Chapter 21 Order Trichoptera

The Trichoptera, or caddisflies, is one of the largest orders of aquatic insects, with representatives in all biogeographic regions. There are more than 11,000 species presently known globally (Morse, 2004). They comprise three suborders: Spicipalpia, Annulipalpia and Integripalpia. Twenty-eight families of tropical Asian caddisflies were recorded by Dudgeon (1999). Larvae are campodeiform or eruciform, and are able to emit silk from an opening at the tip of the labium. Silk is used to make larval nets, retreats and portable cases. Larvae are very diverse and occur in most types of freshwater habitats. They have representatives in all functional feeding groups. This is a consequence of their broad ecological diversity. Pupation almost always occurs underwater, and the pupae are enclosed in a cocoon. Pupation takes about two weeks, and the pupa uses large mandibles to cut through the case, freeing the emerging pharate adult. Adults sit on riparian vegetation and feed on nectar. Almost all research done in Asia focuses on descriptions of adults. Ulmer, Martynov, Kimmins and Schmid were the pioneers in the study of adults in China, India, Pakistan and Borneo (see details in Dudgeon, 1999). Other studies were done by: Tanida (1986a, 1986b, 1987: Japan), Chantaramongkol & Malicky (1989, 1995: Thailand), Malicky (1989a, 1989b: Sumatra, 1995: Vietnam), Malicky & Chantaramongkol (1989a, 1989b, 1991, 1992, 1993a, 1993b, 1997: Thailand), and Malicky *et al.* (2001, 2002: Thailand). Since almost all of the works have been done on the adult stage, research on larvae is very limited (due to the inability to identify larvae to genera and species). The following keys to genera are modified from those of Wallace *et al.* (1990), Edington & Hildrew (1995) and Wiggins (1996), and also from studies on the association of larvae and adults of some caddisflies in Thailand (Radomsuk (1999), Chaiyapa (2001), Sangpradub *et al* (1999), Payupwatanawong (2001) and Sirisinthuwanit (2001)). Some characteristics of *Ganonema* larvae (Calamoceratidae) cited here differ from those cited by Wiggins *et al.* (1994). They cite the abdomen as having only gills with single filaments. But gills on reared larvae of *G. extensum* have three filaments on the dorsal side and two on the lateral side (Sirisinthuwanit, 2001). So, in the present key, gills of *Ganonema* are cited as having two and three filaments.

Key to Families of Mature Trichoptera Larvae of Indochina

1 Dorsum of each thoracic segment covered with a large sclerotized plate (Fig. 1) ... 2
1′ Meta-or mesothoracic segments membranous (Fig. 4a) ... 7

2(1) Ventrolateral gills on abdominal segments (Fig. 24a, 27a, 28a); anal prolegs with a terminal brush of long setae (Fig. 33a); larval net constructed in fast-flowing water ... Hydropsychidae (p. 183)
2′ No ventrolateral gills on abdominal segments; anal prolegs without a terminal brush of long setae ... 3

3(2′) Abdominal tergum IX without a sclerite ... 4
3′ Abdominal tergum IX with a sclerite (Fig. 2c) ... 5

4(3) Thoracic terga heavily sclerotized; all tarsal claws similar in size (Fig. 1); larva in fixed retreat ..... Ecnomidae, *Ecnomus*

4′ Thoracic terga weakly sclerotized and with dark bar on metathoracic segment (Fig. 18a-b); metathoracic claws shorter than claws of pro- and mesothoracic legs; larva in fixed or buried tube..... Dipseudopsidae, (p. 185) *Pseudoneureclipsis*

5(3′) Abdominal segment I with lateral humps (Fig. 2b)..... 6

5′ Abdominal segment I without dorso- and lateral humps; no lateral fringes of bristles on abdominal segments (Fig. 20a-23a) ..... Hydroptilidae (p. 185)

6(5) Abdominal segment I bears dorsal hump; without sternal plates on thorax and abdominal segment I..... Odontoceridae, in part (p. 188)

6′ Abdominal segment I without dorsal hump; venter of thorax and abdominal segment I with sternal plates (Fig. 2b); cases cylindrical, tapered, curved, made of sand grains, fixed on rock in fast flowing stream with attached stalk made of silk (Fig. 2a) ..... Limnocentropodidae, *Limnocentropus*

7(1′) Claw of anal prolegs comb-liked (Fig. 3b); larva with a snail shell shaped case (Fig. 3a) ..... Helicopsychidae, *Helicopsyche*

