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Autor: Kolibá, Jií
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Metaxinidae fam.nov., a new family of Cleroidea (Coleoptera)

by **Jiří Kolibáč**

Abstract. A brief review of the superfamily Cleroidea (Coleoptera) is presented. The superfamily is divided into melyrid, trogositid, clerid and thaneroclerid branches. The final branch includes the families Chaetosomatidae, Thanerocleridae and the new family Metaxinidae fam.nov., which is established for the single species *Metaxina ornata* Broun, 1909 from New Zealand. This enigmatic beetle has hitherto been classified in Cleridae, Chaetosomatidae, Thanerocleridae or as Cleroidea *incertae sedis*. Metaxinidae fam.nov. is characterized by absence of endocarina in the larval head capsule, larval abdomen with long hairs, narrow adult mentum and spermatheca situated on base of bursa copulatrix. Tentorial bridge of adult is weak and pale and it is situated at apices of tentorial arms. Diagnostic characters of Chaetosomatidae and Thanerocleridae are also mentioned and their relationships to Metaxinidae fam.nov. are discussed. The chaetosomatid genus *Somatochaetus* Menier et Ekis, 1982 (type species: *Somatochaetus quadraticollis* Menier et Ekis, 1982) is synonymized with *Malgassochaetus* Ekis et Menier, 1980 (type species: *Malgassochaetus crowsoni* Ekis et Menier, 1980).

Key words. Coleoptera – Cleroidea – Cleridae – Chaetosomatidae – Thanerocleridae – Metaxinidae – *Metaxina ornata* – new family

Introduction

The enigmatic beetle species *Metaxina ornata* Broun, 1909 from New Zealand was classified by its author within the family Cleridae without any further concrete orientation within the clerid system. BROUN (1909: 407) remarked that "*the type of this genus is quite unlike any Australian or New Zealand species* [of Cleridae] *known to me, and certainly an aberrant form, owing to the absence of tarsal lamellae, the unnotched eyes, etc.*" Nearly forty years later, WOLCOTT (1944) classified the species within the subfamily Hydnocerinae (or Phyllobaeninae at that time); probably only on the basis of the shape of the antennae and the colour of the elytra, which are similar to some species of the genus *Lemidia* Spinola, 1841. The first modern approach was made by CROWSON (1952, 1955) who included *M. ornata* in the new family Chaetosomatidae; later, the same author (CROWSON 1964) reclassified the species to Thanerocleridae (or Cleridae: Thaneroclerinae at that time). In my revision of the latter family (KOLIBÁČ 1992), I excluded *M. ornata* from the Thanerocleridae and the species has been classified as Cleroidea *incertae sedis* since that time. This fact was mentioned, for example, by LAWRENCE *et al.* (1999a).

CROWSON'S (1964) paper is especially important for the taxonomy and morphology of *M. ornata* because its larva is described there. Furthermore, adult and larval features are discussed and compared with those of Chaetosomatidae, Cleridae and Thanerocleridae for the first time. The adult *M. ornata* is precisely described in LAWRENCE *et al.* (1999a).

Any opportunity to study the beetle is limited by its rarity in entomological collections, including those in New Zealand. Sixteen years ago, I studied two syntypes

from the Broun collection in the Natural History Museum, London. Recently, I have studied several larvae and adults reared from *Nothofagus* branches in the year 2000.

My recent studies on Cleroidea (KOLIBÁČ 1999), particularly Thanerocleridae (KOLIBÁČ 1992), Chaetosomatidae (partially published below), Cleridae (KOLIBÁČ 1997) and Trogositidae (unpublished), prepared the ground for a well-balanced classification of *M. ornata*. A separate family Metaxinidae fam.nov. is established here for the species. Relationships of the new family with Chaetosomatidae and Thanerocleridae are confirmed by both adult and larval features, as discussed below.

Material

Abbreviations

BMNH ..... Natural History Museum (British Museum of Natural History), London, UK
MNHN ..... Musée National d'Histoire Naturelle, Paris, France
LUNZ .... Entomology Research Museum, Lincoln University, Canterbury, New Zealand
JKC ..... Jiří Kolibáč collection, Moravian Museum, Brno, Czech Republic

Methods

The illustrations and descriptions presented in this communication have been made over the course of the years since 1988. Standards and techniques of ink drawing have changed in that 16 years. Some illustrations were drawn with the aid of an ocular grid in a compound or binocular-microscope (sometimes more schematic figures with somewhat idealised symmetry); the latest illustrations have been made with the drawing unit of an Olympus BX 41 (sometimes slightly asymmetrical figures in a natural state).

The standard method of boiling in 10% KOH was used before dissection of mouthparts or copulatory organs. Digestive tracts were stained with Congo Red. Dimethylhydantoin formaldehyde (soluble in water or ethanol) was used as the medium for preservation of some organs on hard-paper labels pinned under (adult) specimens. Other parts of dissected specimens (larvae) were preserved in microvials with glycerin or 70% ethanol (or ethyl alcohol).

The Hennig86 computer program (commands *ie- bb*, *successive weighting*) in connection with TreeGardener 1.0 were used for an analysis of the character states matrices. Cucujoidea (Protocucujidae, Phloeostichidae, Sphindidae) were used as outgroups for an analysis of Cleroidea (BEUTEL & SLIPINSKI 2001, GUPTA & CROWSON 1979, MCHUGH 1993, SLIPINSKI 1998). Melyridae *s.l.*, Trogositidae *s.l.* and Cleridae were outgroups for the thaneroclerid branch.

For explanation of the morphological terminology employed, see particularly CROWSON (1964), KOLIBÁČ (1987, 1989ab, 1992, 1997) and LAWRENCE *et al.* (1999ab).

Phylogenetic groups of Cleroidea

Description of character states for Tab. 1.

1. Head, structure: 0, impressions (punctures) rounded; 1, with longitudinal impressions or wrinkles (tendency in Trogositidae).
2. Eyes: 0, not emarginate (unnotched); 1, emarginate (notched).
3. Tormal processes (medial, connecting): 0, one of the processes absent; 1, medial and connecting processes present (ground plan of Cleridae).
4. Mandibles: 0, two apical teeth present, horizontally situated; 1, one apical tooth present.
5. Head capsule (larva): 0, elongate and parallel-sided; 1, rather quadrate or conical.
6. Gular sutures (larva): 0, not narrow and parallel; 1, narrow and parallel.
7. Lacinia mobilis (larva): 0, one or more separate spines; 1, spines with common root.
8. Labrum, tormal plate (larva): 0, present; 1, absent.
9. Empodium: 0, medium-sized; 1, large and projecting.
10. Tarsal claws: 0, without appendages; 1, with appendages.
11. Tarsomere 5: 0, medium-sized; 1, conspicuously longer than 1–4.
12. Tarsomeres 1–4: 0, without lobes; 1, with lobes.
13. Mesonotum: 0, not elongate; 1, narrow and elongate.
14. Aedeagus: 0, uninverted; 1, inverted (tendency in Cleridae: Korynetinae).
15. Ventriculus, structure (larva): 0, smooth or with papillae; 1, with net-like structure.

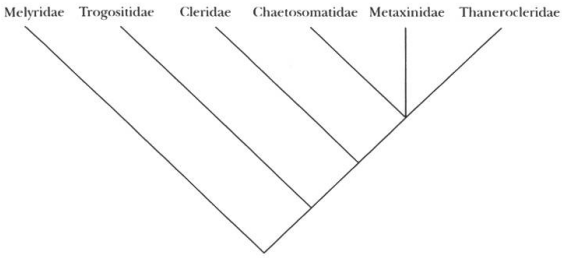
	1
	1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
Melyridae *s.l.*	0 0 0 0 0 0 1 1 0 1 0 0 0 0 1
Trogositidae *s.l.*	1 0 0 0 0 0 0 0 1 0 1 0 0 1 0
Cleridae	0 1 1 1 0 0 0 0 0 0 0 1 0 1 0
Chaetosomatidae	1 0 1 1 1 1 0 0 0 0 1 0 1 1 0
Metaxinidae *nov.*	1 0 1 1 1 1 0 0 0 0 1 0 1 1 0
Thanerocleridae	1 0 1 1 1 1 0 0 0 0 1 0 1 1 0

Tab. 1. Matrix of diagnostic characters of relevant higher taxa of Cleroidea.

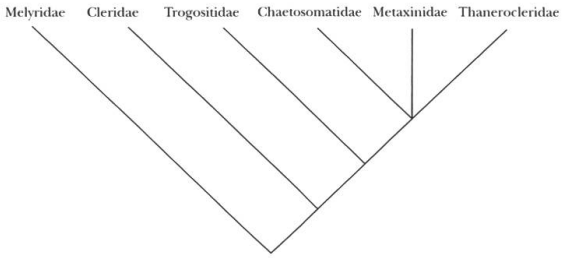
Melyrid branch

[Acanthocnemidae, Phycosecidae, Prionoceridae, Mauroniscidae, Dasytidae, Gietellidae, Melyridae, Malachiidae, Attalomimidae; *sensu* MAJER (1994a,b)]

Remarks. This is the largest group of Cleroidea, containing probably over 5,000 species, mostly of characteristic "malacoderm" appearance. The largest taxa are the



Tree 1. Cladogram 1 computed from Tab. 1 (*ie- bb, successive weighting*): length = 170, ci = 88, ri = 86.



Tree 2. Cladogram 2 computed from Tab. 1 (*ie- bb, successive weighting*): length = 170, ci = 88, ri = 86.

Malachiidae and Dasytidae. The small, originally Australian and New Zealand, families Acanthocnemidae and Phycosecidae are the most separate taxa. They differ from Melyridae *s.l.* especially in the inverted aedeagus and the presence of a primitive abdominal segment IX. An absence of endocarina is characteristic of the larvae of the melyrid branch, with Y-shaped frontal sutures, reduced notal sclerites and large hooked or straight urogomphi situated apically. (The urogomphi are situated rather dorsally in the other branches of Cleroidea.) For further character states of the branch see Tab. 1.

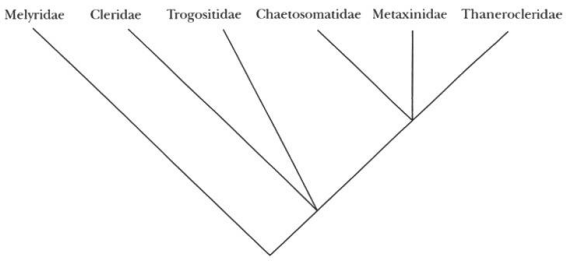
The internal taxonomy of the melyrid branch was reviewed by MAJER (1994a,b). His families Mauroniscidae, Gietellidae, Attalomimidae (although monophyletic) were not accepted by some entomologists, with reference to the relationships of Mauroniscidae with Melyridae, Gietellidae with Dasytidae and Attalomimidae with Malachiidae. Their logical position is correct; however, Majer established these three small families because of a well-balanced system of Melyridae, Dasytidae and Malachiidae, families in which he was a leading specialist.

Literature. BEUTEL & POLLOCK (2000), BÖVING & CRAIGHEAD (1931), CONSTANTIN & MENIER (1987, 1990), CROWSON (1955, 1964, 1981), KOLIBÁČ (1999), LAWRENCE *et al.* (1999ab), MAJER (1986, 1987, 1990, 1995, 1996, 1994ab, 2002), MENIER & CONSTANTIN (1989).

Trogositid branch

[Phloiophilidae, Trogositidae]

Remarks. This relatively small (about 600 species) branch is very varied and complex. For a review of Trogositidae *s.l.* see for example SLIPINSKI (1992) or LAWRENCE *et al.* (1999a). A detailed revision of generic and suprageneric taxa has been prepared by myself in recent years (KOLIBÁČ *in litt.*). The monotypic family Phloiophilidae has some distinct cucujoid features (e.g. the curved frontal sutures in the larva) but, on the other hand, it is also closely related to the trogositid subfamily Peltinae (Phloiophilidae differs mainly in absence of the mandibular mola). Moreover, cucujoid characters also occur in Trogositidae (for example, the curved frontal sutures mentioned above are also present in *Protopeltis* Crowson, 1964 which is probably related to *Thymalus* Latreille, 1802).



Tree 3. Cladogram (consensus tree of trees 1 and 2) computed from Tab. 1 (*ie- bb, successive weighting, nelsen*): length = 170, ci = 88, ri = 86.

Recently, BEUTEL & SLIPINSKI (2001) also mentioned a close relationship between Cleroidea and some Cucujoidea (e.g. Coccinellidae, Nitidulidae) as well as a potential paraphyly of the latter superfamily.

