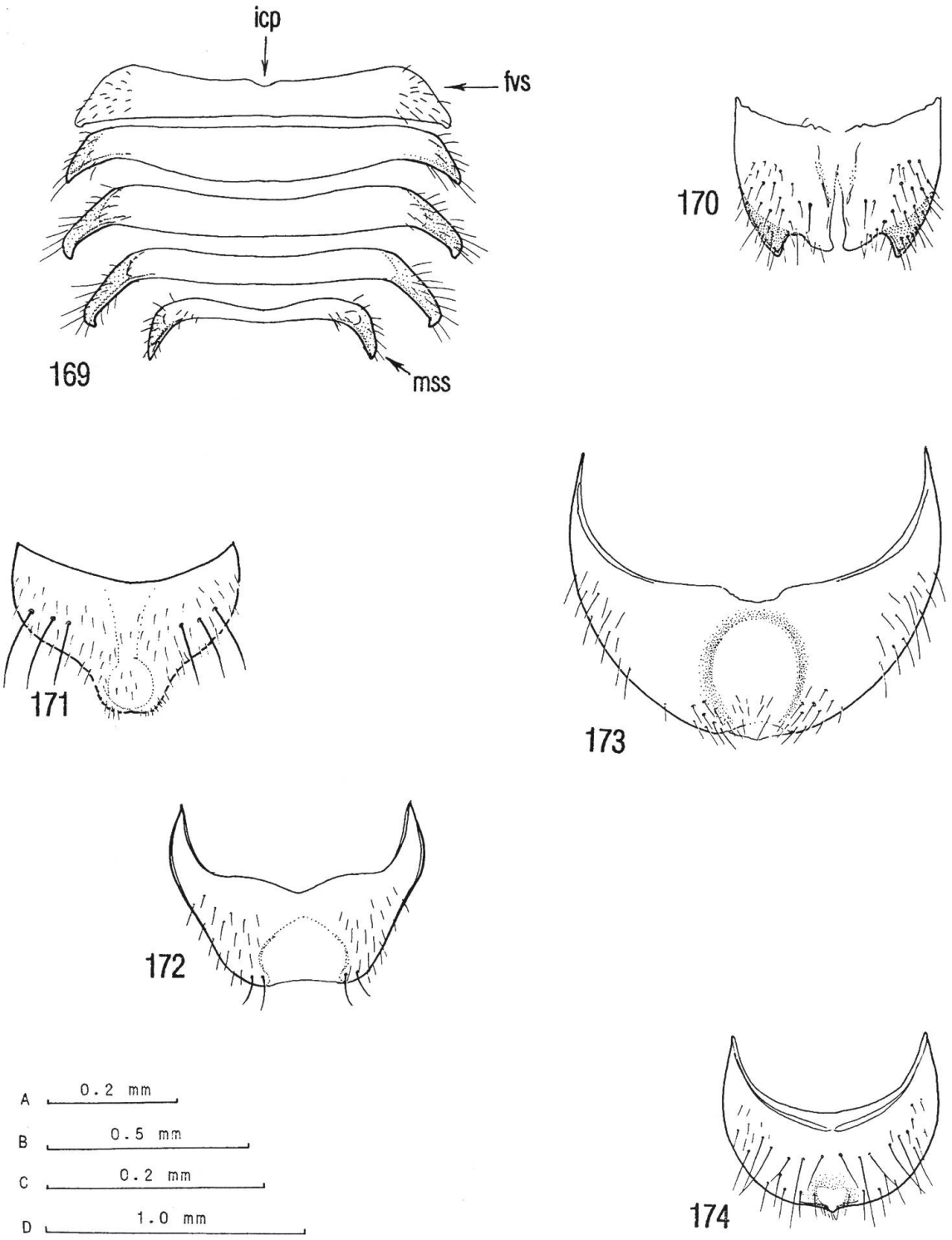
Figs 137–146, pygidium, ♂**:** 137, *Carphurus coriaceipennis* WITTMER, paratype. 138, *Carphurus vittiensis* WITTMER, paratype. 139, *Falsolaius curtipennis* PIC, holotype. 140, *Carphurus setifer* WITTMER, paratype. 141, *Microcarphurus borneensis* (PIC), lectotype. 142, *Carphurus garoensis* WITTMER, paratype. 143, *Scelocarphurus tibiellus* (WITTMER), paratype. 144, *Carphuromorphus validicornis* PIC, lectotype. 145, *Carphurus malaccanus* PIC, paralectotype. 146, *Carphurus notaticollis* PIC. Scales: A = 137, 142, 145, B = 138, 140, C = 146, D = 139, 141, 143, 144.



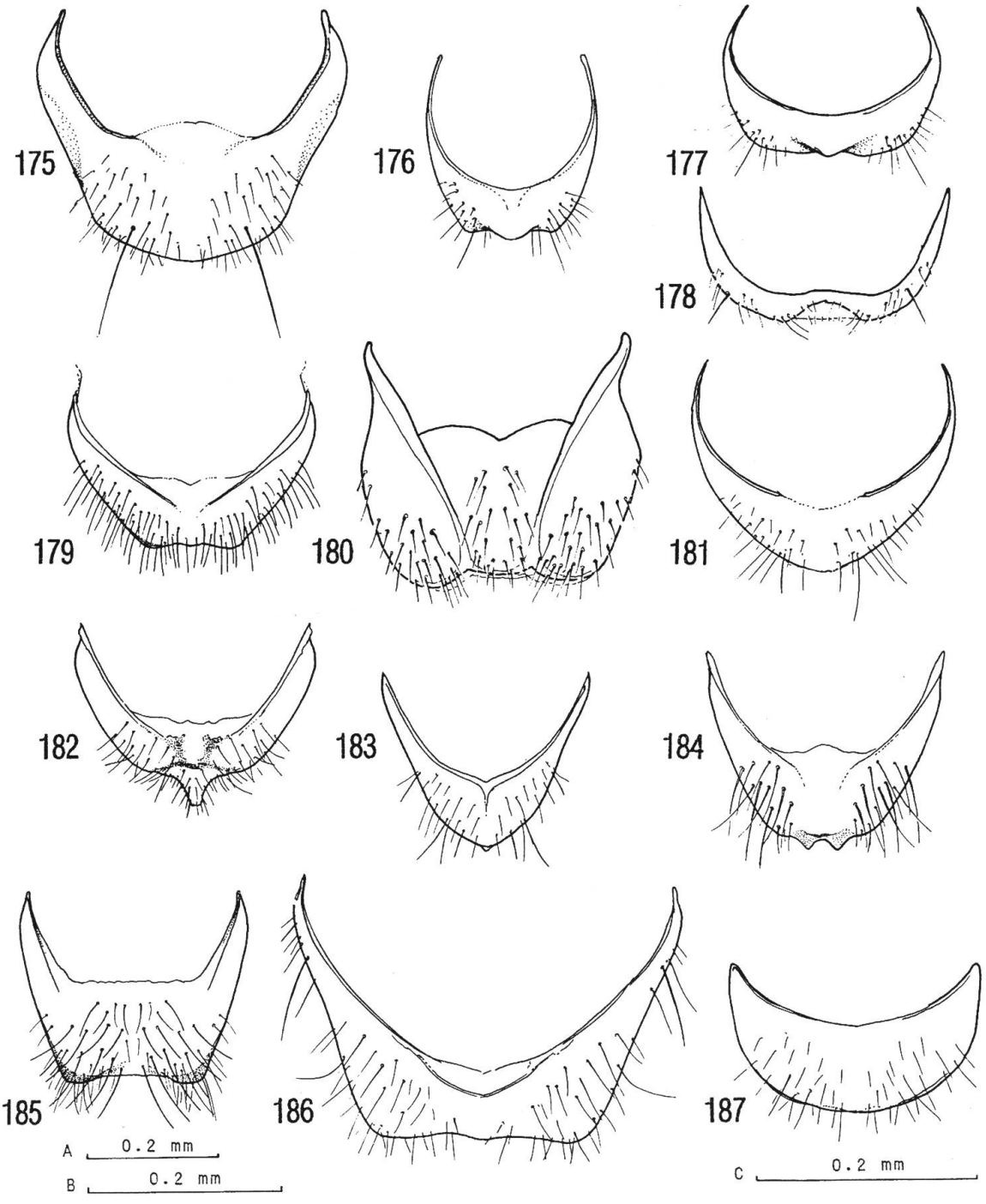
Figs 147–158, pygidium, ♂**:** 147, *Carphurus sumatrensis* PIC. 148, *Thoraxocarphurus rhytideres* (LEA). 149, *Carphurus densepunctatus* WITTMER, paratype. 150, *Carphurus incurvipennis* LEA. 151, *Carphurus rubroannulatus* MOTSCH. 152, *Balanophorus mastersi* MACLEAY, lectotype. 153, *Carphurus dispar* ER., lectotype. 154, *Helcogaster brachypterus* (BOHEMAN). 155, *Carphurus deminutioplicatus* WITTMER, paratype. 156, *Carphurus sinuatus* PIC. 157, *Carphurus basitinctus* WITTMER, paratype. 158, *Carphurus multituberculatus* WITTMER, paratype. Scales: A = 147, 153, 155, 157, B = 149, 154, 157, C = 150–152, 156, D = 148.