7′ Claw of anal prolegs not comb-like, although sometimes claw has accessory hook; larva free living or in fixed retreated or in portable case..... 8

8(7′) Anal prolegs long, at least 4 times as long as claw (Fig. 1) 9

8′ Anal prolegs short, no more than 3 times as long as claw (Fig. 11b)..... 17

9(8) Labrum membranous and T-shaped (Fig. 47b, 48a); larvae spin fixed sac-shaped nets ..... Philopotamidae (p. 189)

9′ Labrum sclerotized 10

10(9′) Trochantin of prothoracic legs broad and hatchet-shaped (Fig. 49b); larva in tubular gallery on rock ..... Psychomyiidae (p. 189)

10′ Trochantin of prothoracic legs pointed (Fig. 9)..... 11

11(10′) Tarsi of all legs strongly flattened (Fig. 19c); larva burrows in soft sediment and constructs tube of sediment grains..... Dipseudopsidae, in part (p. 185)

11′ Tarsi of all legs normal, not flattened 12

12(11′) Dorsum of abdominal segment IX with sclerotized plate (Fig. 2c)..... 13

12′ Dorsum of abdominal segment IX without sclerotized plate 15

13(12) Tarsi of the first thoracic legs modified into chelae (Fig. 4b); larva never builds larval retreat ..... HYDROBIOSIDAE, *Apsilochorema*

13′ Tarsi of the first thoracic legs norma1 14

14(13′) Larva with prosternal plate (Fig. 5b); turtle-shaped case of gravel (Fig. 5a) ..... GLOSSOSOMATIDAE (p. 185)

14′ Larva without prosternal plate; larva free-living (Fig. 52a) ..... RHYACOPHILIDAE (p. 189)

15(12′) Mesopleuron (Fig. 7c) extended anteriorly as a lobate process (Fig. 7a), tibia and tarsi fused together on all legs (Fig. 7b); larva in fixed tube of sand ..... XIPHOCENTRONIDAE

15′ Mesopleuron not extended anteriorly; tibia and tarsi not fused together 16

16(15′) ...Head prolonged, more than 2 times as long as wide (Fig. 8a-b); larva constructs fixed retreat between large stones or in a crevice ..... STENOPSYCHIDAE, *Stenopsyche*

16′ Head not prolonged, basal membranous section of each anal proleg equal in length to distal sclerotized section (Fig. 9); larva constructs fixed silk net on substrate in slow flowing stream ..... POLYCENTROPODIDAE

17(8′) Antenna long and prominent, at least 6 times as long as wide (Fig. 39b), or mesonotum with dark bar (Fig. 42); larvae construct cases with varous materials.... LEPTOCERIDAE (p. 188)

17′ Antenna short, no more than 3 times as long as wide 18

18(17′) Labrum with transverse row of at least 12 setae across central part (Fig. 16e); cases of two pieces of leaves, dorsal piece larger than ventral one (Fig. 16a), or in hollow twig (Fig. 17a); widespread in patches of leaf litter ..... CALAMOCERATIDAE (p. 185)

18′ Labrum without transverse row of setae or with few setae 19

19(18′) Meso- and metanotum largely unsclerotized and with similar setal arrangement; case of plant materials ..... PHRYGANEIDAE

19′ Mesonotum largely covered by sclerotized plates; setal arrangement of mesonotum differs from metanotum 20

20(19′) Claw of hind legs stout, with short bristles (Fig. 43b) or long filament (Fig. 44); case of fine sand grains, shield-shaped (Fig. 43a) ..... MOLANNIDAE (p. 188)

20′ Claw of hind legs not modified 21

21(20′) First abdominal segment lacking dorsal and lateral humps (Fig. 10); case of various materials and arrangement ..... BRACHYCENTRIDAE

21′ First abdomen with dorsal and/or lateral humps (Fig. 13a) 22

22(21′) First abdomen with dorsal hump 23
22′ First abdomen without dorsal hump 29

23(22) Antennae situated close to anterior margin of head capsule (Fig. 12c)..... 24
23′ Antennae situated some distance from anterior margin of head capsule or eyes (Fig. 15c) 25