The trogositid branch appears to be primitive among other Cleroidea. The inclusive synapomorphies are confined to the projecting bisetose empodium and the inverted aedeagus. However, the latter character state also occurs in several other cleroid families (Tab. 1). On the other hand, advanced predatory members of the Trogositinae have mandibles without mola and with one apical tooth, pronotum with lateral edge reduced and other derived features.

Literature. BARRON (1971, 1975), BÖVING & CRAIGHEAD (1931), CROWSON (1955, 1964, 1966, 1970, 1981), KIREYTCHUK & PONOMARENKO (1990), KOLIBÁČ (1993, 1999), KUKALOVÁ-PECK & LAWRENCE (1993), LAWRENCE *et al.* (1999ab), MAMAEV (1976), REITTER (1875), SLIPINSKI (1992).

Clerid branch

[Cleridae]

Remarks. This large branch includes more than 3,500 species, primarily predatory. The single family is extremely varied but well defined by the presence of tarsal lobes in tarsomeres 1–4 and emarginate eyes (Tab. 1). Important apomorphies also include a complete absence of the pronotal lateral edge in most of the species (excepting Korynetinae) and the tegmen consisting of one piece (parameres are perfectly fused with phallobase) in all species with the exceptions of several Australian and South American genera related to *Eleale* Newman, 1840. Larvae have Y- or U-shaped frontal sutures, conspicuous endocarina and dorsally-situated urogomphi. The subfamilies of Cleridae were revised by KOLIBÁČ (1997).

That this clerid branch could be a sister group of the thaneroclerid branch is discussed below.

Literature. BÖVING & CHAMPLAIN (1920), BÖVING & CRAIGHEAD (1931), CHAPIN (1924), CORPORAAL (1950), CROWSON (1955, 1964, 1972, 1981), EKIS & GUPTA (1971), FOSTER (1976a), KOLIBÁČ (1987, 1989ab, 1997, 1998b, 1999, 2003), LAWRENCE *et al.* (1999ab), OPITZ (1997, 2003, 2004).

Thaneroclerid branch

[Chaetosomatidae, Metaxinidae fam.nov., Thanerocleridae]

Remarks. A possibly relict branch, this includes only about 40 species, mostly predatory. Chaetosomatidae are distributed in New Zealand and Madagascar, the

monotypic Metaxinidae *nov.* in New Zealand. Only the Thanerocleridae are distributed worldwide; however, all the Australian species belong to the originally southeastern Asian genus *Isoclerus* Lewis, 1892. The branch is based on several larval characters (narrow and parallel gular sutures, elongate capsule) and the narrow, elongate mesonotum. Also characteristic are a pattern in the anal field of the wings in which the cross-vein MP3-MP4 is mostly missing, and the structure of the metendosternite, which is same in all three families.

The trogositid or clerid branch is a sister group of the thaneroclerid branch, as shown in the cladograms (Trees 1–3). This question is still open and it can hardly be ultimately addressed in the classical morphological way. Excepting the characters in Tab. 1, there are common apomorphies with some advanced Trogositinae (structure of the mandible) that can be only convergent adaptation to a similar (predatory) way of life. Chaetosomatidae and some Trogositinae (e.g. *Corticotomus* Sharp, 1891) have the front tibiae with spines on the outer sides. The larva of *C. scaritides* Westwood, 1851 has a similar structure of the last abdominal segment as a larva of Egoliinae described by SLIPINSKI (1992). There are some more similarities between both the groups mentioned in the adults as well (e.g. sculpture of head, long setae at elytral apex, etc.) Although these similarities are interesting, there are numerous important features that tend towards indicating a relationship of the Egoliinae with Peltinae (lacinia with hook, presence of mandibular mola, etc.).

The features shared by the thaneroclerid branch with some members of Cleridae are more numerous and probably more important than those shared with Trogositidae *s.l.* They are, for example: asymmetric mandibles, membraneous ligula, prementum with deep notch, tormal processes of adult and larva, metendosternite and identical structure of mandibular tooth, penicillus and cutting edge. This is why I favour the opinion that Cleridae are a sister group of the thaneroclerid branch (Tree 1).

Description of character states for Tab. 2.

1. Endocarina (larva): 0, present; 1, absent.
2. Antenna (larva): 0, medium-sized; 1, short and small.
3. Gular area (larva): 0, flat; 1, with tubercle (or expanded).
4. Hypostomal rods (larva): 0, present; 1, absent.
5. Lacinia mobilis (larva): 0, more than one spine; 1, one short spine.
6. Urogomphi (larva): 0, present; 1, absent or minute (earlier stages of *Thaneroclerus*).
7. Abdomen with long setae (larva): 0, no; 1, yes.
8. Mentum: 0, moderate; 1, narrow.
9. Tormal processes: 0, with triangular plate in centre of connecting process; 1, connecting process simple.
10. Tentorial bridge: 0, situated in centre of arms, 1, situated between apices of arms.
11. Mandible, basal notch: 0, medium-sized; 1, very deep.
12. Lacinia: 0, without spines; 1, with conspicuous spines.
13. Front coxae: 0, rather transverse; 1, spherical (tendency).

	1									2									
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4
Chaetosomatidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Metaxinidae *nov.*	1	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1
Thanerocleridae	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	1	0	0	1	1	1	1

Tab. 2. Character state matrix of the thaneroclerid branch.

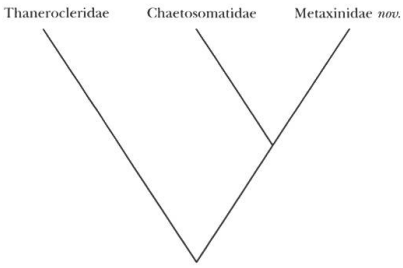
14. Pronotum, lateral edge: 0, present; 1, reduced (tendency).
15. Front coxal cavities: 0, open; 1, closed (tendency).
16. Discriminal line on metasternum: 0, present; 1, absent (tendency).
17. Front and middle tibiae, spines along outer edge: 0, absent; 1, present.
18. Front tarsomeres 1–4: 0, normal; 1, widened.
19. Body apex with long setae: 0, no; 1, yes.
20. Spermatheca: 0, situated on top of bursa copulatrix; 1, situated on base of bursa copulatrix.
21. Abdominal segment IX: 0, present; 1, reduced (tendency).
22. Phallobasic apodeme on tegmen: 0, present; 1, absent.
23. Parameres fused with phallobase: 0, no; 1, yes.
24. Malpighian glands (larva, adult): 0, six; 1, four.

Family Chaetosomatidae Crowson, 1952

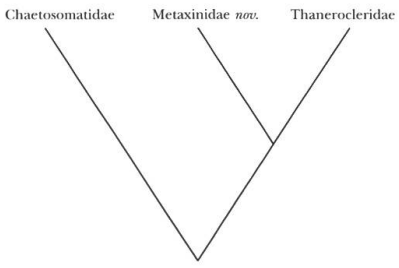
Type of family: *Chaetosoma* Westwood, 1851 (**type species:** *Chaetosoma scaritides* Westwood, 1851; by monotypy).

Diagnosis. Chaetosomatidae is the most primitive family in the thaneroclerid branch. It differs in front and middle tibiae with spines at outer sides, large larval urogomphi growth from sclerotized, dish-shaped depression, empodium conspicuously projecting in *Malgassochaetus* but rather retracted in *Chaetosoma*. Crowson (1964: 300) wrote: "*The adult* Chaetosoma *might be considered as an aberrant Trogositid,* [...] *conversely* Chaetosoma *larva could well be treated as a primitive type of Cleridae,* ..." Adult labrum, maxilla and mandibles are perfectly clerid-like; the labial ligula is sclerotized at the base and appears similar to that of some advanced Trogositinae. Unfortunately, the larval mouthparts have not been studied in detail. Hypostomal rods are extended across whole length of capsule – this is a unique state in Cleroidea and it is unclear whether to consider it plesiomorphy. For other character states see Tab. 2 and Figs 15–38, 40.

Larvae. *C. scaritides* larva was described by Crowson (1964: 301) and Lawrence *et al.* (1999b) in detail. I examined one larva ("New Zealand RI Taihape; 18, sept. 1982; J. C. Watt; ex dead standing *Hoheria sextylosa*", BMNH), body size 17 mm. The characters agree exactly with the descriptions in both papers mentioned above. For a schematic drawing of endocarina and frontal sutures see Fig. 41, sclerites on mesonotum are in Fig. 42 (metanotum looks the same as mesonotum).



Tree 4. Cladogram 1 computed from Tab. 2 (*ie- bb, successive weighting*): length = 260, ci = 92, ri = 50.



Tree 5. Cladogram 2 computed from Tab. 2 (*ie- bb, successive weighting*): length = 260, ci = 92, ri = 50.

Adults. The adults of Chaetosomatidae were also described by CROWSON (1964: 301) and LAWRENCE *et al.* (1999a). The Madagascan species were described by EKIS & MENIER (1980) and MENIER & EKIS (1982).

Although the eight Madagascan species are smaller and more colourful (Fig. 2) than the two New Zealand species, the family is morphologically very homogenous. Only the empodium of *Malgassochaetus* projects more than that of *Chaetosoma*.

Literature. CROWSON (1955, 1964, 1972), EKIS & MENIER (1980), KOLIBÁČ (1999), LAWRENCE *et al.* (1999ab), MENIER (1991), MENIER & EKIS (1982).

Chaetosoma scaritides Westwood, 1851 (Fig. 1)

Material examined. "New Zealand" (syntype, MNHN); "Wellington, Hudson 1890" (MNHN); "N.Z., Clarke coll." (MNHN); "New Zealand, Humera" (MNHN); 2 specimens: "New Zealand WA, Martinborough, Mahaki, 15 Sep 1982, J. C. Watt; under bark dead *Podocarpus dacrydioides* trunk" (JKC).

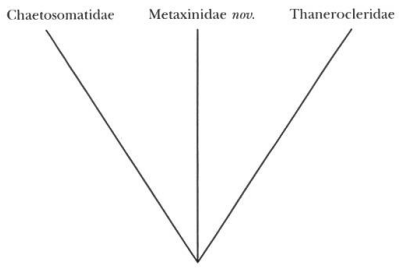
Remarks on morphology. Hypopharynx membraneous. Ligula deeply notched, submembraneous to rigid, especially in basal part (similar in Trogositinae). Hypopharyngeal sclerite without apodeme. Labrum, mandibles and maxillae clerid-like. Lateral edge present. Tarsal pattern 5–5–5 in both sexes, empodium weakly projecting. Tarsomeres without lobes. Tegmen ventrally open, i.e. inverted. For other characters see illustrations.

Variability. The species is very variable in colour (red to black or brown), body size (6–12 mm), sculpture (punctation of meso- and metasternum), number of tibial spines, shape of labial and maxillary palps, wing venation (Figs 30–34), proportions of antennal segments, copulatory organs, and abdominal segment VIII of both sexes.

Chaetosomodes halli Broun, 1921

Material examined. 1 specimen: locality unknown (MNHN).

Remarks on morphology. Larger than *C. scaritides*, elytra black with 3–4 white-yellow spots. Body pubescence shorter than in *C. scaritides*. Pronotum short, rounded, without basal angles. Front tibiae with small spines, middle tibiae without spines. Wing venation in Fig. 39.



Tree 6. Cladogram (consensus tree of trees 4 and 5) computed from Tab. 2 (*ie- bb, successive weighting, nelsen*): length = 260, ci = 92, ri = 50.

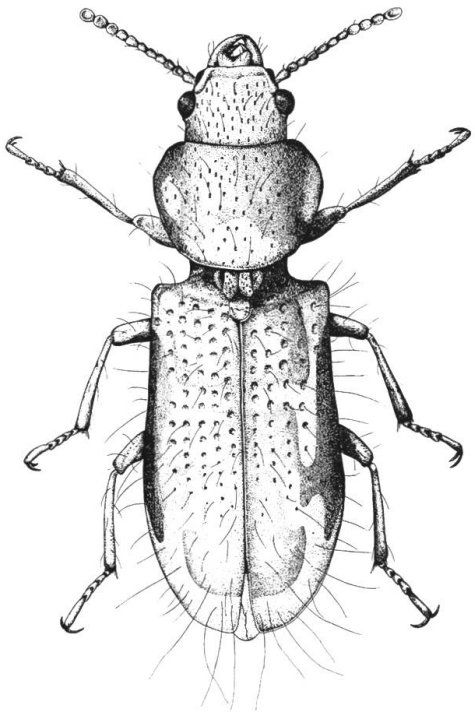
Malgassochaetus Ekis et Menier, 1980

Ekis & Menier (1980): 200. (**type species:** *Malgassochaetus crowsoni* Ekis et Menier, 1980: 202.)
Somatochaetus Menier et Ekis, 1982: 343, **syn.nov.** (**type species:** *Somatochaetus quadraticollis* Menier et Ekis, 1982: 344).