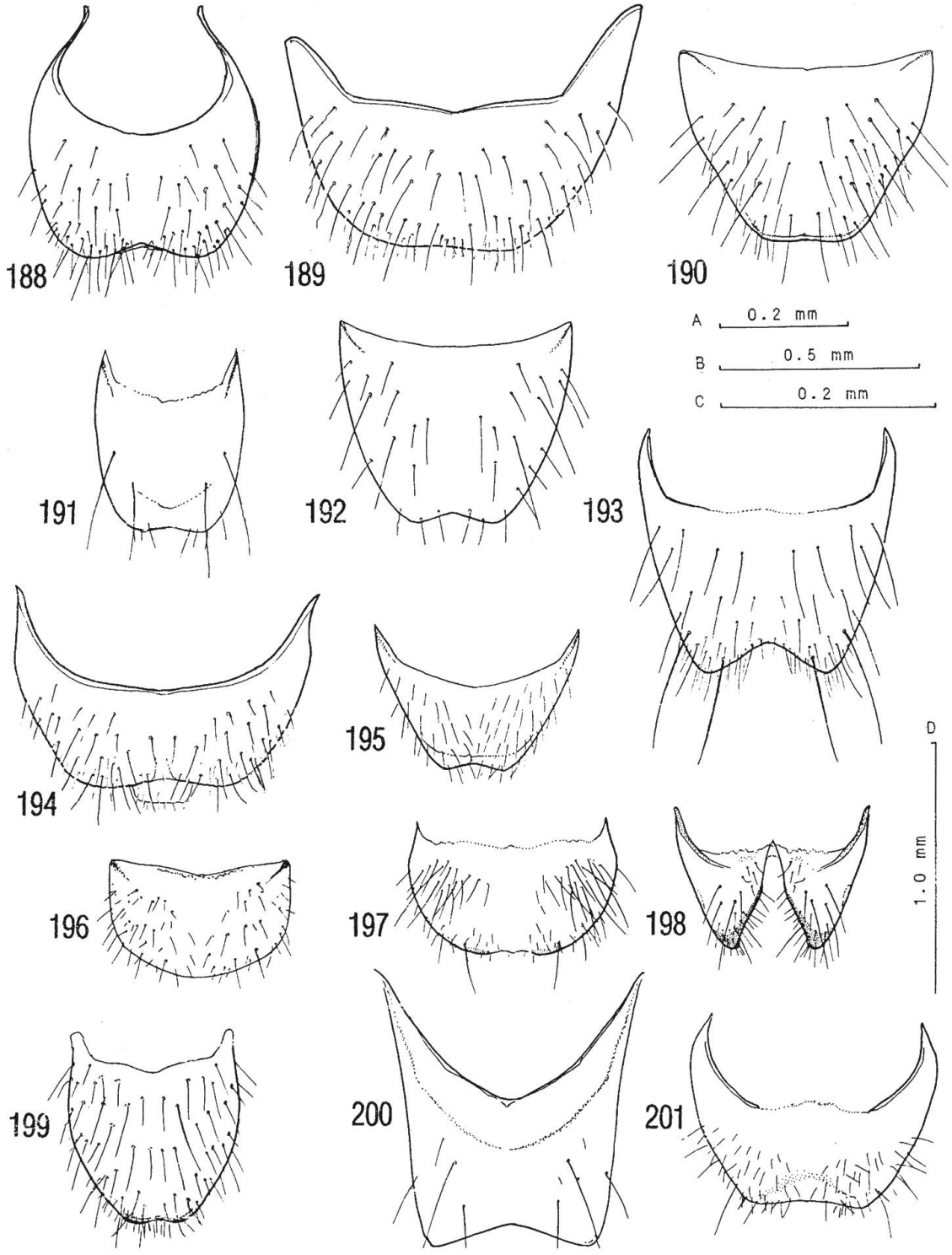
Figs 159–168 (159–163, pygidium, ♂; 164–168, pygidium, ♀)**:** 159, *Neolemphus varipes* WITTMER, paratype. 160, *Lemphus mancus* ER. 161, *Oxylemphus azureus* (WITTMER). 162, *Flabellolemphus atrocinctus* (PIC). 163, *Falsoanthocomus humerosus* (ABEILLE). 164, *Carphurus cyaneipennis* MACLEAY. 165, *Lemphus inlateralis* PIC. 166, *Lemphus opacus* (GORH.), holotype. 167, *Hypattalus punctulatus* BLACKB., holotype. 168, *Amalthocus humerosus* (ABEILLE), ♀. Scales: A = 163, 168, B = 160, 162, 164, 165, C = 159, 161, 167, D = 166.



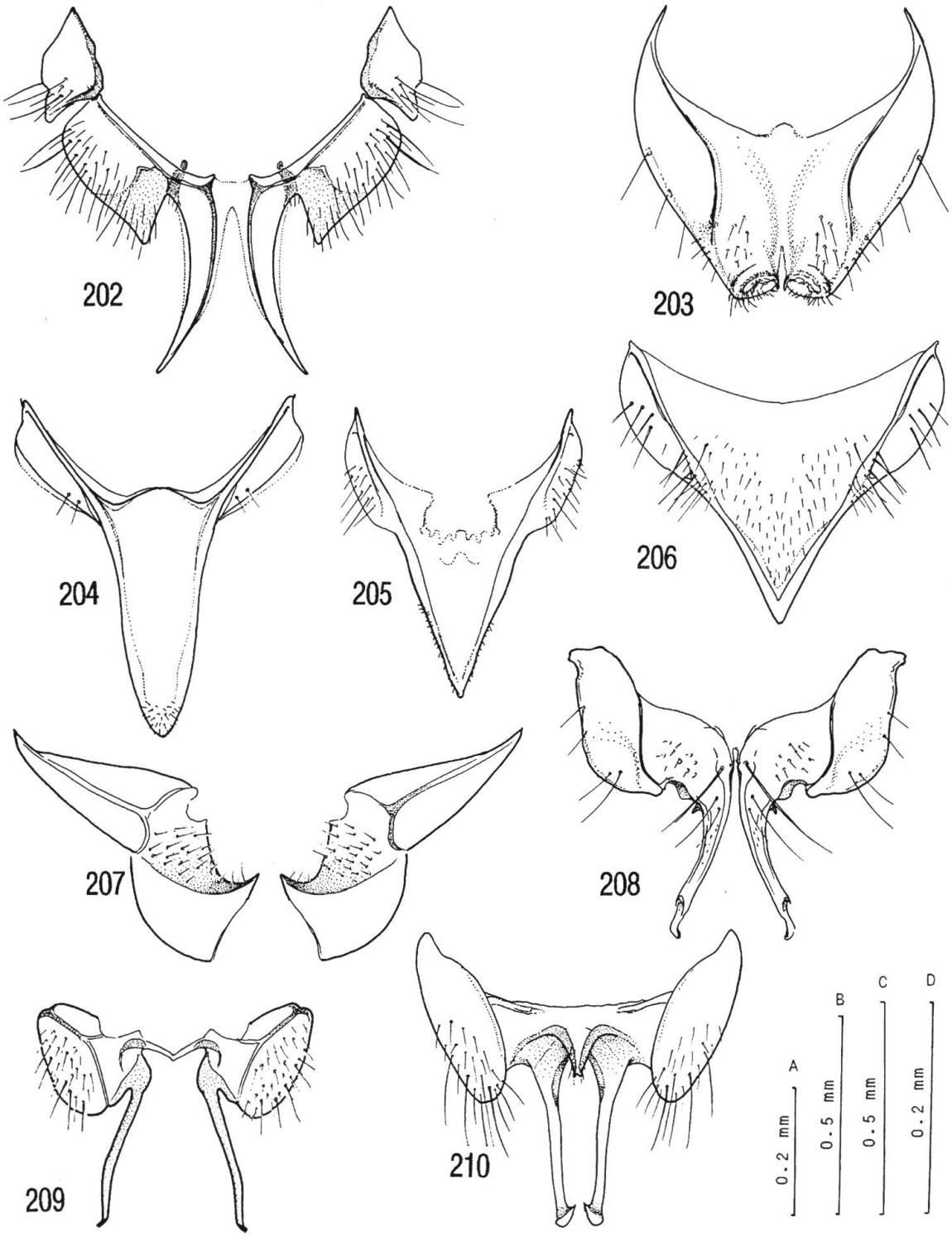
Figs 169–174 (169, ventrites I–VII; 170–174, sternum VIII, ♂)**:** 169, *Oxylemphus azureus* (WITTMER), ♂. 170, *Carphuroides lopchuensis* (WITTMER).171, *Apteromalachius namibensis* WITTMER, paratype [*C. ovambo* WITTMER]. 172, *Carphuroides pectinatus* (SHARP).173, *Asiocarphurus bhaktai* WITTMER, paratype. 174, *Telocarphurus drescheri* WITTMER, paralectotype. Scales: A = 170, 173, B = 171, C = 172, 174, D = 169.



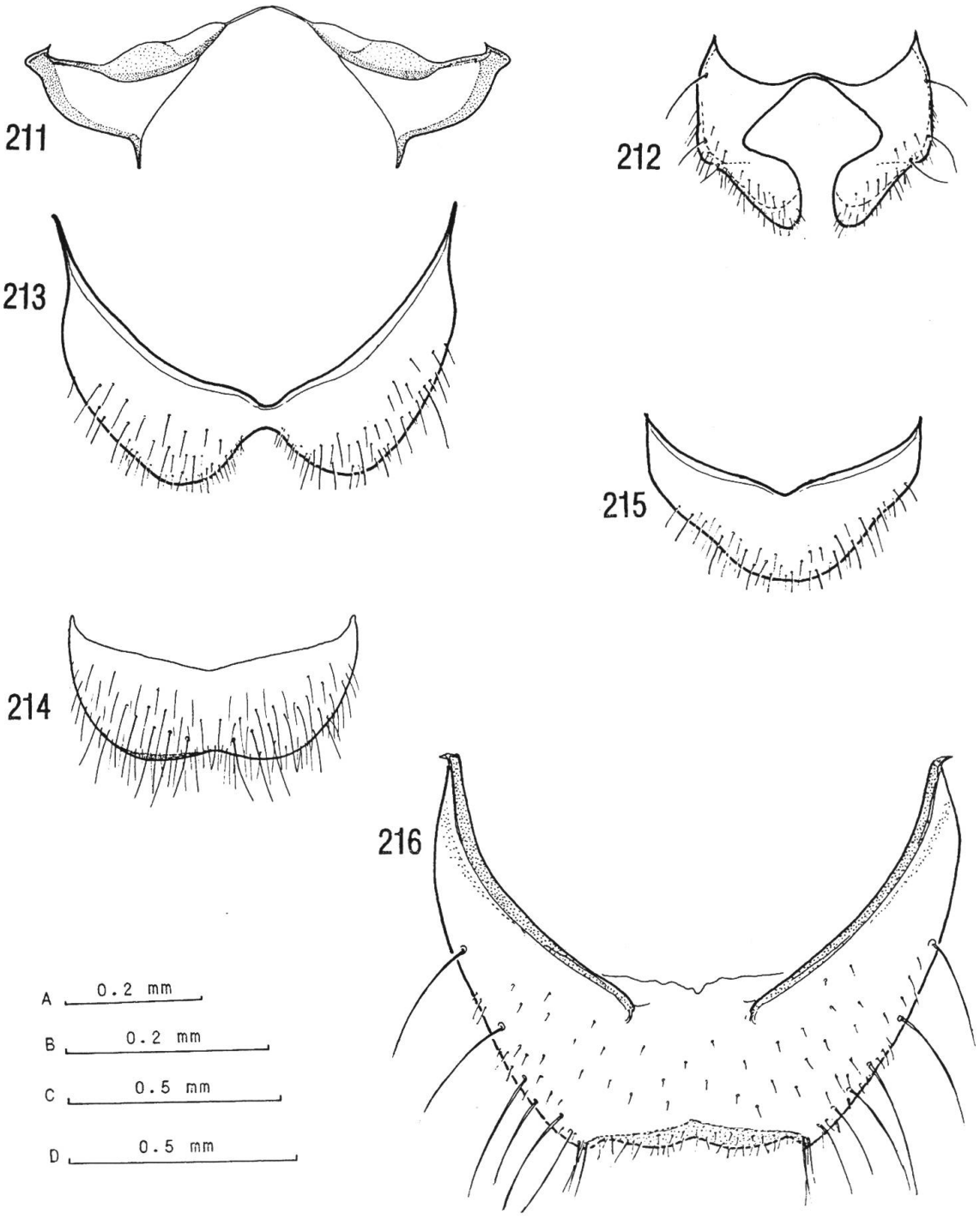
Figs 175–187, sternum VIII, ♂: 175, *Carphurus coriaceipennis* WITTMER, paratype. 176, *Carphurus testaceolimbatus* (WITTMER), paratype. 177, *Carphurus vittiensis* (WITTMER), paratype. 178, *Falsolaius carinatus* (PIC), holotype. 179, *Falsolaius curtipennis* PIC, holotype. 180, *Choresine rugiceps* WITTMER. 181, *Carphurus apicemaculatus* WITTMER, paratype. 182, *Microcarphurus borneensis* (PIC), lectotype. 183, *Carphurus garoensis* WITTMER, paratype. 184, *Scelocarphurus tibiellus* (WITTMER), paratype. 185, *Carphuromorphus validicornis* PIC, lectotype. 186, *Carphurus rubrosegmentatus* FAIRM. 187, *Carphurus malaccanus* PIC, paralectotype. Scales: A = 178, 180, 183, 186, 187, B = 175–177, 181, C = 179, 182, 184, 185.