24(23) Anal proleg claw with accessory hooks and a sharply angled crook (Fig. 12d); fore trochantin relatively large, with apex hook-shaped (Fig. 12b); portable case of small rock fragments .....Sericostomatidae
24′ Anal proleg with no more than 3-5 setae posteromesad of lateral sclerite; claw without accessory hooks and with a gently curved crook (Fig. 46c); fore trochantin reduced, blunt (Fig. 46d); larval case of coarse rock fragments (Fig. 46a) ....Odontoceridae (p. 188)

25(23′) Anal proleg with a ventral brush of setae and with a dorsal process bearing setae (Fig. 11b); pronotum usually with transverse carina extended as rounded anterolateral lobe (Fig. 11a); cases of sand grains..... Beraeidae, *Ernodes*
25′ Anal proleg without a ventral brush of setae or dorsal process; pronutum without transverse carina 26

26(24′) Mesopleuron extended as acute process; each half of mesonotum divided into two or three separate plates (Fig. 13b); portable larval case tubular, made of coarse rock fragments, with two or three large stones on each side (Fig. 13a) ..... Goeridae
26′ Mesopleuron not extended anteriorly; mesonotum not divide into several plates . 27

27(26′). Pronotum longer than wide; case usually long, slender and slightly curved, made of fine sand or coarse gravel or entirely of silk, or relatively stout and usually with small stone arranged along each lateral side .....Uenoidae
27′ Pronotum wider than long 28

28(27′) Basal setae of each tarsal claw subequal or as long as claw (Fig. 14); case of mineral materials ..... Apataniidae
28′ Basal setae of each tarsal claw shorter than claw; case of mineral or plant materials ..... Limnephilidae

29(22′) Larva with prosternal horn (Fig. 15b); antenna situated close to anterior margin of eye (Fig. 15c); cases of various materials and arrangment (Fig. 15a)..... .....Lepidostomatidae
29′ Larva without prosternal horn; antenna situated close to anterior margin of head; case of debrisarranged irregularly .....Phryganopsychidae, *Phryganopsyche*

Family Calamoceratidae—Key to Genera of Calamoceratidae

1 Anterolateral corners of pronotum projection into prominent lobes (Fig. 16b-c); gills each with 2 or 3 branches; hind tibia usually divided (Fig. 16d); case made of 2 leaf pieces, dorsal piece overlapping ventral one (Fig. 16a) ..... *Anisocentropus*

1′ Anterolateral corners of each pronotum without prominent lobe (Fig. 17c); dorsal and ventral gills with 3 branches, lateral gills with 2 branches (Fig. 17b); hind tibia usually not divided; case a hollowed-out twig (Fig. 17a).....*Ganonema*

Family Dipseudopsidae—Key to Subfamilies and Genera of Dipseudopsidae

1 Meso- and metanotal sclerite present (Fig. 18a-b); larval dwelling a fixed tube covered with sand (Fig. 18c) ..... Pseudoneureclipsinae, *Pseudoneureclipsis*

1′ Meso- and metanota membranous.....Dipseudopsinae…2

2(1′) Outer edges of mandibles serrate; ventral gills behind metathoracic legs absent; larval dwelling tube buried in sediments..... *Polycentropus*

2′ Outer edge of mandibles with three strong teeth (Fig. 19b); filamentous gills present behind metathoracic legs and between metasternum and abdominal sternum I (Fig. 19a); larval dwelling tube buried in sediments, or sometimes on the surface of soft sediment (Fig. 19d) .....*Dipseudopsis*

Family Glossosomatidae—Key to Genera of Glossosomatidae

1 Mesonotum bearing 2 sclerites (Fig. 5c); anal opening without dark sclerotized line on each side ..... *Agapetus*

1′ Mesonotum membranous (Fig. 6); anal opening with dark, sclerotized line on each side.....*Glossosoma*

Larvae of *Nepaloptia, Padunia, Poeciloptila* are unknown.

Family Hydroptilidae—Key to Genera of Hydroptilidae

1 Anterior ventral apotome of head triangular (Fig. 20b); case made of silk alone (Fig. 20a) ..... *Orthotrichia*

1′ Anterior ventral apotome of head varied but not triangular; case varied 2

2(1′) Dorsum of abdominal segments I-VII with small tergite 3

2′ Dorsum of abdominal segments without tergite..... 5

3(2) Fifth instar larvae free living or builds a fixed case (Fig. 21) .....*Ugandatrichia*

3′ Fifth instar larvae always with cases 4

4(3′) Dorsum of abdominal tergite with ring on the middle ..... *Stactobia*
4′ Abdominal terga without ring..... *Plethus*