Material examined. All 8 species described, specimens preserved in MNHN. One specimen of *M. viettei*: "E MADAGASCAR, 30km E of Moramanga, MAROMIZAHA 1996, 1200m, Bednařík leg. 7.–10.12." (JKC).

Remarks on synonymy. The genus *Somatochaetus* was based only on the shape of pronotum (elongate in *Malgassochaetus*, transverse in *Somatochaetus*). This body part is very variable in all Chaetosomatidae and especially in *Malgassochaetus* with 5 originally described species. Shapes of pronota of all nine chaetosomatid species are shown in Ekis & Menier (1980) and Menier & Ekis (1982). For example, *M. crowsoni*, the genotype of *Malgassochaetus*, does not have pronotum elongate, but rather cordate, with width in anterior portion equal to length.

All the Madagascan species are excellently illustrated and described in the papers mentioned, *M. viettei* Menier et Ekis, 1982 is in Fig. 2.



***Metaxina ornata* Broun, 1909.** Drawn after a syntype from Broun's coll. (BMNH).

Family Metaxinidae fam.nov.

Type of family: *Metaxina* Broun, 1909 (**type species:** *Metaxina. ornata* Broun, 1909; by monotypy).

Material examined. 2 adults and 5 larvae: "NEW ZEALAND: South Isl., NC; Glentui; 10.X.2000; J. B. Johnson" or "NEW ZEALAND, KA, 30 km of ; Kaikoura 10.X.2000; J. B. Johnson" [same localities?]; "reared from sooty mold on *Nothofagus* branches".

Diagnosis. The new family is characterized by absence of endocarina in larval head capsule, larval abdomen with long hairs, narrow adult mentum and spermatheca situated on base of bursa copulatrix. Adult lacinia has small, weak spines but these spines are situated along outer margin of lacinia whereas the much more robust spines of Thanerocleridae are only at top of lacinia. Tentorial bridge of adult is weak and pale and is situated at apices of tentorial arms. This is a unique feature in all Cleroidea studied. For other character states see Tab. 2 and Figs 3, 43–72.

Metaxinidae *nov.* stands between Thanerocleridae and Chaetosomatidae (Trees 4–6) and it is hard to decide to which of these families it is closer. Metaxinidae *nov.* shares more character states with Chaetosomatidae but most of these states are plesiomorphies. The most important synapomorphies shared by Metaxinidae *nov.* and Thanerocleridae are reduced hypostomal rods in larvae and, particularly, four malpighian glands in both adults and larvae (six in *C. scaritides*; see CROWSON 1972). Unfortunately, the number of these glands in *Zenodosus sanguineus* Say, 1835, the most primitive member of the latter family, is not known.

The character states examined show that *M. ornata* is the last remnant of a separate phyletic lineage rather than a primitive thaneroclerid as CROWSON (1964) suggested. It would be possible to classify Thanerocleridae, Chaetosomatidae and Metaxinidae *nov.* into one family which would certainly be monophyletic. However, Thanerocleridae are an advanced group, very well defined by inclusive synapomorphies (Tab. 2), even multistate characters (KOLIBÁČ 1992). Therefore, its classification together with Chaetosomatidae and *M. ornata* (as separate subfamilies) would not form a well-balanced system (differences between the three taxa mentioned are too large in comparison with sister Cleridae, where subfamilies were established earlier). This is why I consider a classification of the isolated New Zealand species *Metaxina ornata* as a separate family to be the best solution.

Larva. This was excellently described by CROWSON (1964), more detailed illustrations are in Figs 43–52; the important character states are in Tabs 1, 2. The larva is predatory: the pharynx of the larva examined contains remnants of (probably) myriapod antennae.

Adult. CROWSON'S description (1964) is relatively brief; a much more detailed one appears in LAWRENCE *et al.* (1999a). Also, the adult characters are illustrated here in Figs 53–72; the important character states are in Tabs 1, 2. Other characters include: Antennal sockets weakly covered by frons; submentum very wide; basal part of cutting edge of mandibles slightly elevate; pronotum with bordered base, lateral edge very distinct; mesothorax with simple prepectus; both front and middle coxal cavities open; paracoxal sutures narrow; hind coxae with longitudinal edge; trochanters and femora with long setae; tarsi 5–5–5, the first tarsomere small; empodium moderately projecting; apices of tibiae with comb of fine spines; six visible sternites, not bordered laterally as in Thanerocleridae; ovipositor thaneroclerid-like; aedeagus inverted, sometimes laterally situated; male sternite VII emarginate, with long hairs.

Literature. BROUN (1909), CROWSON (1955, 1964), LAWRENCE *et al.* (1999ab).

Family Thanerocleridae Chapin, 1924

Type of family: *Thaneroclerus* Lefevre, 1838 (**type species:** *Thaneroclerus buquet* Lefevre, 1835; by monotypy).

Diagnosis. Thanerocleridae is the most derived family of the branch, well defined by several inclusive synapomorphies (Tab. 2). Widened front tarsomeres 1–4 are the most conspicuous apomorphy in all of the thaneroclerids. Other important apomorphies include: Parameres perfectly fused with phallobase; tendency of parameres to fuse with each other; lacinia with conspicuous spines (esp. in the subtribe Isoclerina); small

rounded front coxae; larval gula with tubercle and reduced urogomphi. Pro- and mesocoxal cavities species are closed in most of the species; abdominal segment VIII is reduced, as in Cleridae – the primitive American species *Zenodosus sanguineus* is the exception to both these apomorphies.

Twenty-nine predatory species are distributed in the warm regions of all continents, although they primarily inhabit the tropics of the Old World. South America was probably colonised from North America and Australia from south-eastern Asia. They live in tree fungi, termite nests or stored products where they prey on other insects. Although thaneroclerids are probably a relict group, like the other families in their branch, some species are relatively common, e.g. of the genus *Neoclerus* Lewis, 1892 living in fungi, or the cosmopolitan *Thaneroclerus buquet* from stored vegetable products.

Larvae. Although the larvae of several species are known, most of them have not been described and figured adequately. Therefore illustrations of *T. buquet* larva are published here (Figs 73–82) although the species is well-known. The important character states of the thaneroclerid larvae appear in Tabs 1, 2.

Adults. These have been completely described and illustrated in detail in my previous papers (KOLIBÁČ 1992, 1998). A representative of the genus *Isoclerus* is in Fig. 4.

Literature. BÖVING & CHAMPLAIN (1920), CROWSON (1964), EKIS & GUPTA (1971), FOSTER (1976b), KOLIBÁČ (1992, 1998a, 1999), LAWRENCE *et al.* (1999ab).

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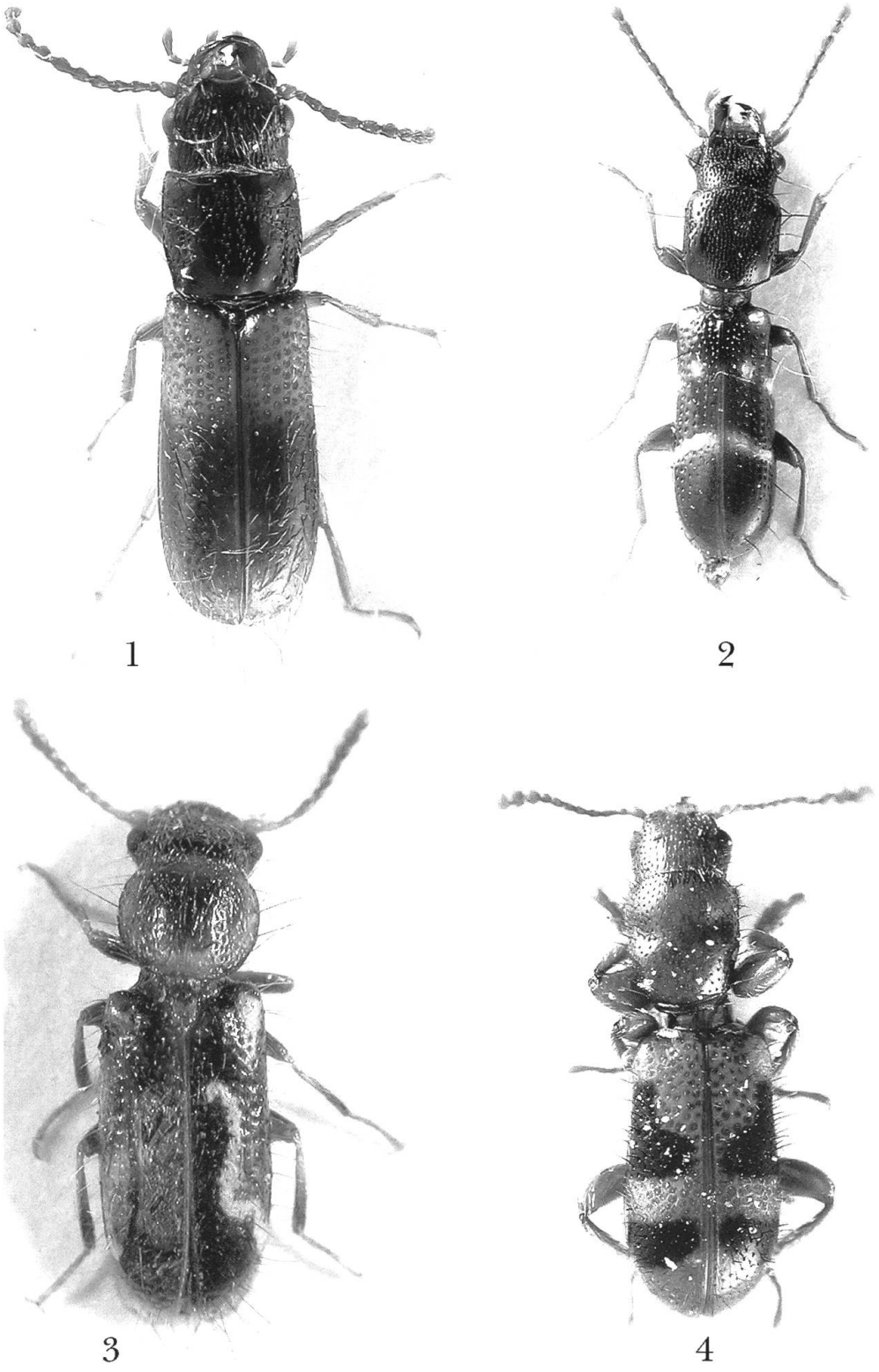
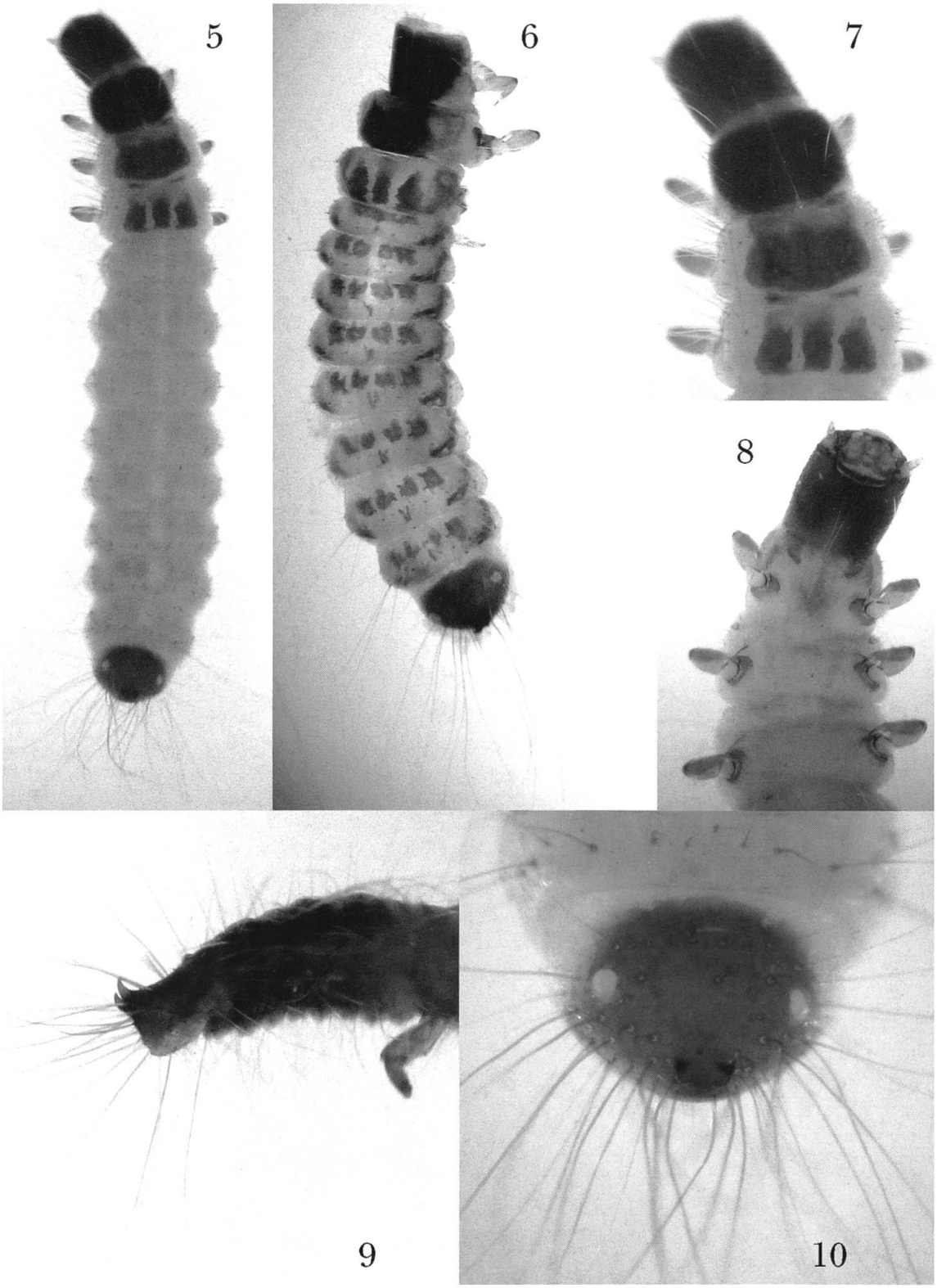
Address of author:

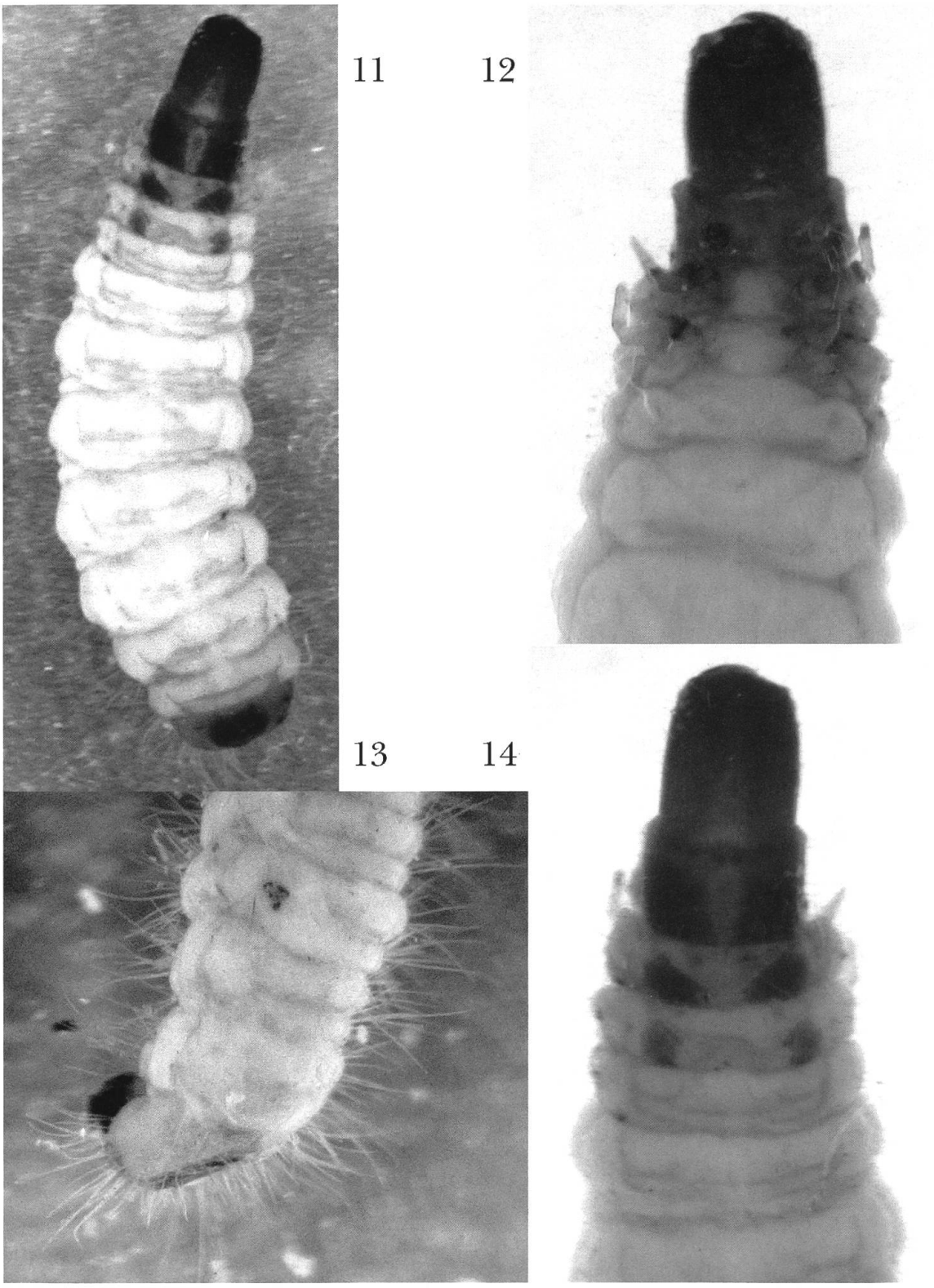
Dr. Jiří Kolibáč
Moravian Museum
Department of Entomology
Hviezdoslavova 29a
627 00 Brno
CZECH REPUBLIC
e-mail: ento.kol@volny.cz



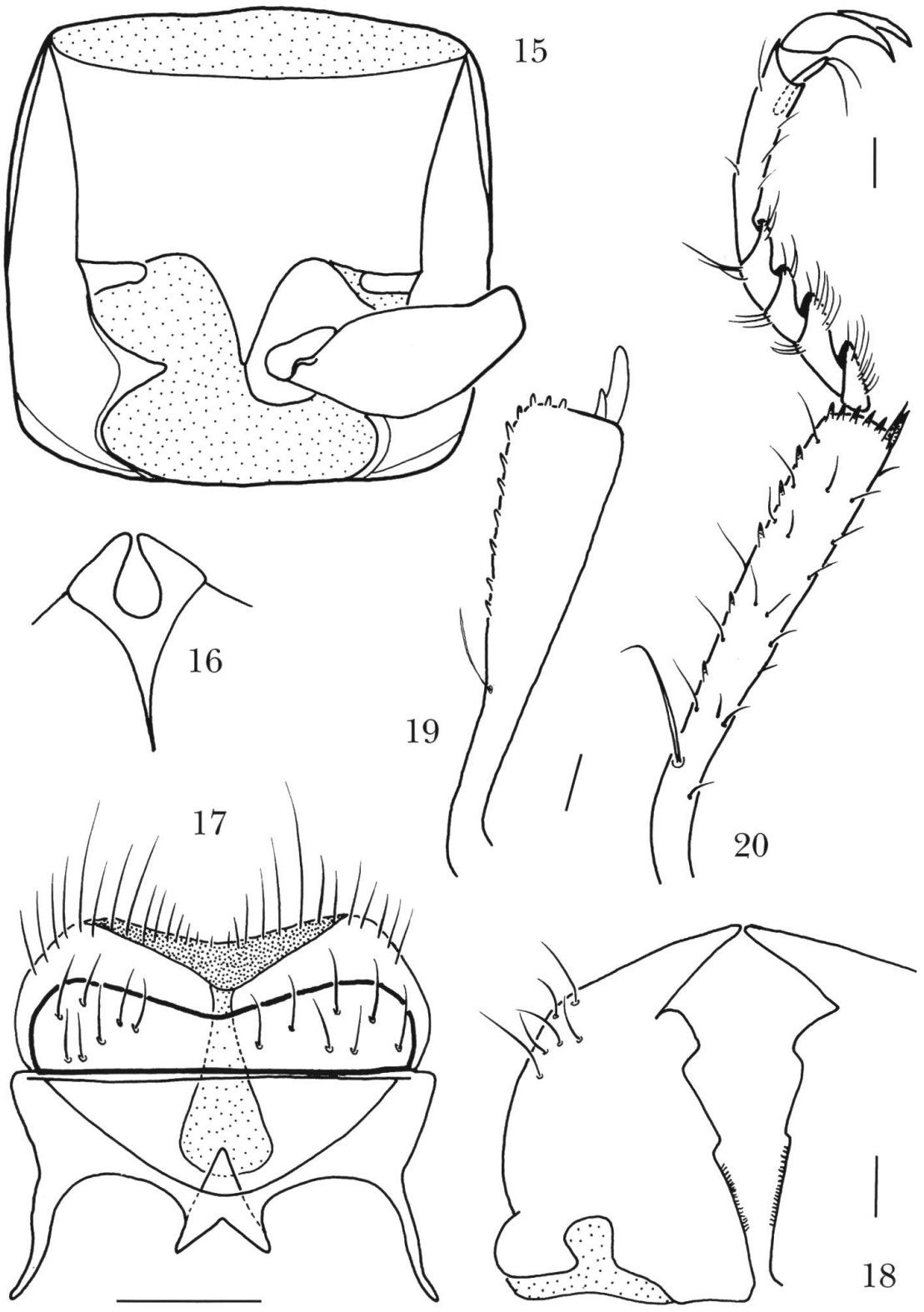
Figs 1–4. 1, *Chaetosoma scaritides* Westwood; 2, *Malgassochaetus viettei* Menier et Ekis; 3, *Metaxina ornata* Broun; 4, *Isoclerus menieri* Kolibáč.



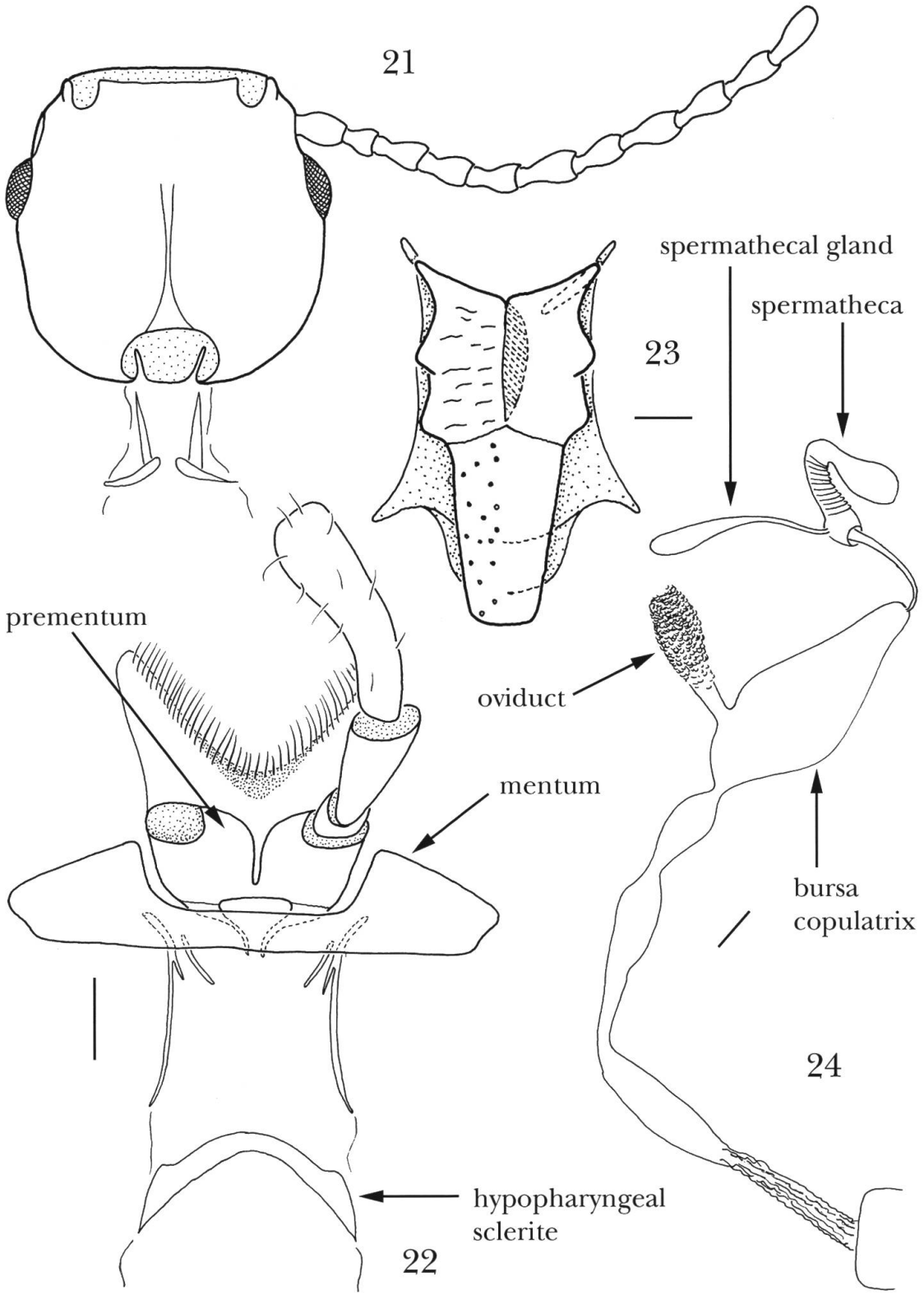
Figs 5–10. *Metaxina ornata* Broun, larva: 5, dorsal view; 6, ditto (another specimen, head removed); 7, head and thorax dorsally; 8, ditto ventrally; 9, abdomen laterally; 10, apex of abdomen dorsally.