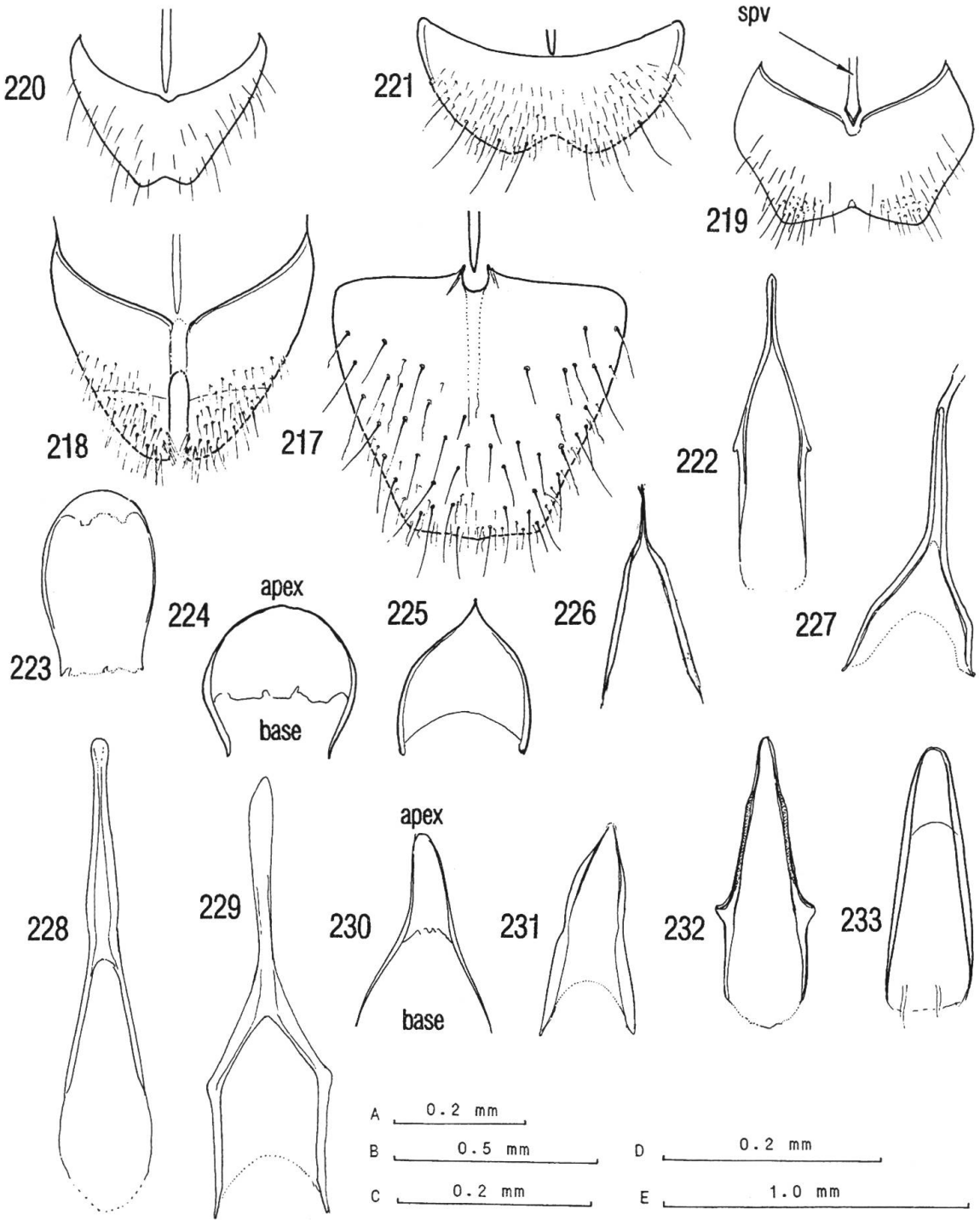
Figs 188–201, sternum VIII, ♂: 188, *Carphurus sumatrensis* PIC. 189, *Carphurus notaticollis* PIC. 190, *Thoraxocarphurus rhytideres* (LEA). 191, *Carphurus densepunctatus* WITTMER, paratype. 192, *Neocarphurus incurvipennis* LEA. 193, *Carphurus dispar* ER., lectotype. 194, *Helcogaster biroi biroi* (WITTMER), paratype. 195, *Carphurus rubroannulatus* MOTSCH. 196, *Carphurus deminutioplicatus* WITTMER, paratype. 197, *Balanophorus mastersi* MACLEAY, lectotype. 198, *Helcogaster brachypterus* (BOHEMAN). 199, *Brachyhedybius sinuatus* PIC. 200, *Carphurus compressicornis* WITTMER, paratype. 201, *Carphurus sayeri* CHAMP. Scales: A = 188–200, B = 196, 198, 190–192, 201, C = 193, 194, D = 195, 197, 199.



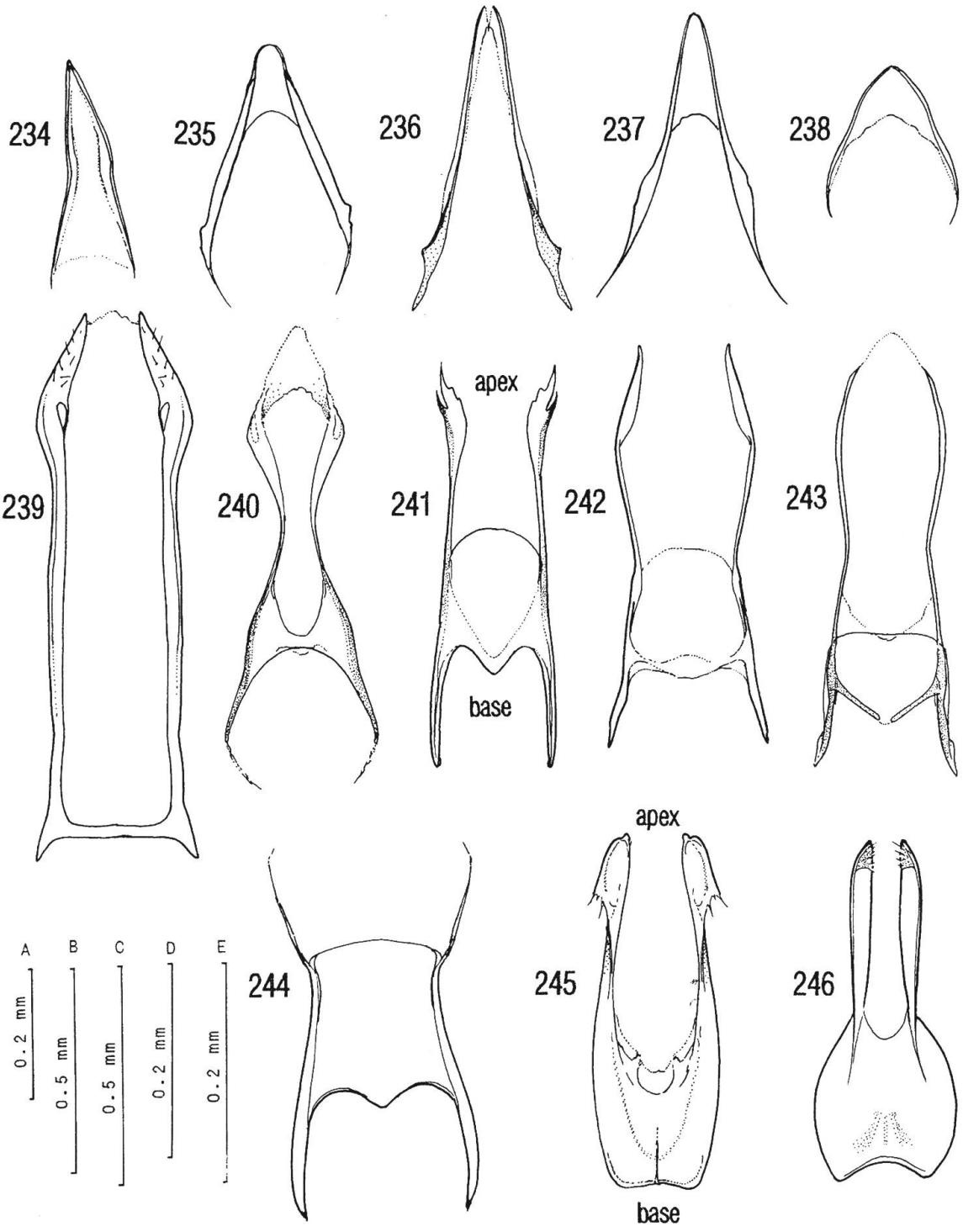
Figs 202–210, sternum VIII, ♂**:** 202, *Brachidia ruficollis* SOLIER. 203, *Neolemphus varipes* WITTMER, paratype. 204, *Lemphus fulcratus* ER. 205, *Lemphus mancus* ER. 206, *Lemphus tropicus* (KIRSCH), lectotype. 207, *Lemphus rubricollis* WITTMER, paratype. 208, *Oxylemphus azureus* WITTMER. 209, *Flabellolemphus atrocinctus* (PIC). 210, *Engilemphus boliviensis* (PIC).Scales: A = 205, 207, 209, B = 202, 203, C = 208, 210, D = 204, 206.