5(2′) All three pairs of legs approximately the same length; larva with 3 apical abdominal gills, one from dorsomedian position on segment IX, other two at lateral sclerite of anal prolegs (Fig. 22b); compressed case made of silk covered with fine sand grain or filamentous algae (Fig. 22a) .....*Hydroptila*
5′ Mid- and hind legs more than 2 times as long as forelegs; larvae without apical anal gills; cases varied..... 6

6(5′) Meso- and metathoracic legs 2.5 times as long as prothoracic legs; larvae in flatted flask-shaped case made of silk (Fig. 23)..... *Oxyethira*
6′ Meso- and metathoracic legs 4 times as long as prothoracic legs .... *Tricholelochiton*

Larvae of *Microptila, Chrysotrichia, Sacelotrichia* and *Ptilocolepus* are unknown.

Family Hydropsychidae—Key to Subfamilies and Genera of Hydropsychidae

1 Gena of head capsule completely separated by ventral apotome (Fig. 24b) .... Arctopsychinae…2
1′ Gena of head capsule partially separated by anterior and posterior apotome (Fig. 26a,27c) 3

2(1) Dorsum of most abdominal segments with tuft of several long setae and/or scale setae on sa2 and sa3 positions (Fig. 25); ventral apotome usually nearly rectangular ..... *Parapsyche*
2′ Dorsum of most abdominal segments with single long seta on sa2 and sa3 positions (Fig. 24c), frequently with one or two short setae but not a tuft; ventral apotome tapers posteriorly .....*Arctopsyche*

3(1′) Posterior ventral apotome at least one-half as long as median ecdysial line (Fig. 26a); frontocypleus constricted at eye level (Fig. 26b)..... ..... Diplectroninae, *Diplectrona*
3′ Posterior ventral apotome less than one-half as long as median ecdysial line (Fig. 27d); frontocypleus not constricted at eye level 4

4(3′) Abdominal gills with central stalk with numerous filaments arising fairly uniformly along entire length (Fig. 27d); fore trochantin never forked (Fig. 27a,31a,32a)..... .....Macronematinae…5
4′ Abdominal gills with central stalk, mostly gill filaments arising from basal part of central stalk (Fig. 33c); fore trochantin usually forked (Fig. 33a,36a,37a)..... .....Hydropsychinae…10

5(4) Dorsum of head flattened (Fig. 27,28), with sharp carina; fore tibia and tarsus with dense setal fringe (Fig. 27a,28a)..... 6
5′ Dorsum of head not flattened and without sharp carina; fore tibia and tarsus without setal fringe (Fig. 29a,31a,32a)..... 7

6(5) Head broad and short, dorsal ridge sharply marked with crown of setae (Fig. 27b); trapezoidal submentum (Fig. 27c)..... *Macrostemum*
6′ Head less broad, dorsal ridge without crown of setae (Fig. 28b); triangular submentum (Fig. 28c)..... *Amphipsyche*

7(5′) Head and thorax elongated and narrower than abdomen, head width about one-half as long as its length (Fig. 31b)..... 8
7′ Head and thorax not narrower than abdomen, head about as long as wide; (Fig. 29b); abdominal gills with two filaments, gills arranged in single row on each side of abdomen (Fig. 29a)..... 9

8(7) Mesosternum with gills; fore trochantin acute (Fig. 31c) ..... *Polymorphanisus*
8′ Mesosternum without gills; fore trochantin blunt (Fig. 32b) ..... *Oestropsyche*

9(7′) Abdominal gills with two filaments (Fig. 29a)..... *Pseudoleptonema*
9′ Abdominal gills with more than two filaments (Fig. 30) ..... *Trichomacronema*

10(4′) Anterior ventral apotome with remarkable anteromedial projection (Fig. 33b); lateral border of mandible flanged (Fig. 33d)..... *Potamyia*
10′ Anterior ventral apotome without remarkable anteromedial projection; lateral border or mandible not flanged..... 11

11(10′) Dorsal abdominal segments with scale setae (Fig. 36b,37b)..... 13
11′ Dorsal abdominal segments without scale setae..... 12

12(11′) Dorsal abdominal segments with only plain setae (Fig. 34b); prosternum with small scerite or absent (Fig. 34a)..... *Cheumatopsyche*
12′ Dorsal abdominal segments with plain setae and club setae (Fig. 35b); prosternum with large scerite (Fig. 35a)..... *Ceratopsyche*

13(11) Only conical scale setae on abdominal segments (Fig. 36b)..... *Hydatomanicus*
13′ Dorsal abdominal segments with plain setae and scale setae..... 14

14(13′)....Dorsal abdominal segments with plain setae and long wedge-shaped scale setae (Fig. 38) ..... *Hydropsyche*
14′ Dorsal abdominal segments with plain setae and numerous round scale setae (Fig. 37b) ..... *Hydromanicus*

Larvae of *Maesaipsyche* not found.