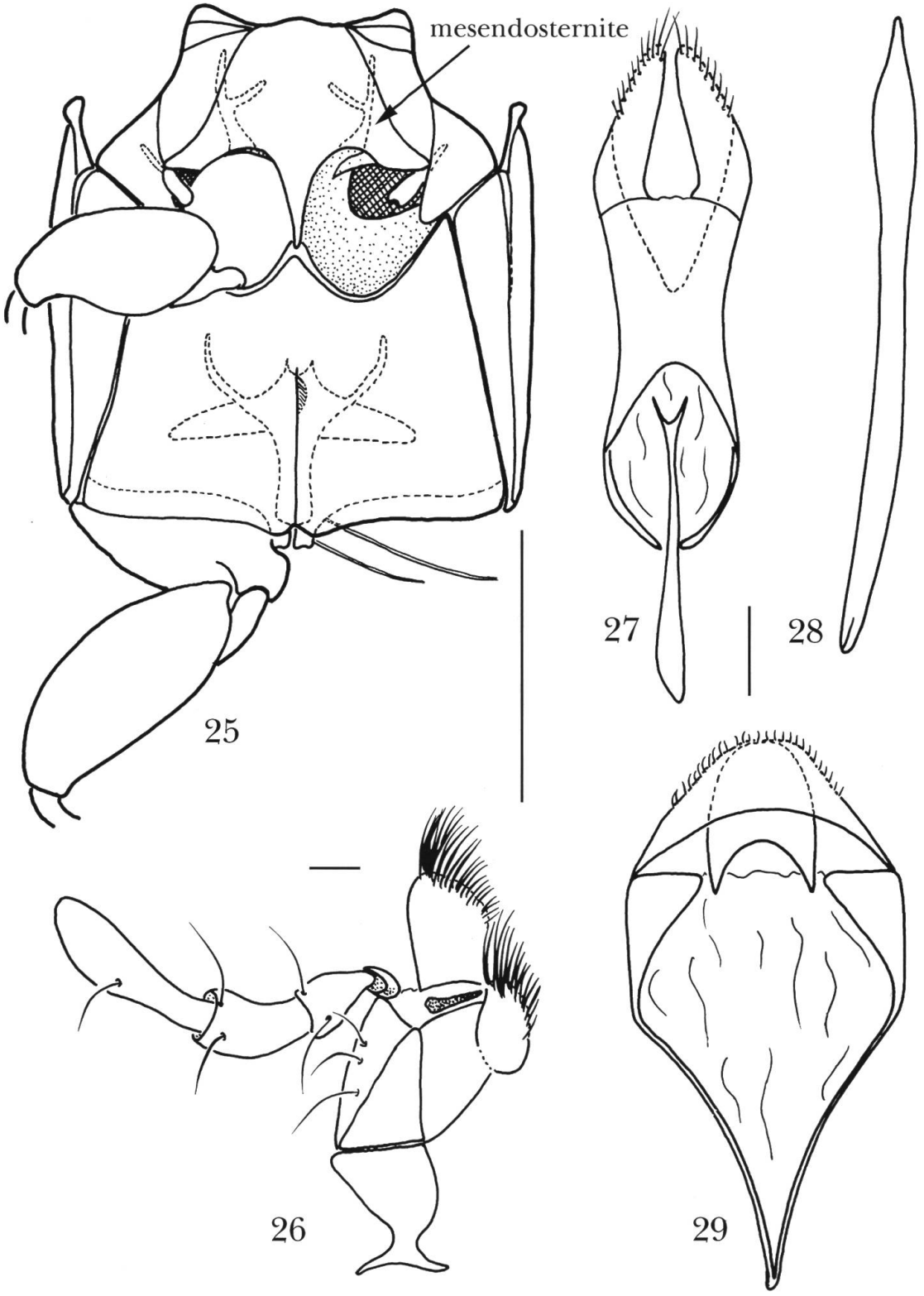
Figs 11–14. *Thaneroclerus buquet* Lefevre, larva: 11, dorsal view; 12, head and thorax ventrally; 13, apex of abdomen laterally; 14, head and thorax dorsally.



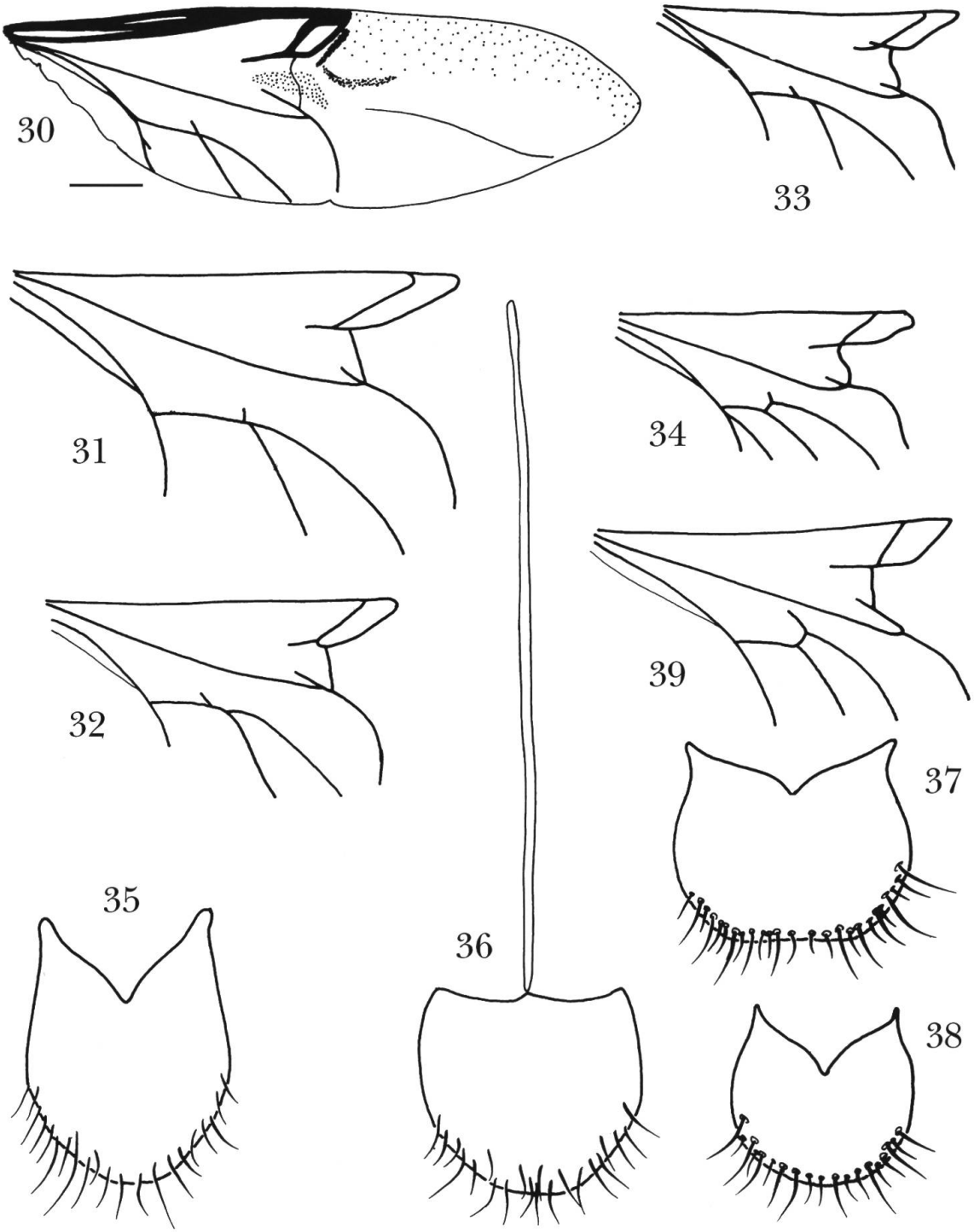
Figs 15–20. *Chaetosoma scaritides* Westwood, adult: 15, prothorax ventrally; 16, proendosternite; 17, labrum; 18, mandibles dorsally; 19, front tibia; 20, middle tibia and tarsus. Scale = 0.1 mm. No scale: Figs 15, 16.



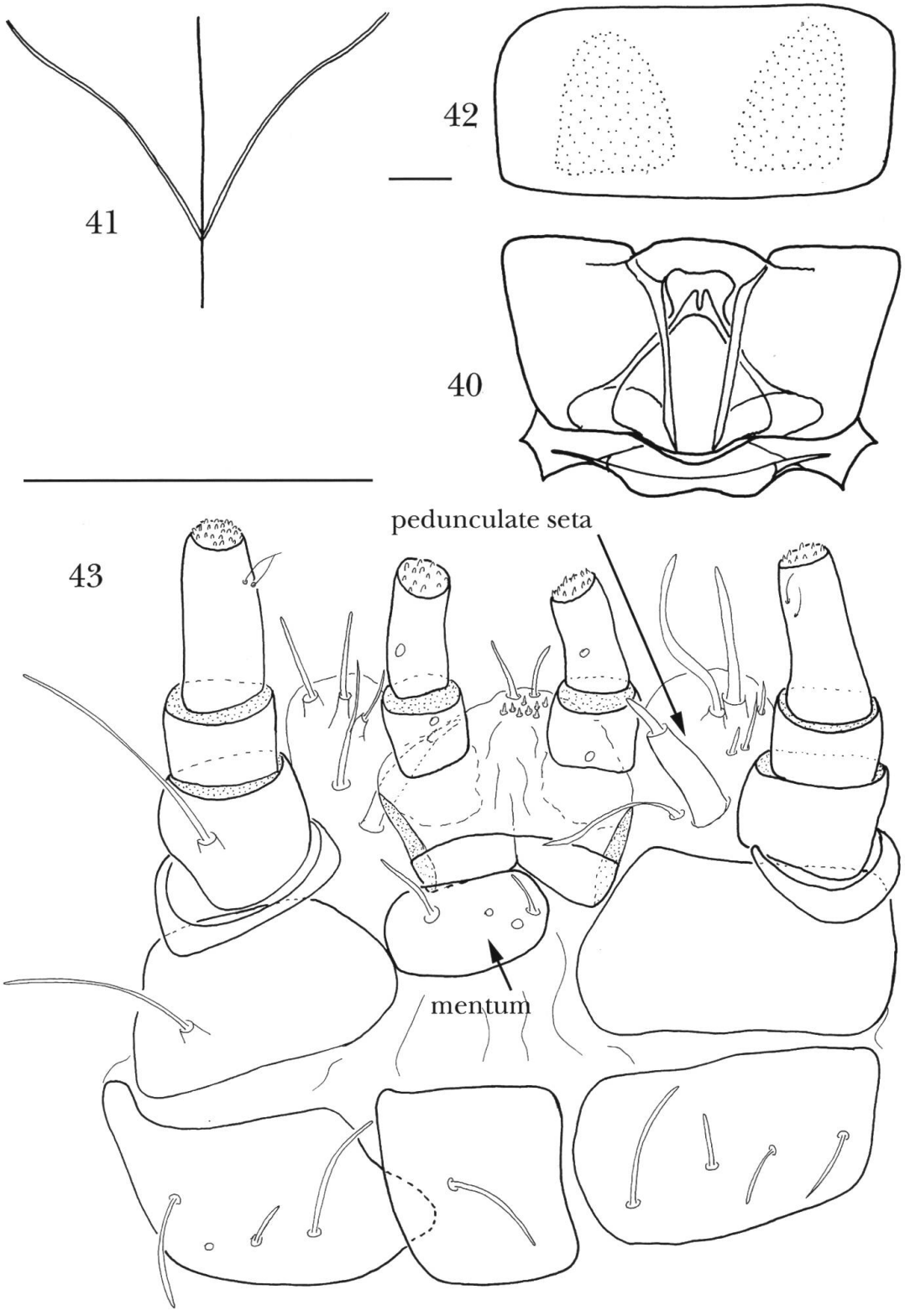
Figs 21–24. *Chaetosoma scaritides* Westwood, adult: 21, head ventrally; 22, labium; 23, mesonotum; 24, female internal copulatory organs. Scale = 0.1 mm. No scale: Fig. 21.