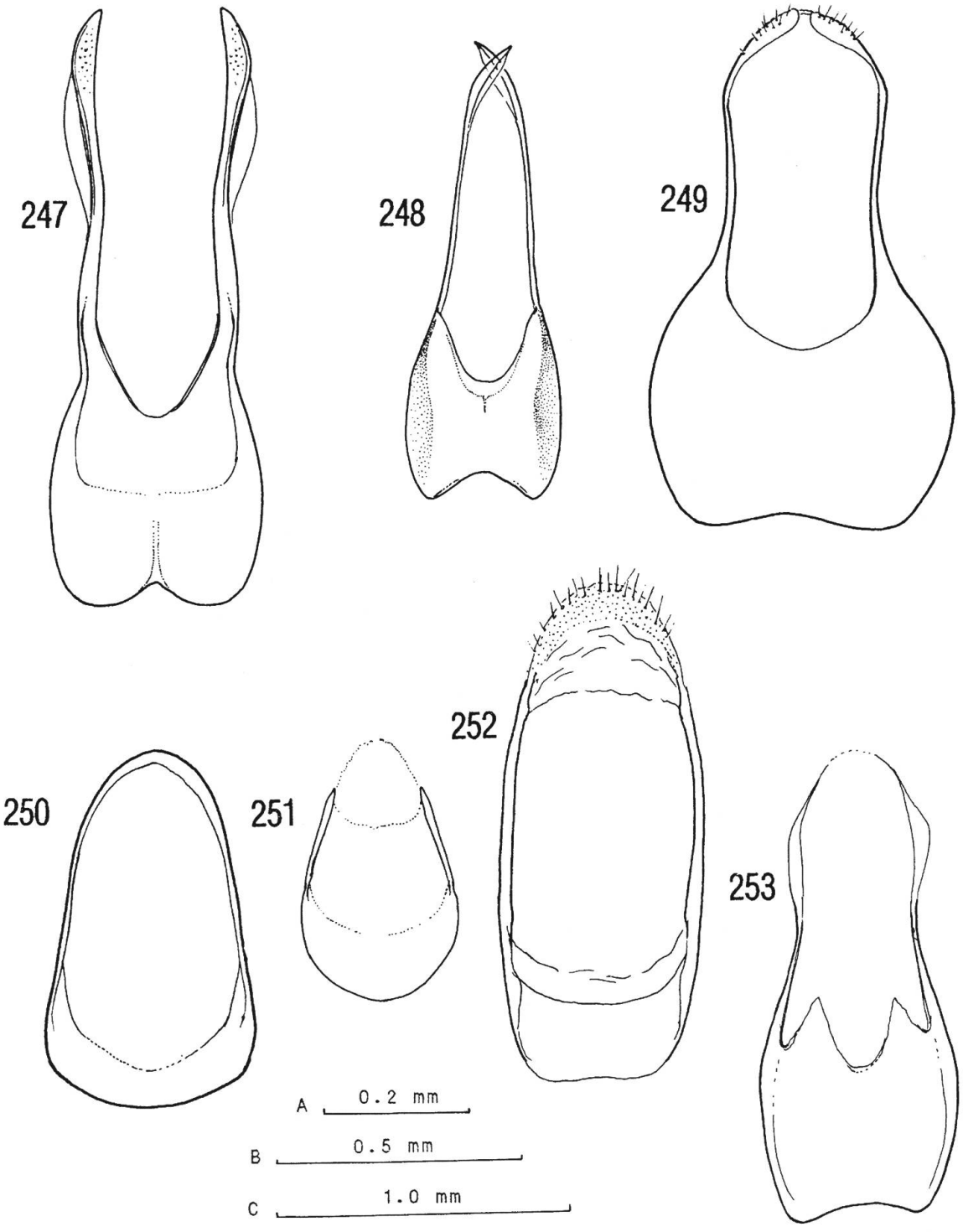
Figs 211–216, sternum VIII, ♂**:** 211, *Flabellolemphus minutus* (PIC), 212, *Hypattalus alphabeticus* LEA. 213, *Falsoanthocomus cyaneonotatus* PIC, paralectotype. 214, *Amalthocus tetraspillus* FAIRM., syntype. 215, *Falsoanthocomus humerosus* (ABEILLE). 216, *Pagurodactylus rostralis* CHAMP. Scales: A = 213–215, B = 216, C = 212, D = 211.



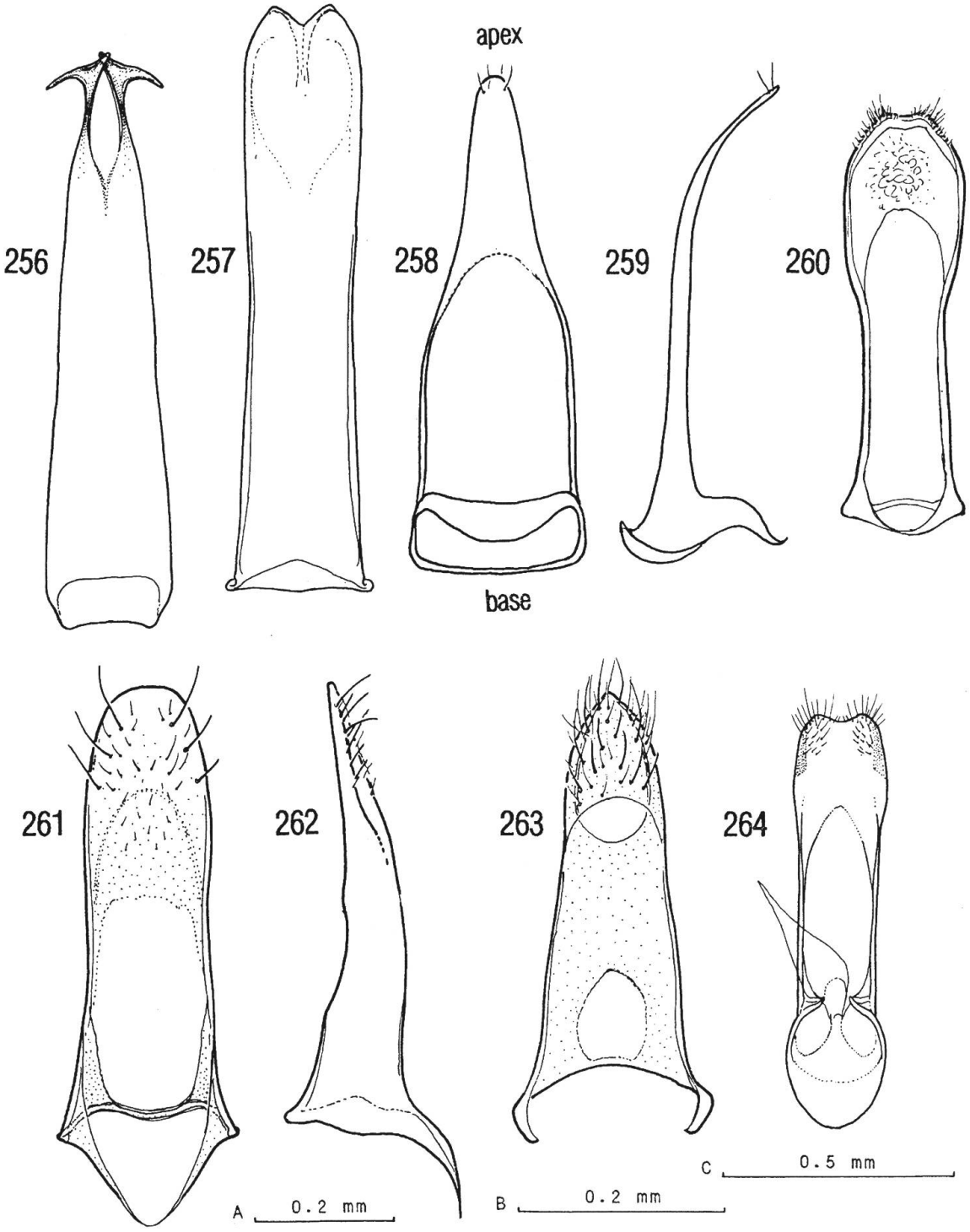
Figs 217–233 (220–217 sternum VIII, ♀; 222–233 spicular fork, ♂)**:** 217, *Carphurus cyaneipennis* MACLEAY. 218, *Lemphus inlateralis* PIC. 219, *Lemphus opacus* (GORH.), holotype. 220, *Hypattalus alphabeticus* LEA. 221, *Falsoanthocomus humerosus* (ABEILLE). 222, *Carphuroides lopchuensis* WITTMER. 223, *Carphuroides bhaktai* WITTMER, paratype. 224, *Carphuroides pectinatus* (SHARP). 225, *Apteromalachius namibensis* WITTMER, paratype [*C. ovambo* WITTMER]. 226, *Falsolaius carinatus* (PIC), holotype. 227, *Falsolaius curtipennis* PIC, holotype. 228, *Choresine advena* PASCOE. 229, *Choresine rugiceps* WITTMER. 230, *Carphurus garoensis* WITTMER, paratype. 231, *Scelocarphurus tibiellus* (WITTMER), paratype. 232, *Carphuromorphus validicornis* PIC, lectotype. 233, *Carphurus notaticollis* (PIC). Scales: A = 221, 222, 224, 225, 226, 228–230, B = 217, 218, 223, C = 233, D = 227, 231, 232, E = 219, 220.