Family Leptoceridae—Key to Subfamilies and Genera of Leptoceridae

1 Head with secondary cephalic ecdysial lines (Fig. 39b); metanotum thout sclerite or with only one pair of small sclerites at sa3 ..... Leptocerinae…2
1′ Head without secondary cephalic ecdysial lines; metanotum with at least two pairs of sclerites; case a hollowed twig, randomly arranged detritus, or empty case of other caddis larva ..... Triplectininae, *Triplectides*

2(1) Mesothoracic legs each with tarsal claw hooked (Fig. 39c); case of silk, strongly tapered and slightly curve (Fig. 39a) ..... *Leptocerus*
2′ Mesothoracic legs each with normal tarsal claw 3

3(2′) Anal prolegs each with sclerite (Fig. 40b); or larva with three subequal thoracic segments and undivided tibia on metathoracic legs; head and pronotum with dark spots and small marks; conical case of sand grains (Fig. 40a) ..... *Setodes*
3′ Anal prolegs each without sclerites 4

4(3′) Maxillary palp extending far beyond anterior edge of labrum (Fig. 41b); case of mineral and/or plant material (Fig. 41a) ..... *Oecetis*
4′ Maxillary palp not extending far beyond anterior edge of labrum 5

5(4′) Mesonotum with pair of dark, curved or straight bars on weakly sclerotized plates (Fig. 42); case of sand grains with anterior opening wider, tapered posteriorly ..... *Ceraclea*
5′ Metanotum without dark bars on sclerites ..... unknown genus

Larvae of *Adicella, Mystacides, Triaenodes* and *Trichosetodes* are unknown.

Family Molannidae—Key to Genera of Molannidae

1 Tarsal claw of each hind leg much shorter than tarsi, modified into curved broad setose lobe (Fig.43b) ..... *Molanna*
1′ Tarsal claw of each hind leg as long as tarsus, modified into slender filament (Fig. 44) ..... *Molannodes*

Family Odontoceridae—Key to Genera of Odontoceridae

1 Anterolateral corner of pronotum sharp-pointed; each mesonotal plate not divided into small sclerites (Fig. 45) ..... *Psilotreta*
1′ Anterolateral corner of pronotum not produced into sharp point (Fig. 46b); each mesonotal plate subdivided into three sclerites (Fig. 46b) ..... *Marilia*

Larvae of *Inthanopsyche, Lannapsyche* are unknown.

Family Philopomatidae—Key to Genera of Philopomatidae

1 Anterior margin of frontoclypeus with asymmetrical prominent notch (Fig. 47b); fore coxa with long process arising near distal end (Fig. 47c) ..... *Chimarra*

1′ Anterior margin of frontoclypeus convex (Fig. 48a); fore coxa lacking long process (Fig. 48b) ..... *Wormaldia*

Larvae of *Doloclanes, Dolophilodes,* and *Gunungiella* not known.

Family Psychomyiidae—Key to Genera of Psychomyiidae

1 Anal claw with conspicuous ventral teeth (Fig. 51b) 3

1′ Anal claw without ventral teeth 2

2(1′) Mandible with dorsolateral protubercle, lateral setae near middle of each mandible (Fig. 49d); sclerites of submentum large, half as long as wide (Fig. 49c)..... *Tinodes*

2′ Mandible without protubercle, lateral setae arising about one-third of distance from base of each mandible (Fig. 50); sclerites of submentum one-third as long as wide . ..... *Lype*

3(1) Submentum longer than wide (Fig. 51a) ..... *Psychomyia*

3′ Submentum wider than long ..... *Paduniella*

Family Rhyacophilidae—Key to Genera of Rhyacophilidae

1 Second segment of maxillary palps longer than the other segments (Fig. 52b); tuft of gills absent or present ..... *Rhyacophila*

1′ Second segment of maxillary palps not longer than the other segments; tuft of lateral gills on thoracic and abdominal segments (Fig. 53) ..... *Himalopsyche*