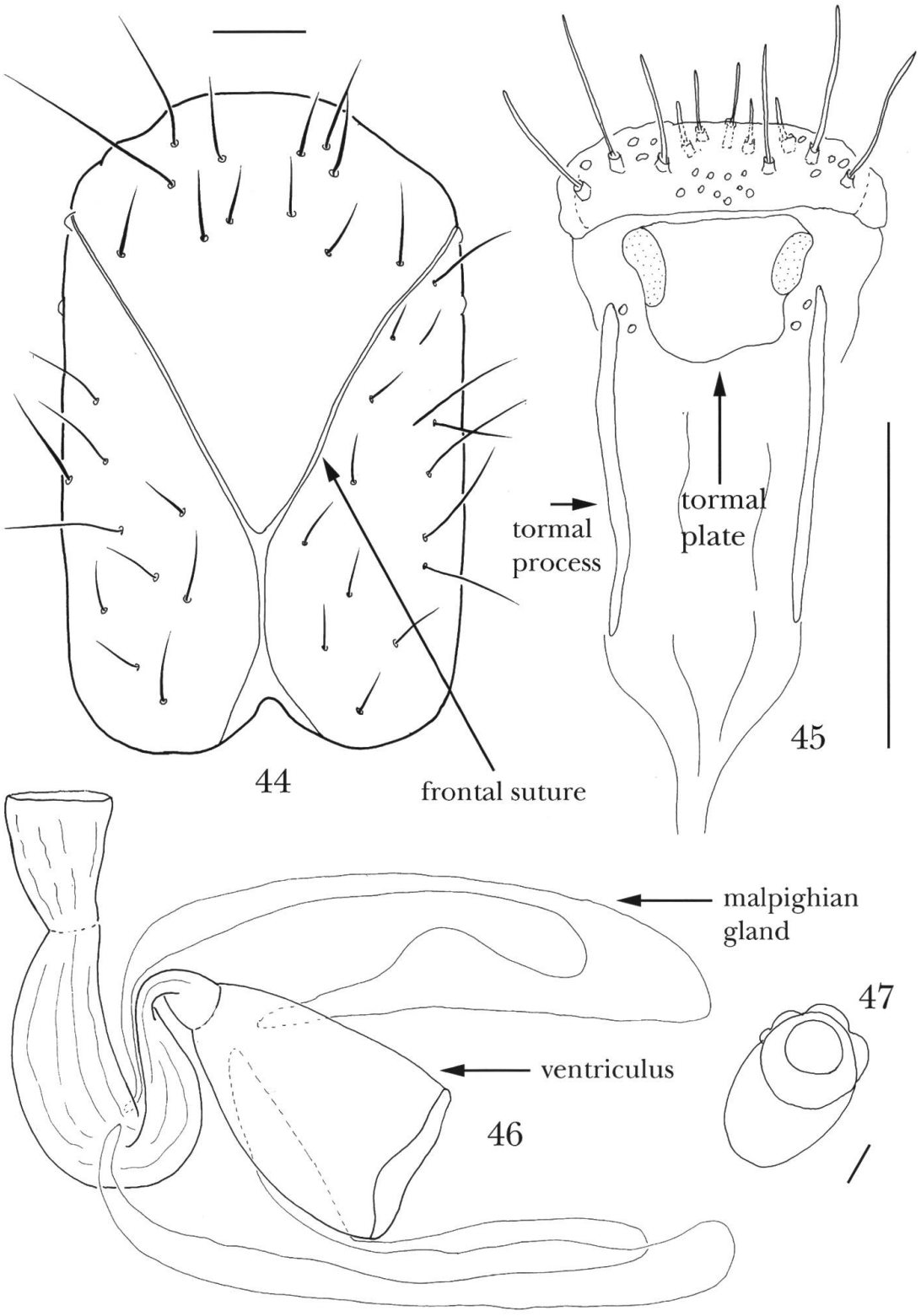
Figs 25–29. *Chaetosoma scaritides* Westwood, adult: 25, meso- and metanotum ventrally; 26, maxilla; 27, tegmen ventrally; 28, phallus; 29, male abdominal segment IX. Scale = 0.1 mm (Figs 26–29), 1 mm (Fig. 25).



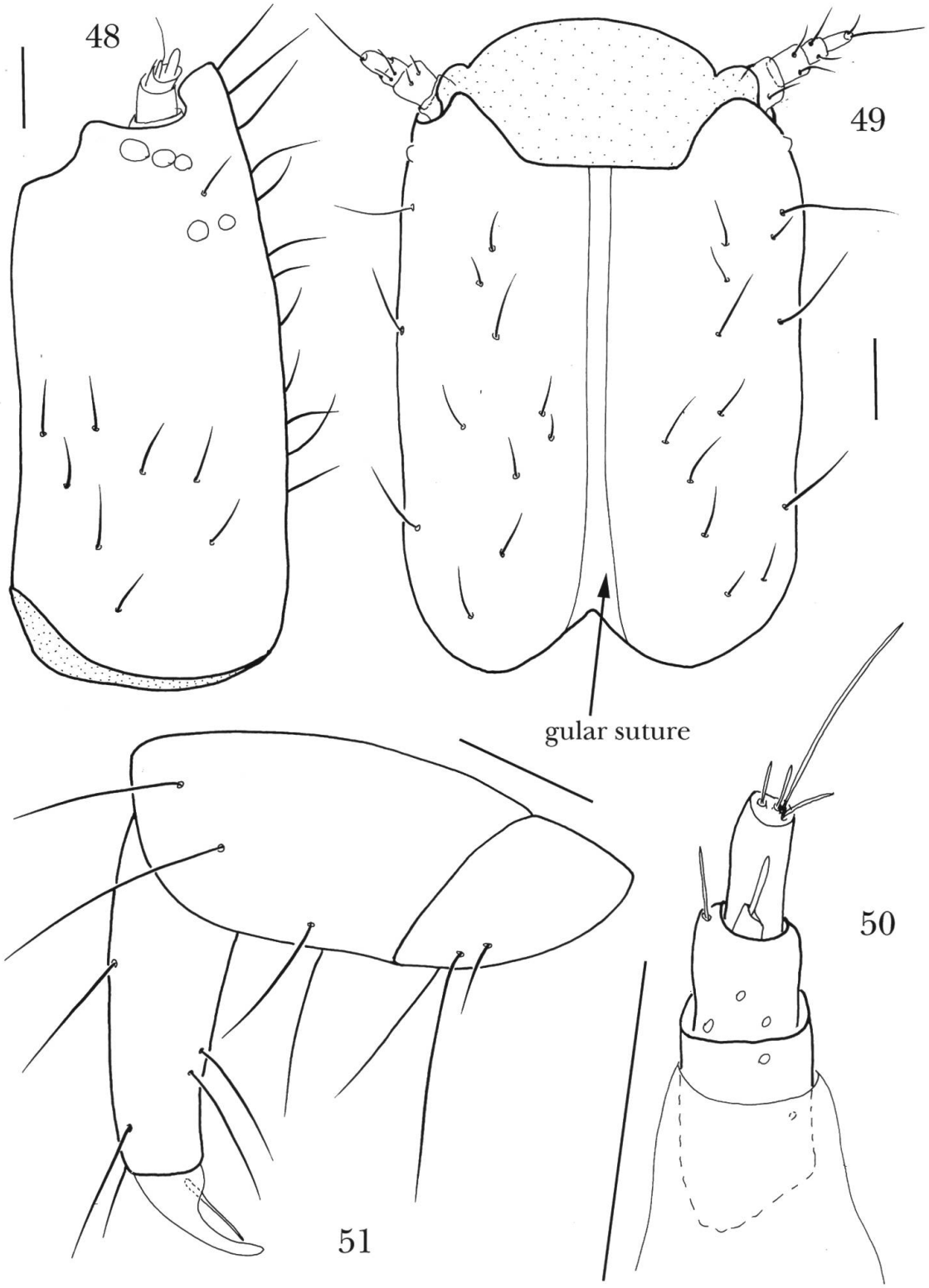
Figs 30–39. *Chaetosoma scaritides* Westwood, adult: 30, wing; 31–34, wing venation of various specimens; 35, female pygidium (syntype); 36, female sternite VIII (syntype); 37, male pygidium; 38, male sternite VIII. *Chaetosomodes halli* Broun, adult: 39, wing venation. Scale = 1 mm. No scale: Figs 31–39.



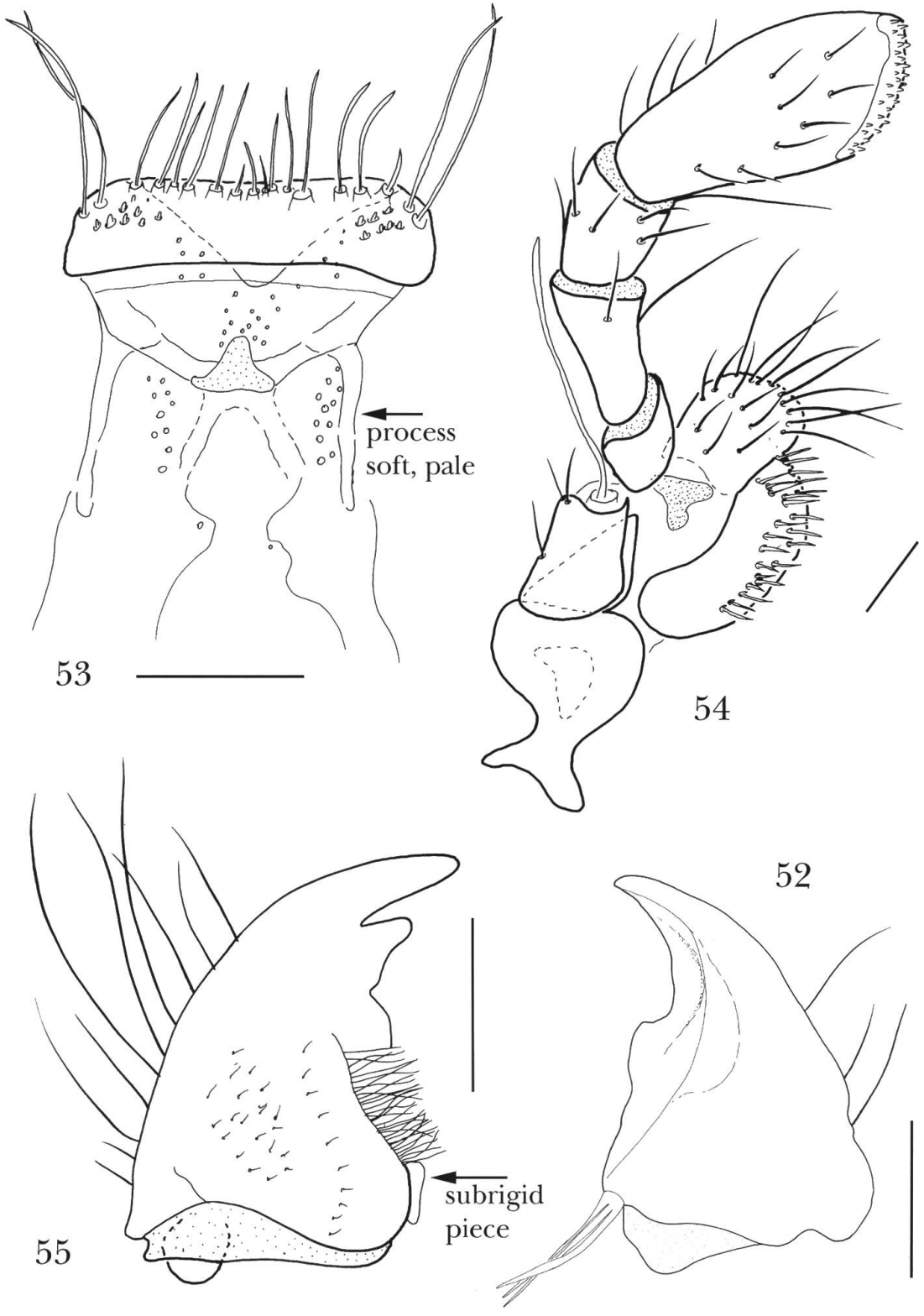
Figs 40–43. *Chaetosoma scaritides* Westwood, adult: 40, metanotum. *C. scaritides* Westwood, larva: 41, schema of frontal sutures and endocarina; 42, mesonotum. *Metaxina ornata* Broun, larva: 43, maxillolabial complex. Scale = 0.1 mm. No scale: Figs 40, 41.