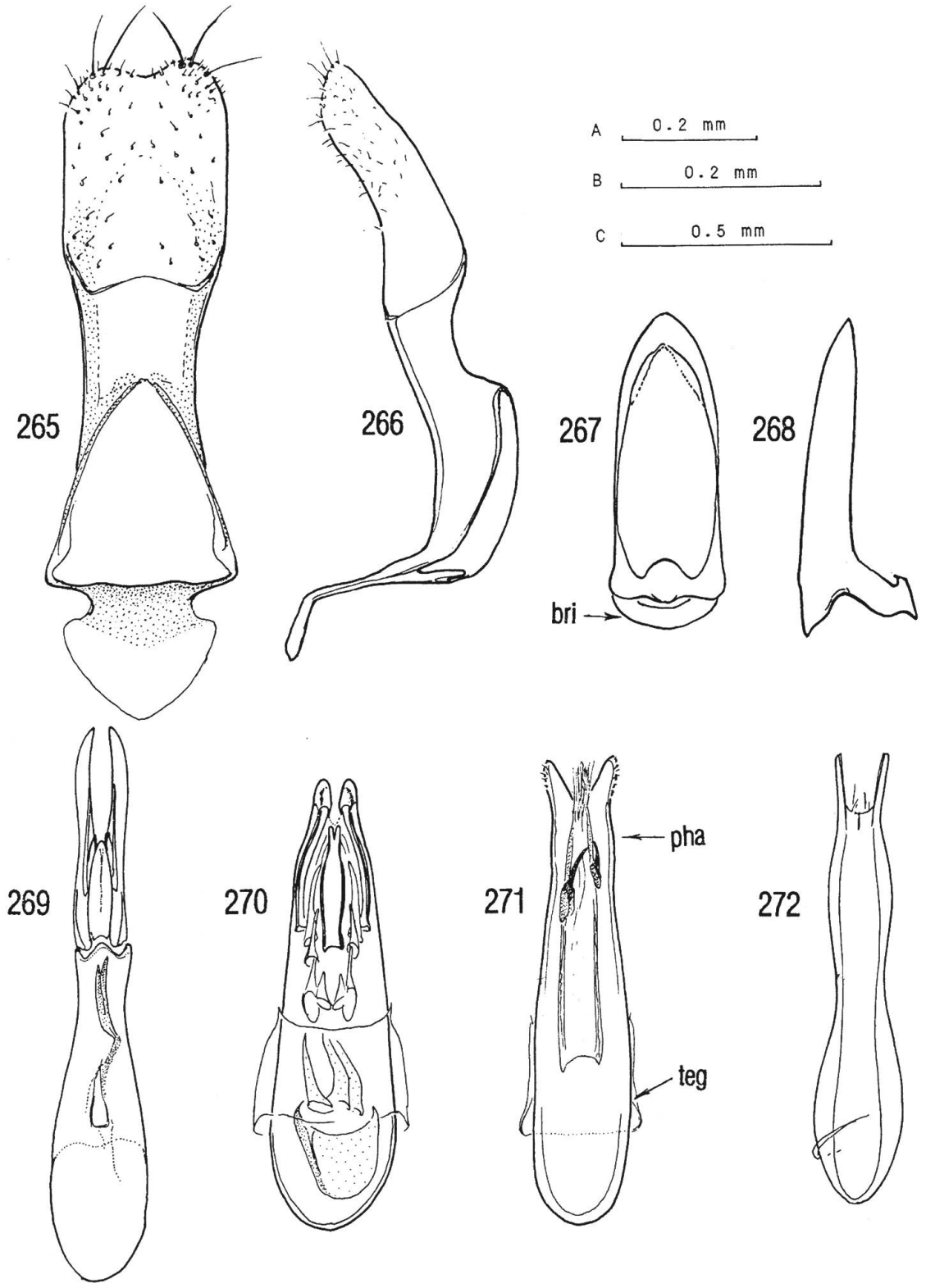
Figs 234–246, spicular fork, ♂**:** 234, *Carphurus dispar* ER., lectotype. 235, *Helcogaster biroi biroi* WITTMER, paratype. 236, *Balanophorus mastersi* MACLEAY, lectotype. 237, *Carphurus cyaneipennis* MACLEAY. 238, *Helcogaster brachypterus* (BOHEMAN). 239, *Brachidia ruficollis* SOLIER. 240, *Neolemphus varipes* WITTMER, paratype. 241, *Lemphus fulcratus* ER. 242, *Lemphus mancus* ER. 243, *Lemphus tropicus* (KIRSCH), lectotype. 244, *Lemphus rubricollis* WITTMER, paratype. 245, *Oxylemphus azureus* WITTMER. 246, *Flabellolemphus atrocinctus* (PIC). Scales: A = 242, 244, B = 236, 237, 238, 239, 240, 245, 246, C = 234, 243, D = 235, E = 241.



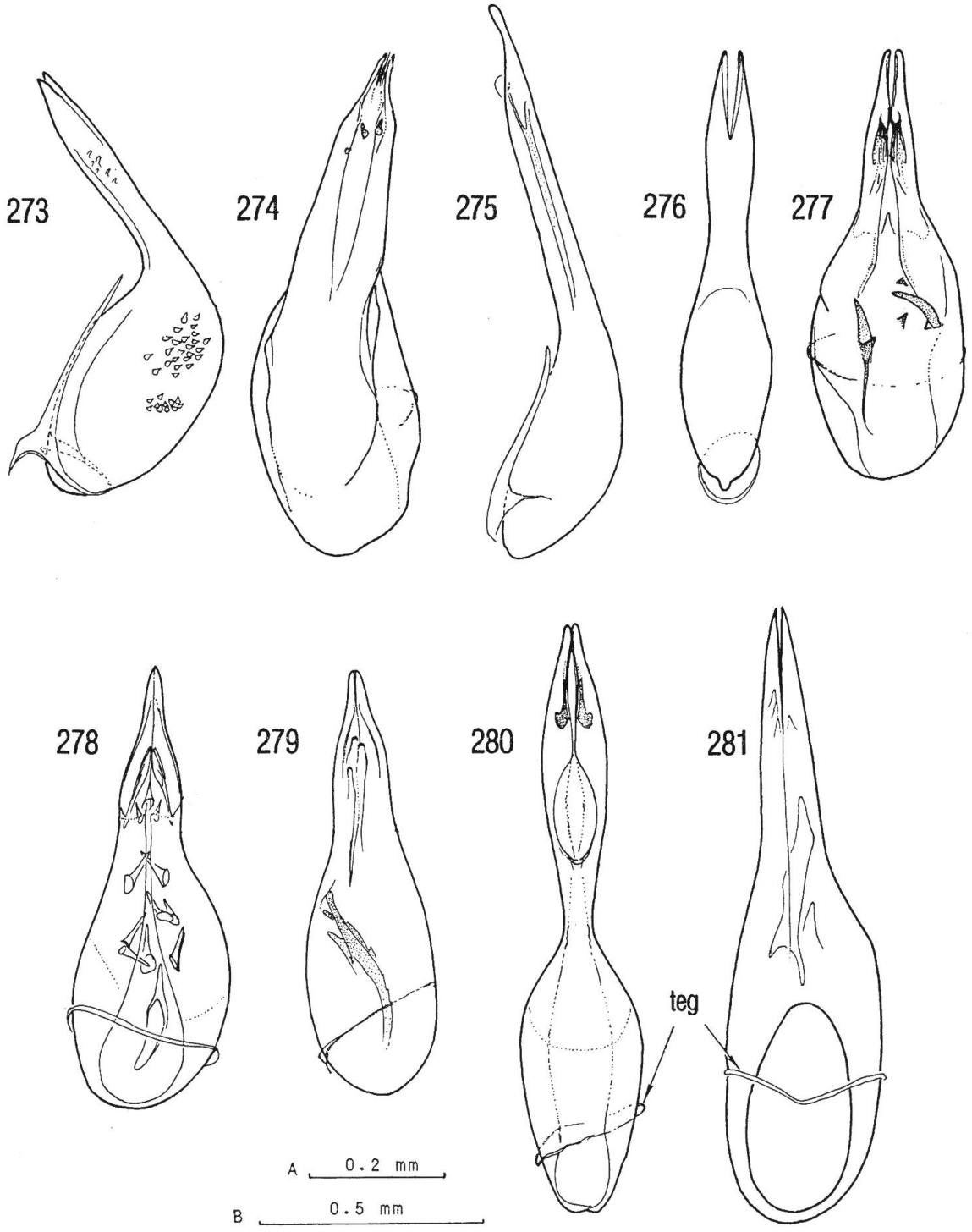
Figs 247–253, spicular fork, ♂**:** 247, *Engilemphus boliviensis* (PIC). 248, *Flabellolemphus minutus* (PIC), 249, *Hypattalus alphabeticus* LEA. 250, *Falsoanthocomus cyaneonotatus* (PIC), paralectotype. 251, *Amalthocus tetraspillus* FAIRM., syntype. 252, *Pagurodactylus rostralis* CHAMP. 253, *Malachius aeneus* (L.), ♂. Scales: A = 249–252, B = 247, 248, C = 253.



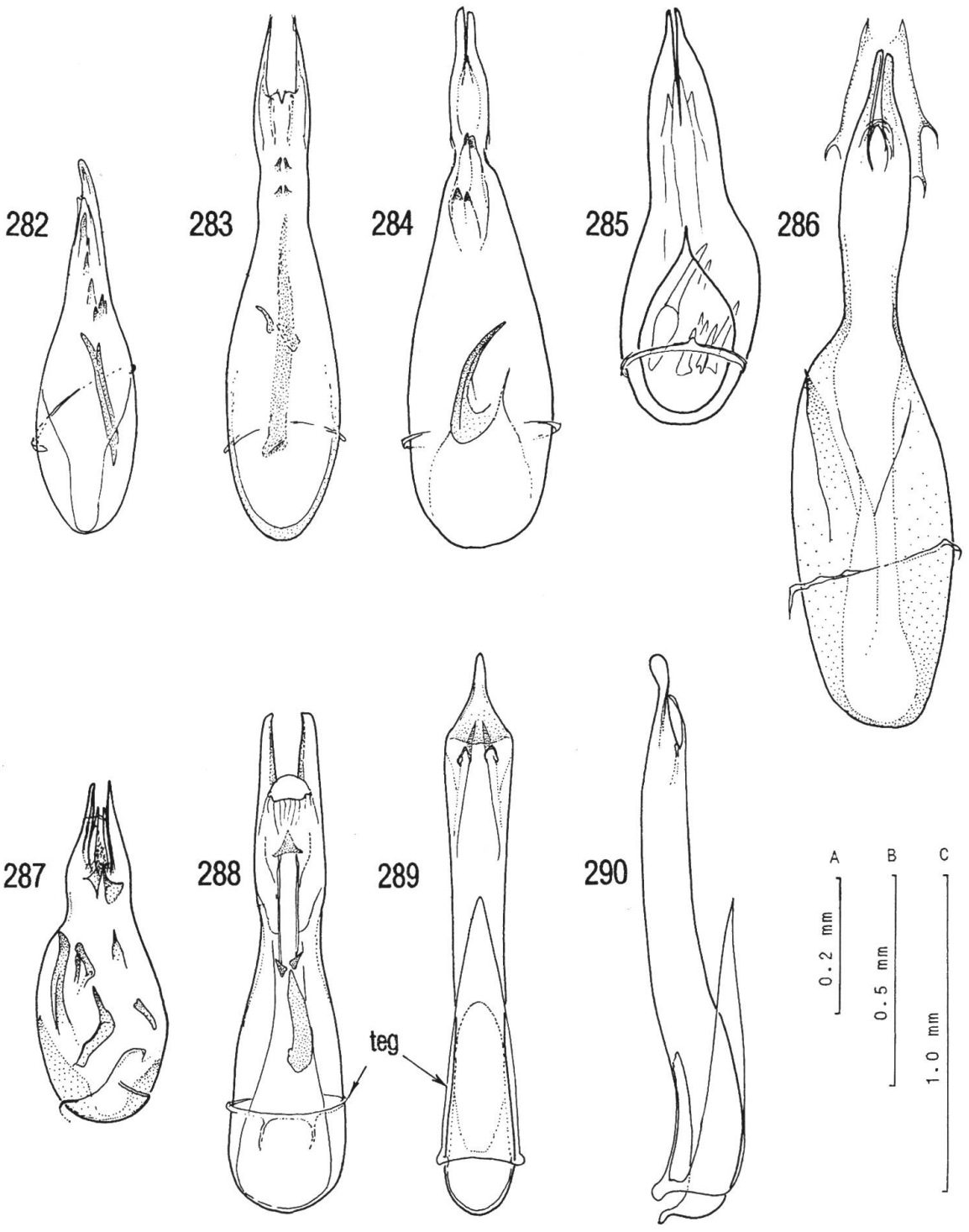
Figs 256–264 (256, 257, tegmen, dorsal; 258, 260, 261, 263, 264, tegmen, ventral; 259, 262, tegmen, lateral): 256, *Lemphus mancus* ER. 257, *Lemphus tropicus* (KIRSCH), lectotype. 258, 259, *Hypattalus alphabeticus* LEA. 260, *Falsoanthocomus costipennis* (ABEILLE). 261, 262, *Falsoanthocomus cyaneonotatus* PIC, paralectotype. 263, *Amalthocus humerosus* (ABEILLE). 264, *Amalthocus tetraspillus* FAIRM., syntype. Scales: A = 256, 258–262, 264, B = 263, C = 257.