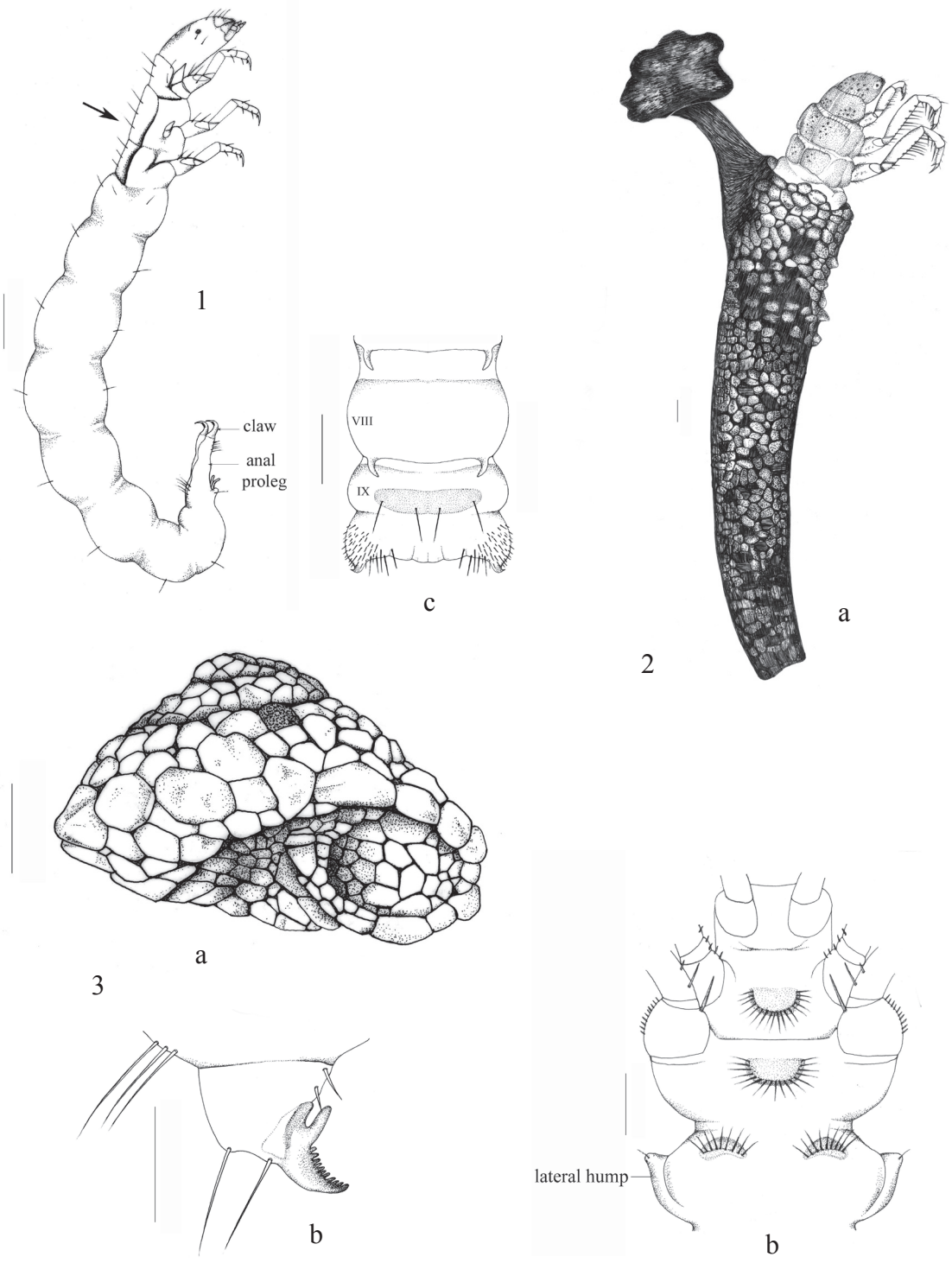


Fig. 1-3 1. Lateral view of *Ecnomus* sp. larva (Ecnomidae); 2. Lateral view of case (a),ventral view of thorax (b) and ventral view of abdominal segment IX (c) of *Limnocentropus* sp. larva (Limnocentropodidae); 3. Portable case (a) and anal hook (b) of *Helicopsyche* sp. larva (Helicopsychidae).
Scale: (1,2a-c,3a) 1 mm; (3b) 0.5 mm