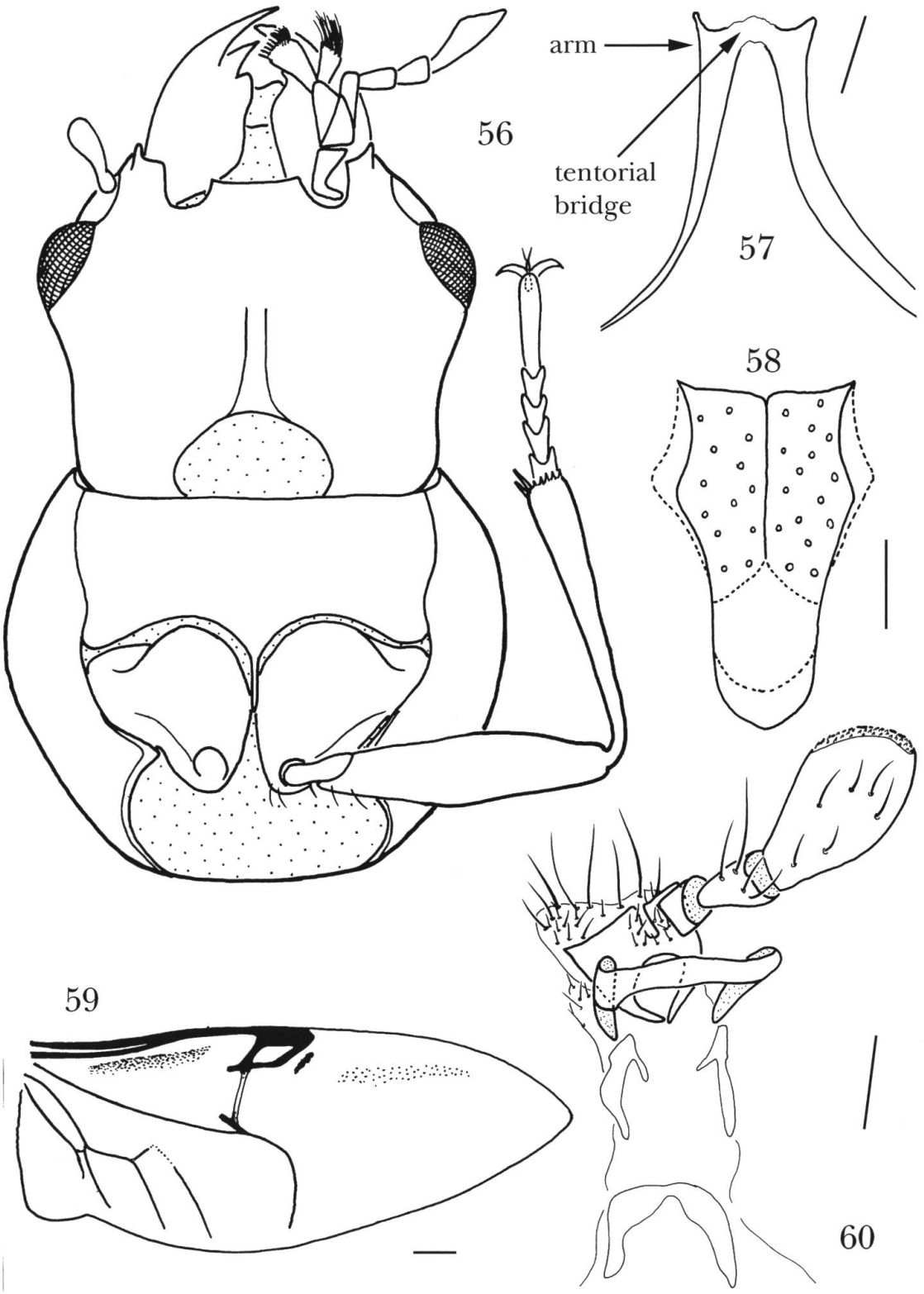
Figs 44–47. *Metaxina ornata* Broun, larva: 44, head capsule dorsally; 45, epipharynx; 46, part of ventriculus with malpighian glands; 47, abdominal spiracle, schema. Scale = 0.1 mm (Figs 44, 45), 0.01 mm (Fig. 47). No scale: Fig. 46.



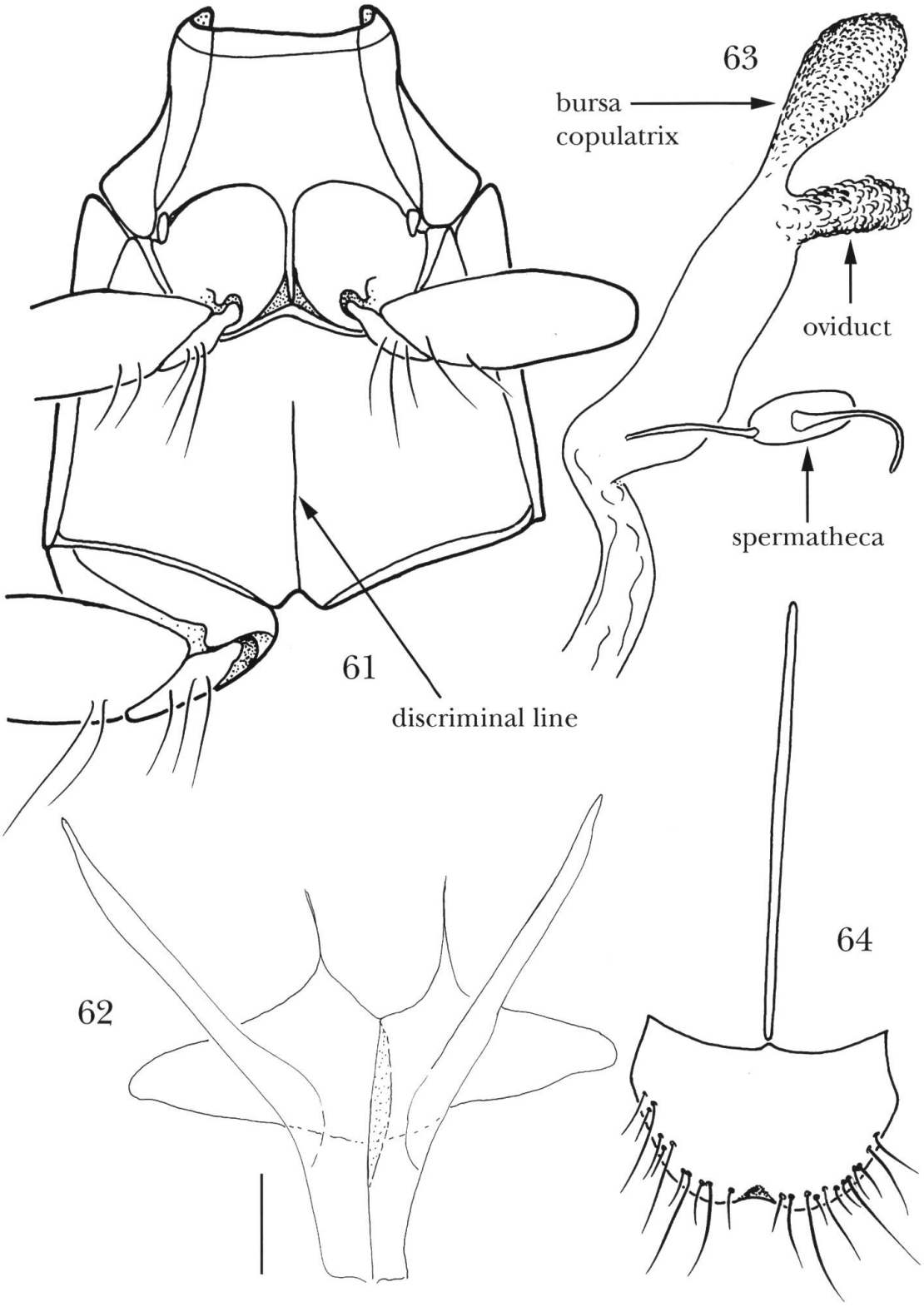
Figs 48–51. *Metaxina ornata* Broun, larva: 48, head capsule laterally; 49, ditto ventrally; 50, antenna; 51, hind leg. Scale = 0.1 mm.



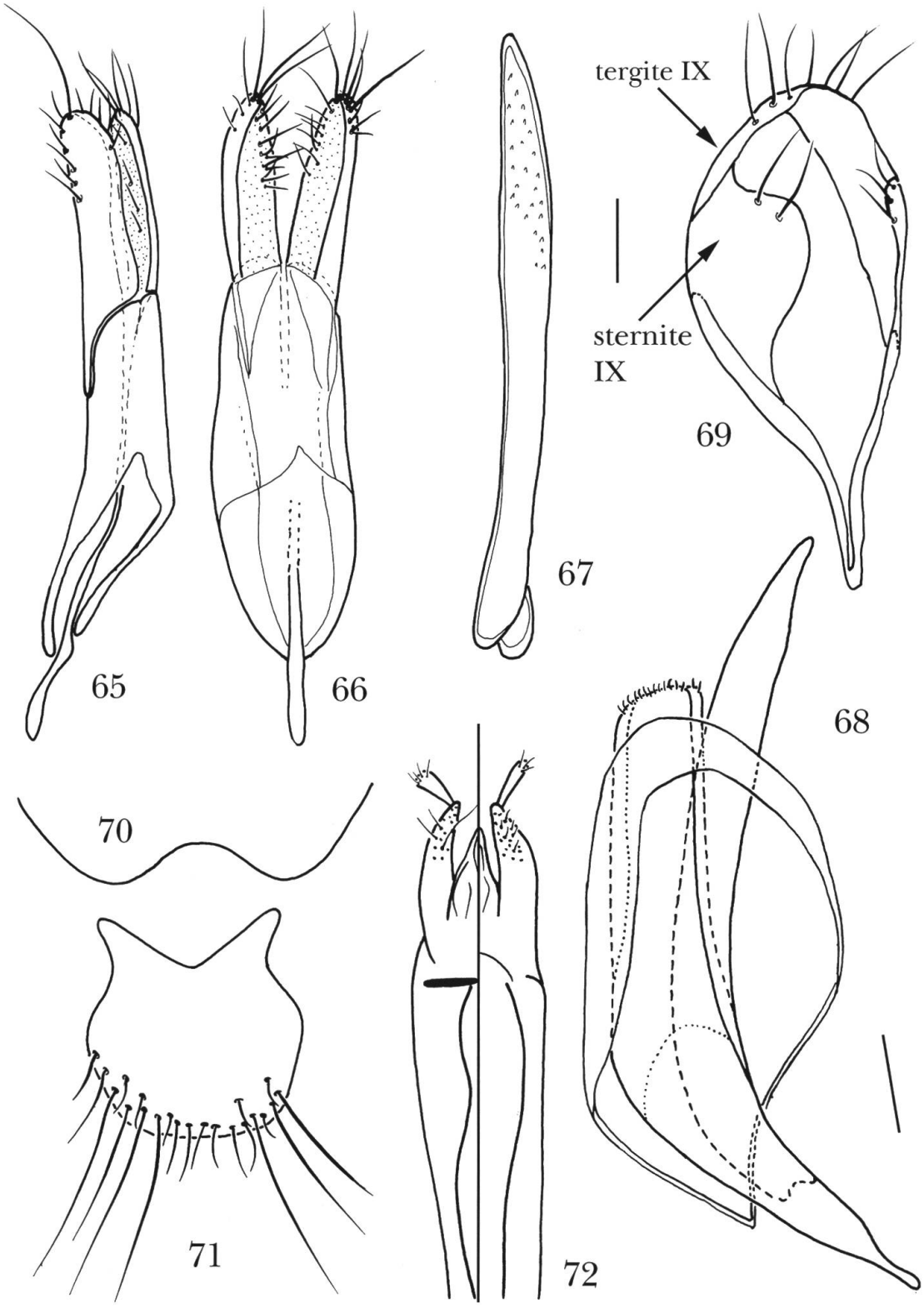
Figs 52–55. *Metaxina ornata* Broun, larva: 52, mandible dorsally. *M. ornata* Broun, adult: 53, labrum; 54, maxilla; 55, mandible dorsally. Scale = 0.1 mm.