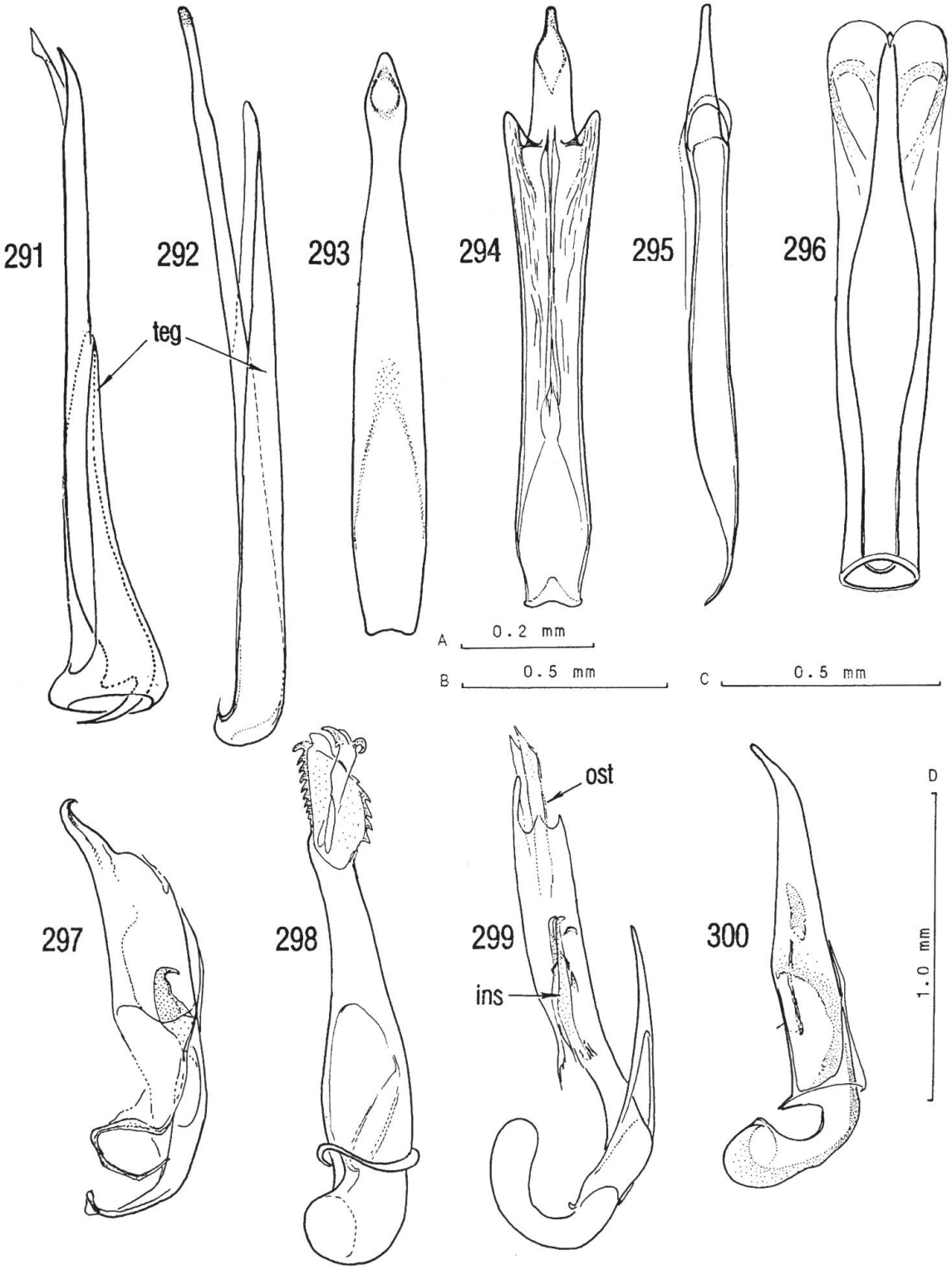
Figs 265–272 (265, 267 tegmen ventral; 266, 268 tegmen lateral; 269–272, phallus ventral)**:** 265, 266, *Pagurodactylus rostralis* CHAMP. 267, 268, *Malachius aeneus* (L.). 269, *Asiocarphurus bhaktai* (WITTMER), paratype. 270, *Carphuroides pectinatus* (SHARP). 271, *Apteromalachius namibensis* WITTMER, paratype. [*C. ovambo* WITTMER]. 272, *Telocarphurus drescheri* WITTMER, paralectotype. Scales: A = 270–272, B = 265, 266, C = 267–269.



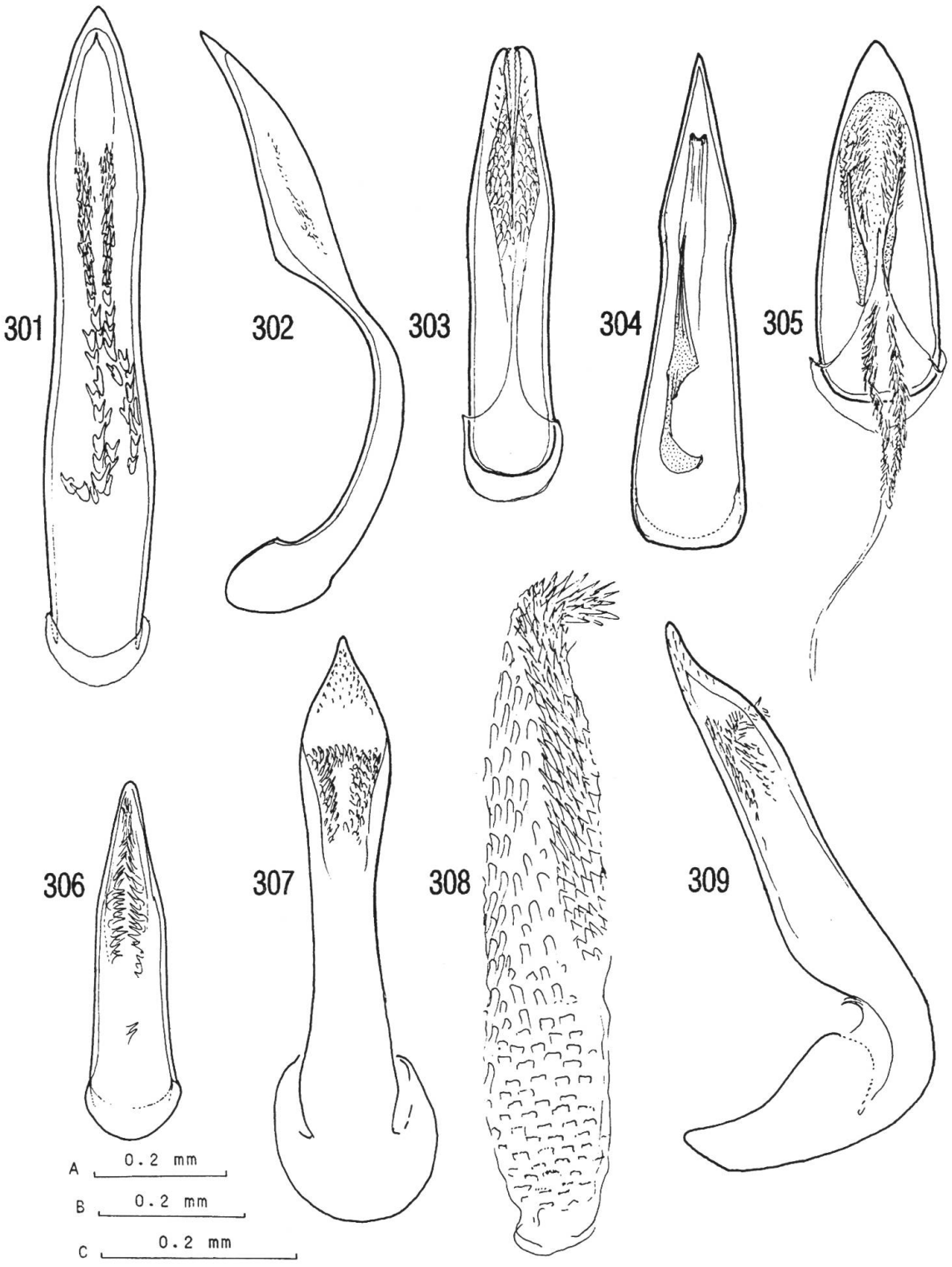
Figs 273–281 (273, 275, phallus lateral; 274, 276–281, phallus dorsal)**:** 273, *Falsolaius carinatus* (PIC), holotype. 274, *Falsolaius curtipennis* PIC, holotype. 275, *Choresine advena* PASCOE. 276, *Choresine rugiceps* WITTMER. 277, *Microcarphurus borneensis* (PIC), lectotype. 278, *Carphurus garoensis* WITTMER, paratype. 279, *Scelocarphurus tibiellus* (WITTMER), paratype. 280, *Carphuromorphus validicornis* PIC, lectotype. 281, *Carphurus notaticollis* PIC. Scales: A = 273–280, B = 281.



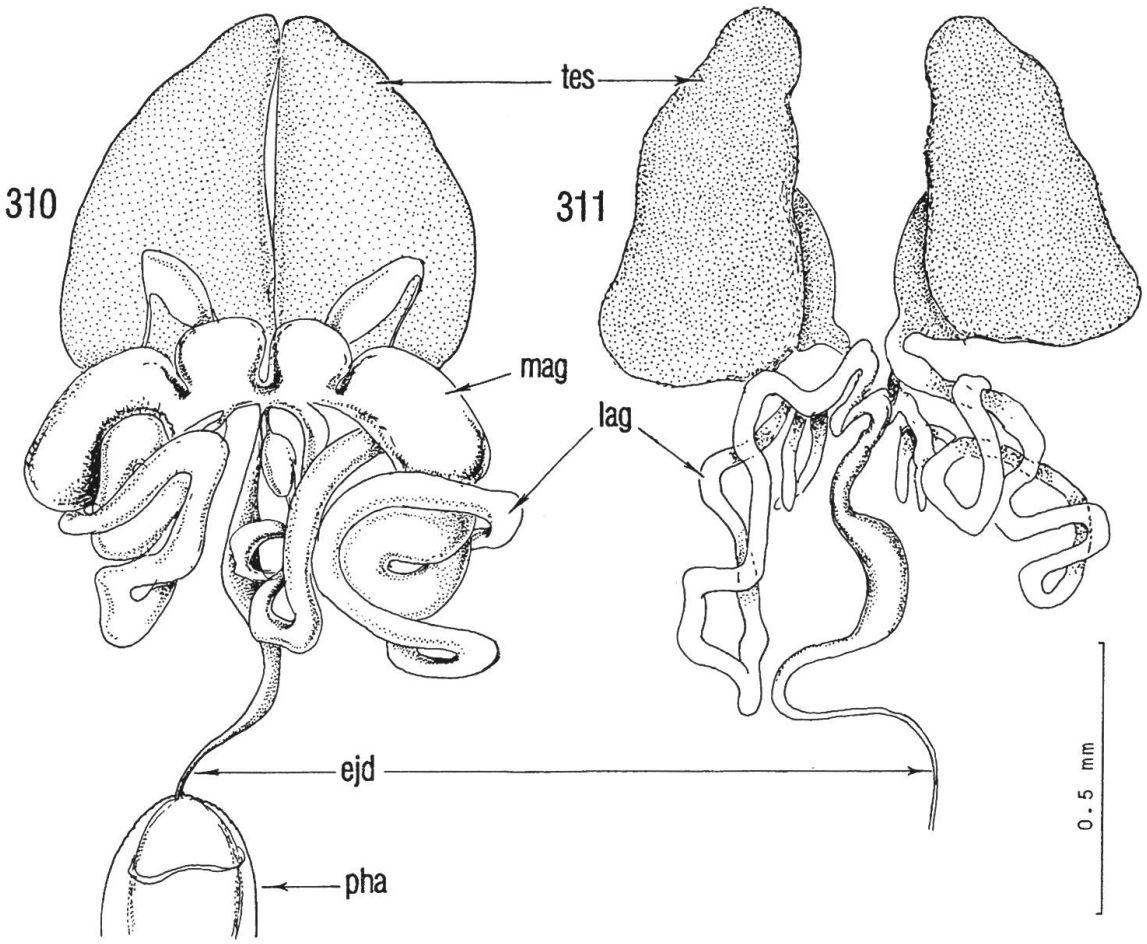
Figs 282–290 (282–289, phallus ventral; 290, phallus lateral)**:** 282, *Thoraxocarphurus rhytideres* LEA. 283, *Carphurus appendicifer* WITTMER, holotype. 284, *Carphurus dispar* ER., lectotype. 285, *Helcogaster biroi biroi* (WITTMER), paratype. 286, *Balanophorus mastersi* MACLEAY, lectotype. 287, *Helcogaster brachypterus* (BOHEMAN). 288, *Brachyhedybius sinuatus* PIC. 289, 290, *Brachidia ruficollis* SOLIER. Scales: A = 284, 285, B = 286–290, C = 282, 283.



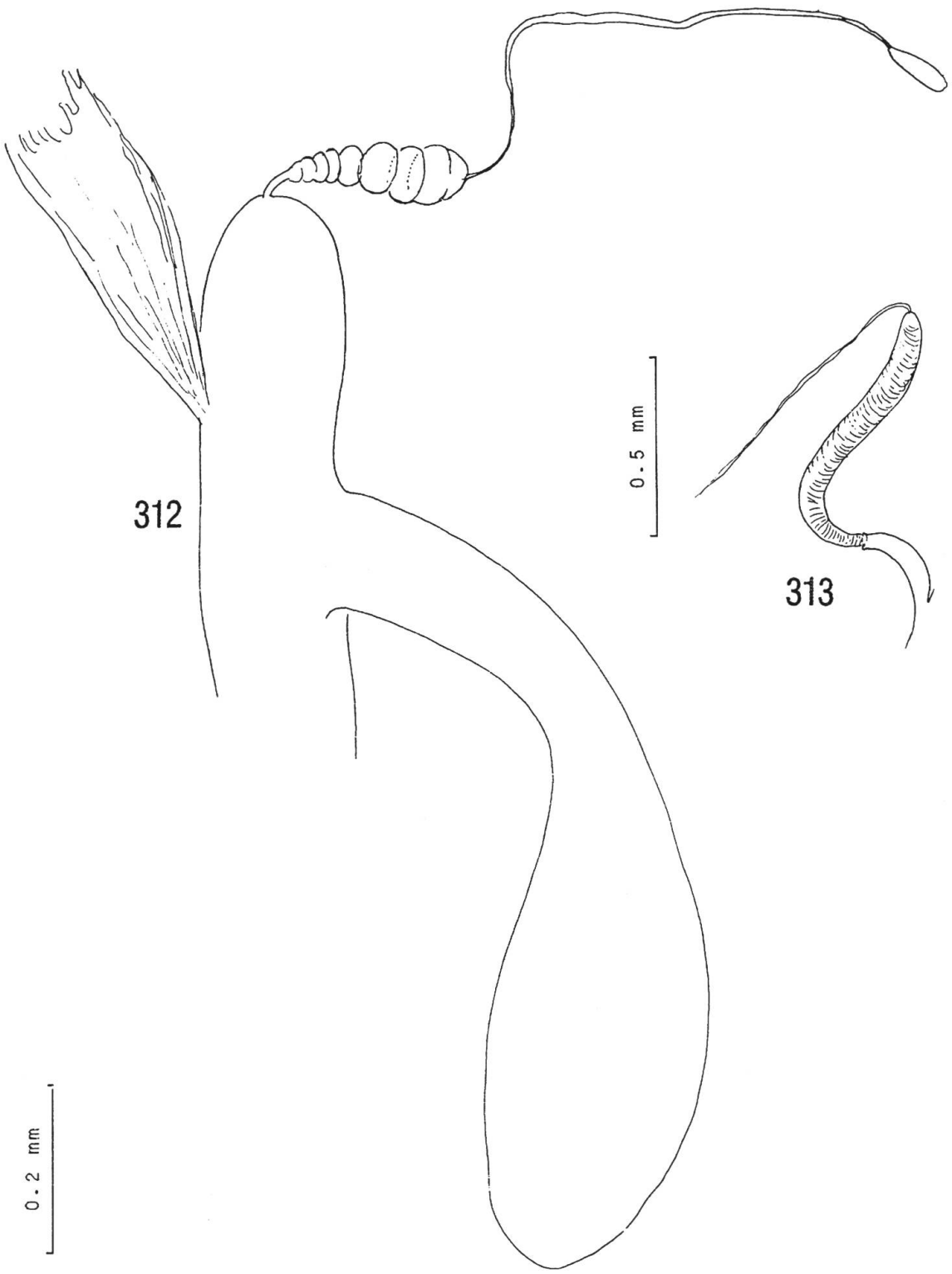
Figs 291–300 (291, 292, 295, 297–300, phallus lateral; 293, 294, 296, phallus dorsal)**:** 291, *Neolemphus varipes* WITTMER, paratype. 292, *Lemphus fulcratus* ER. 293, *Lemphus mancus* ER. 294, 295, *Lemphus tropicus* (KIRSCH), lectotype. 296, *Lemphus rubricollis* WITTMER, paratype. 297, *Oxylemphus azureus* WITTMER. 298, *Flabellolemphus atrocinctus* (PIC). 299, *Engilemphus boliviensis* (PIC). 300, *Flabellolemphus minutus* (PIC). Scales: A = 293, 296, B = 297, 298, C = 291, 292, 294, 295, 300, D = 299.



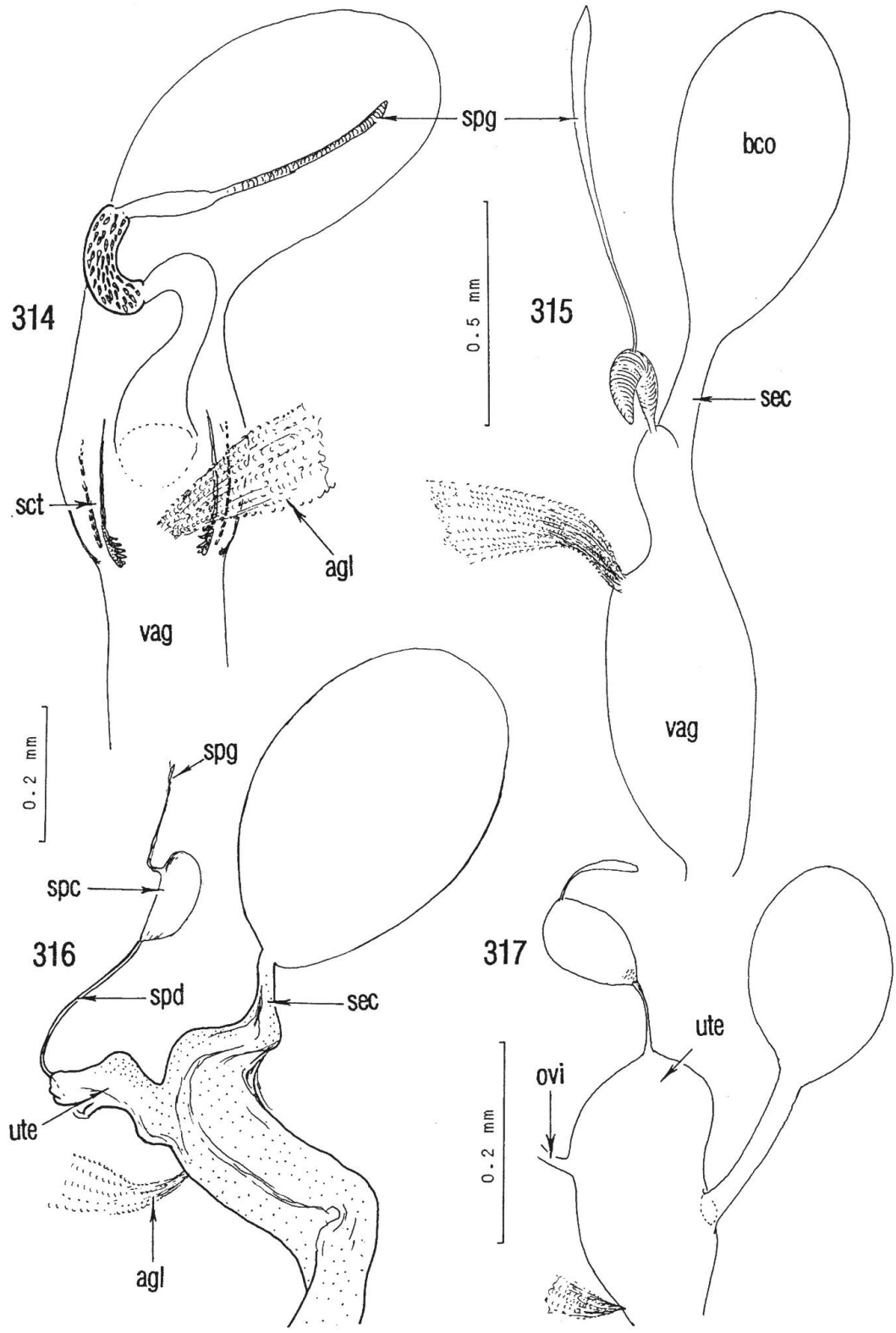
Figs 301–309 (301, 303–307, phallus dorsal; 302, 309, phallus lateral; 308, internal sac)**:** 301, 302, *Hypattalus alphabeticus* LEA. 303, *Falsoanthocomus costipennis* (ABEILLE). 304, *Falsoanthocomus cyaneonotatus* (PIC), paralectotype. 305, *Falsoanthocomus humerosus* (ABEILLE). 306, *Amalthocus tetraspillus* FAIRM., syntype. 307–309, *Pagurodactylus rostralis* CHAMP. Scales: A = 301–304, B = 306, C = 305, 307–309.