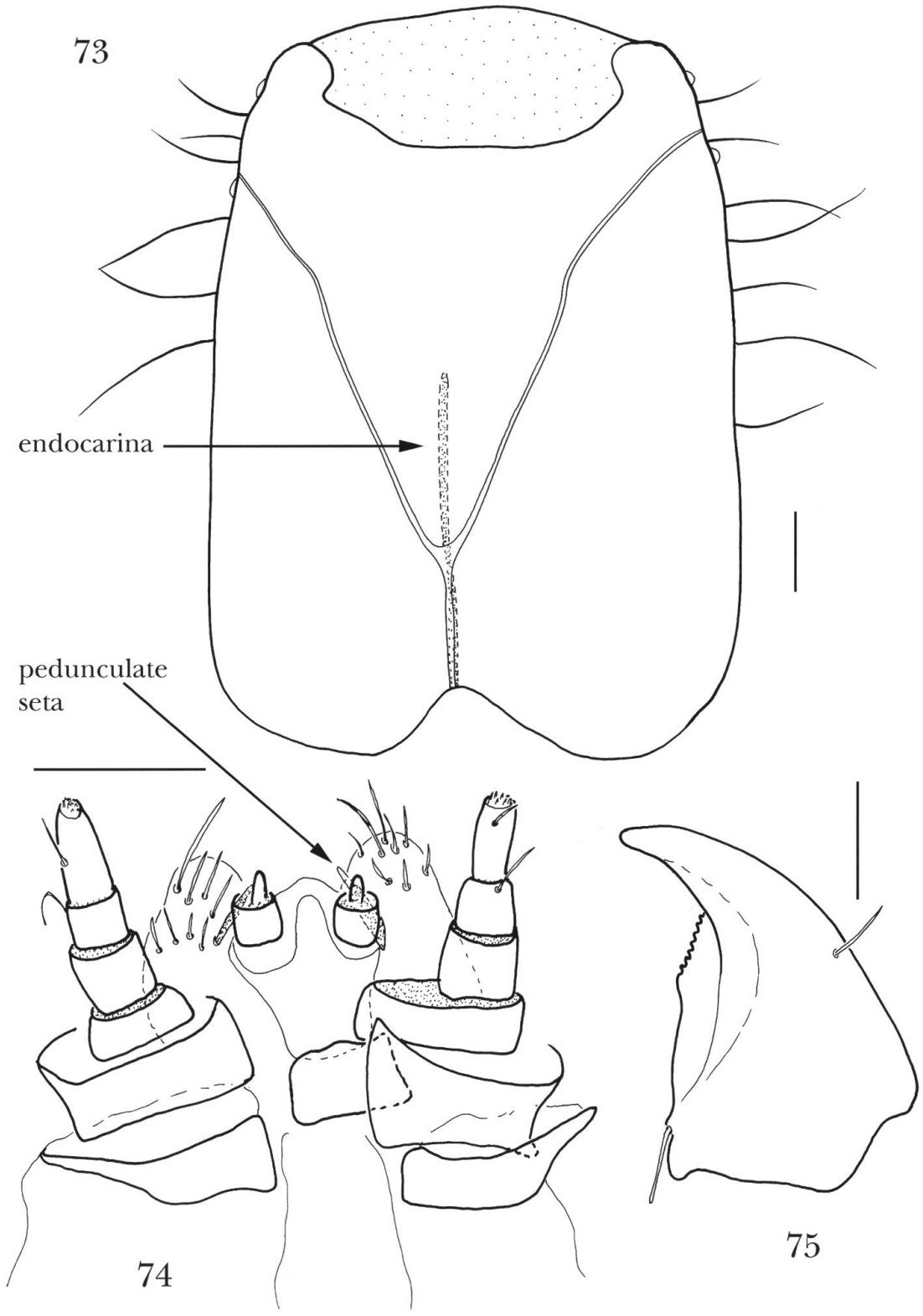
Figs 56–60. *Metaxina ornata* Broun, adult: 56, head and prothorax ventrally; 57, tentorium; 58, mesonotum; 59, wing; 60, labium. Scale = 0.1 mm. No scale: Fig. 56.



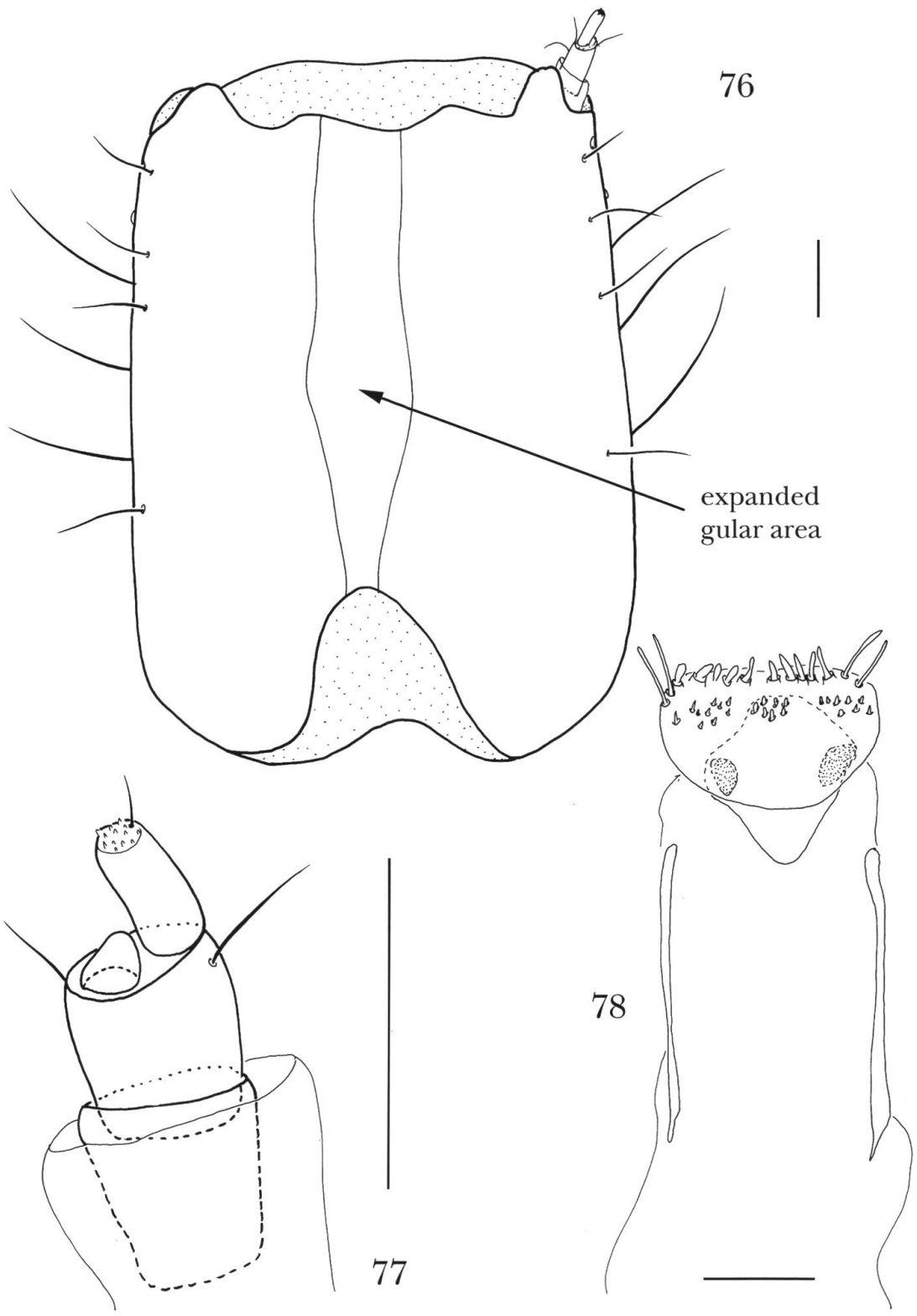
Figs 61–64. *Metaxina ornata* Broun, adult: 61, meso- and metathorax ventrally; 62, metendosternite; 63, female internal copulatory organs; 64, female sternite VIII. Scale = 0.1 mm. No scale: Figs 61, 63, 64.



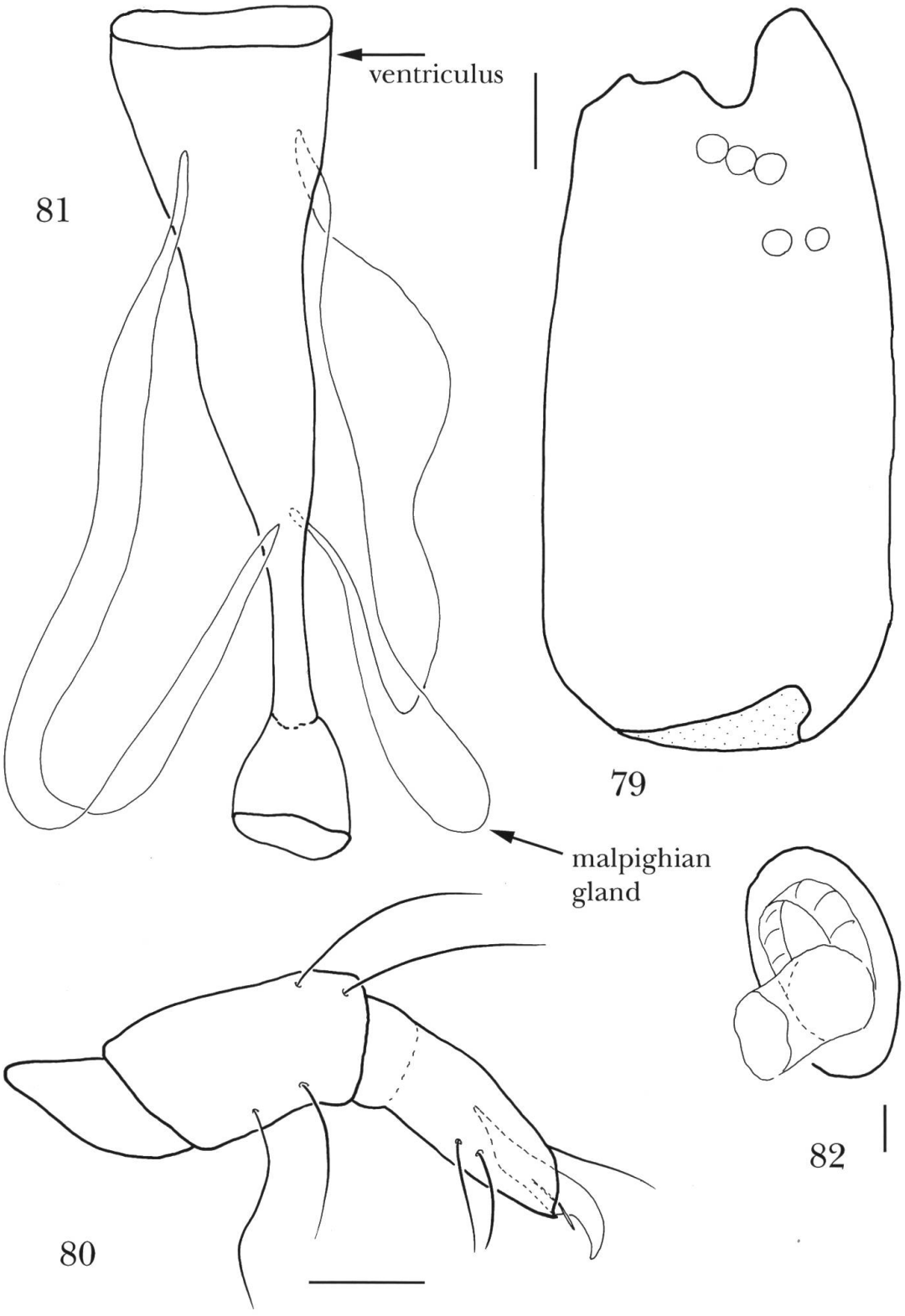
Figs 65–72. *Metaxina ornata* Broun, adult: 65, tegmen semilaterally; 66, ditto laterally; 67, phallus; 68, aedeagus and abdominal segment IX laterally; 69, male abdominal segment IX ventrolaterally; 70, apex of male abdominal sternite VII (long setae removed); 71, female pygidium; 72, ovipositor (left side ventrally, right side dorsally). Scale = 0.1 mm. No scale: Figs 70–72.



Figs 73–75. *Thaneroclerus buquet* Lefevre, larva: 73, head capsule dorsally; 74, maxillolabial complex; 75, mandible ventrally. Scale = 0.1 mm.



Figs 76–78. *Thaneroclerus buquet* Lefevre, larva: 76, head capsule ventrally; 77, antenna; 78, epipharynx. Scale = 0.1 mm.



Figs 79–82. *Thaneroclerus buquet* Lefevre, larva: 79, head capsule laterally; 80, middle leg; 81, part of ventriculus with malpighian glands; 82, 1st abdominal spiracle, schema. Scale = 0.1 mm (Figs 79, 80), 0.01 mm (Fig. 82). No scale: Fig. 81.