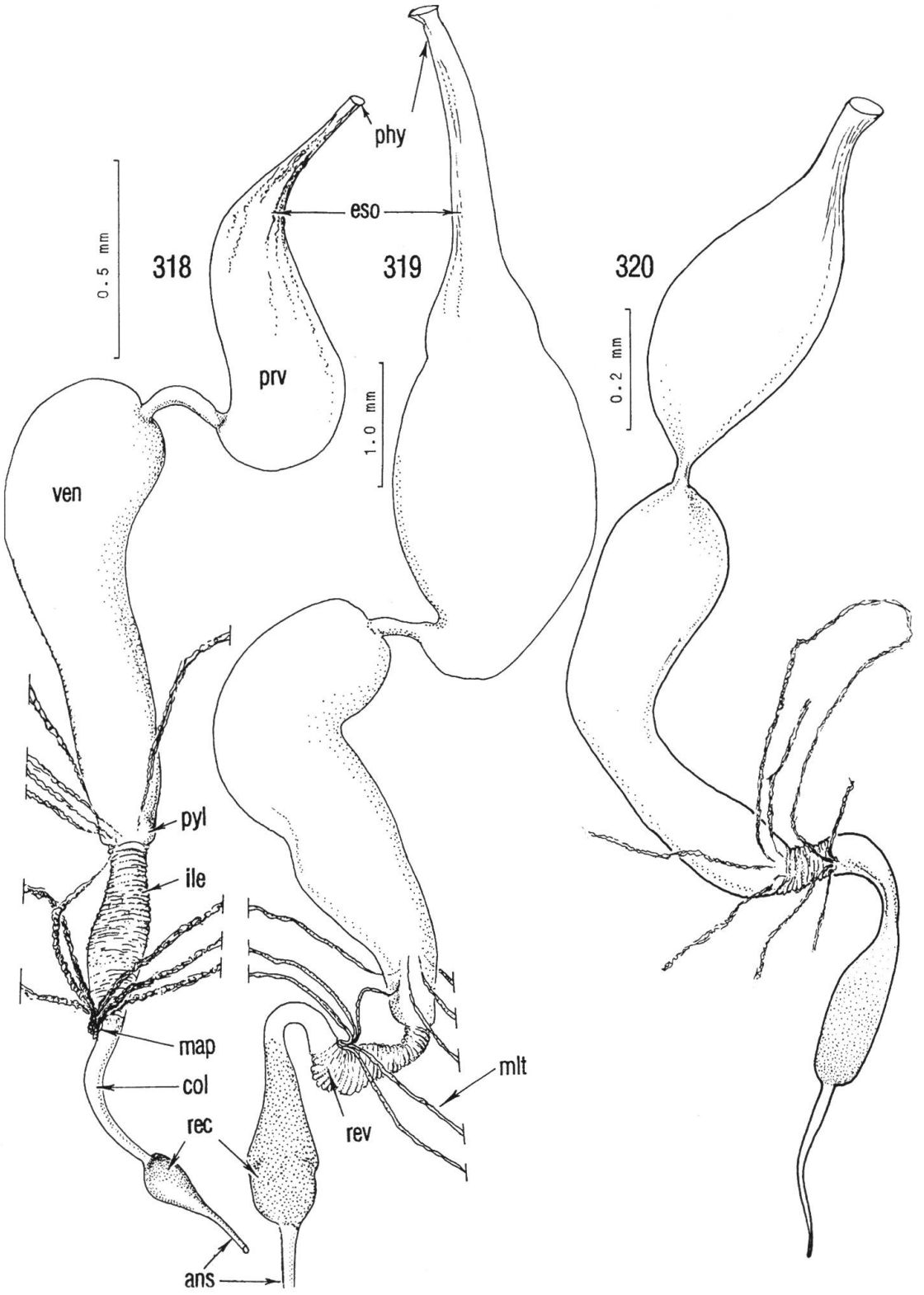
Figs 310, 311, reproductive organs, ♂: 310, *Helcogaster brachypterus* (BOHEMAN). 311, *Malachius aeneus* (L.).



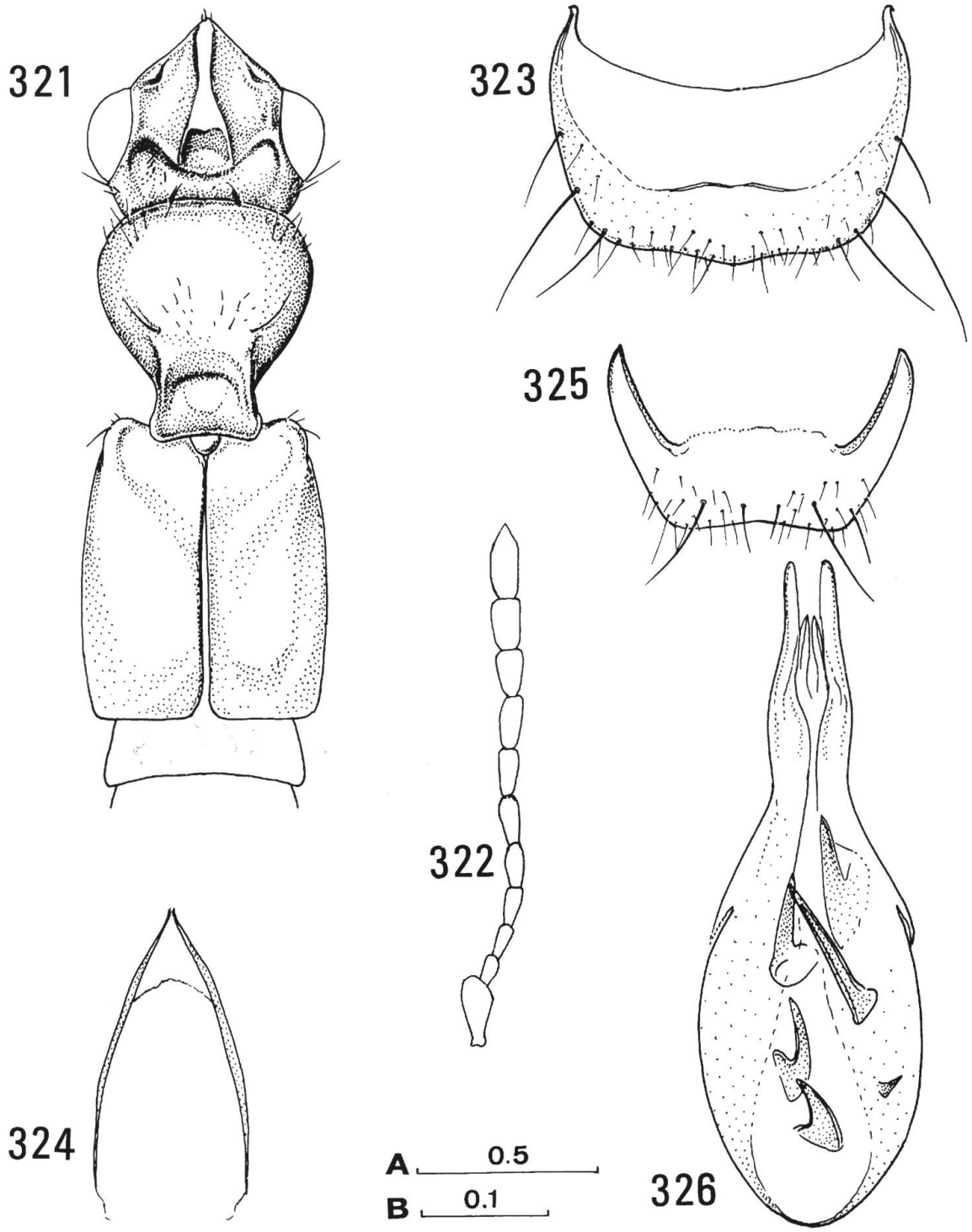
Figs 312, 313 (312 copulatory organs, ♀; 313 spermatheca)**:** 312, *Carphurus cyaneipennis* MACLEAY. 313, *Lemphus opacus* (GORH.), holotype.



Figs 314–317, copulatory organs, ♀: 314, *Engilemphus boliviensis* (PIC). 315, *Hypattalus punctulatus* BLACKB., holotype. 316, *Pagurodactylus coronatus* (BOHEMAN). 317, *Malachius aeneus* (L.).



Figs 318–320, alimentary canal: 318, *Helcogaster brachypterus* (BOHEMAN), ♂. 319, *Malachius aeneus* (L.), ♀. 320, *Pagurodactylus coronatus* (BOHEMAN), ♀.



Figs 321–326, *Neocarphurus chlorops* LEA (Holotype, ♂)**:** 321, anterior part of body. 322, right antenna. 323, pygidium. 324, spicular fork. 325, sternum VIII. 326, phallus dorsal. Scales: A = 321, 322; B = 323–326.