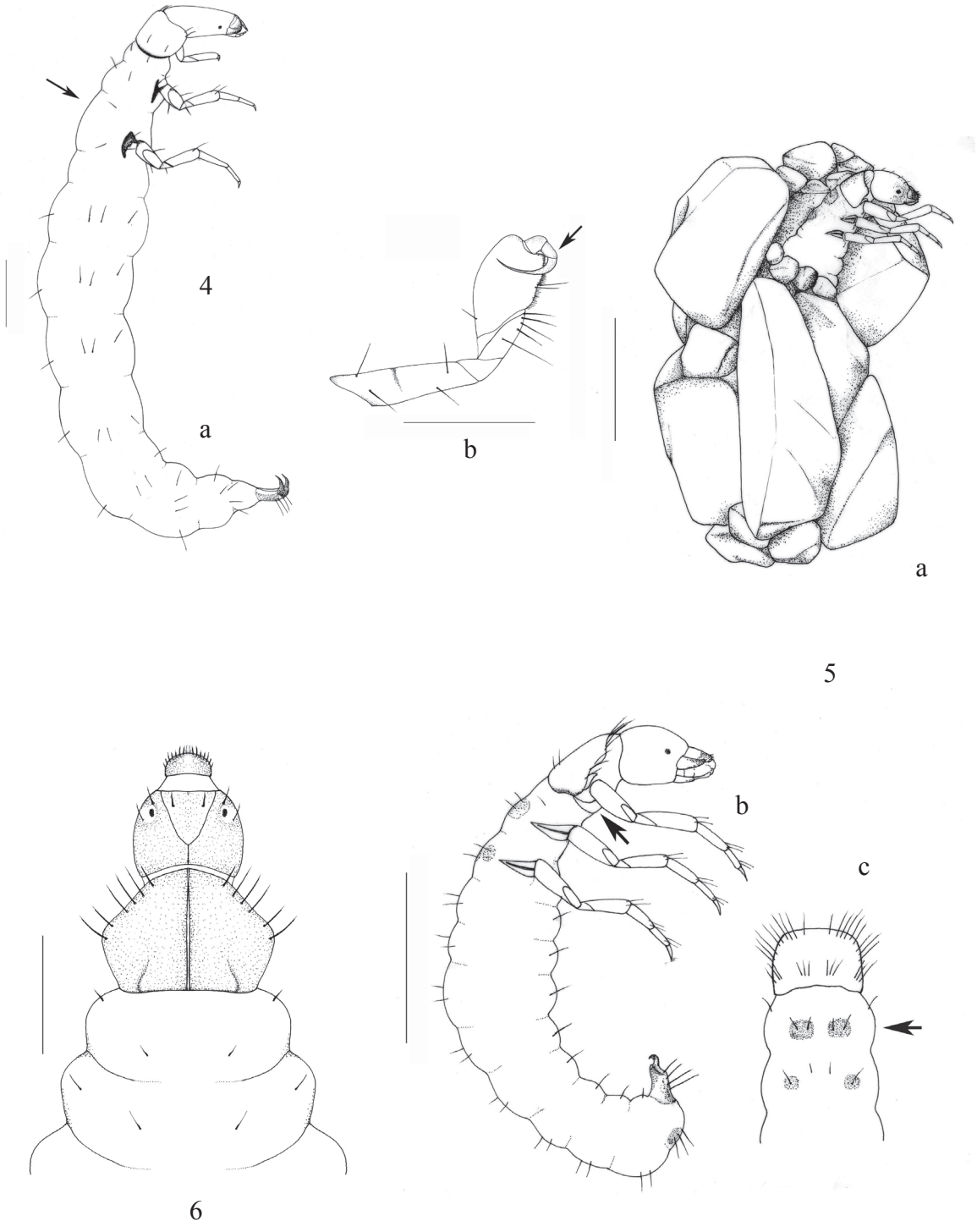


Fig. 4-6 4. Lateral view (a) and foreleg (b) of *Apsilochorema* sp. larva (Hydrobiosidae); 5. Larva in portable case (a) , lateral view (b) and dorsal view of thorax (c) of *Agapetus* sp. larva (Glossosomatidae); 6. Dorsal view of head and thorax of *Glossosoma* sp. larva (Glossosomatidae).
Scale: (4a,5a-c,6) 1 mm; (4b,6b) 0.1 mm.

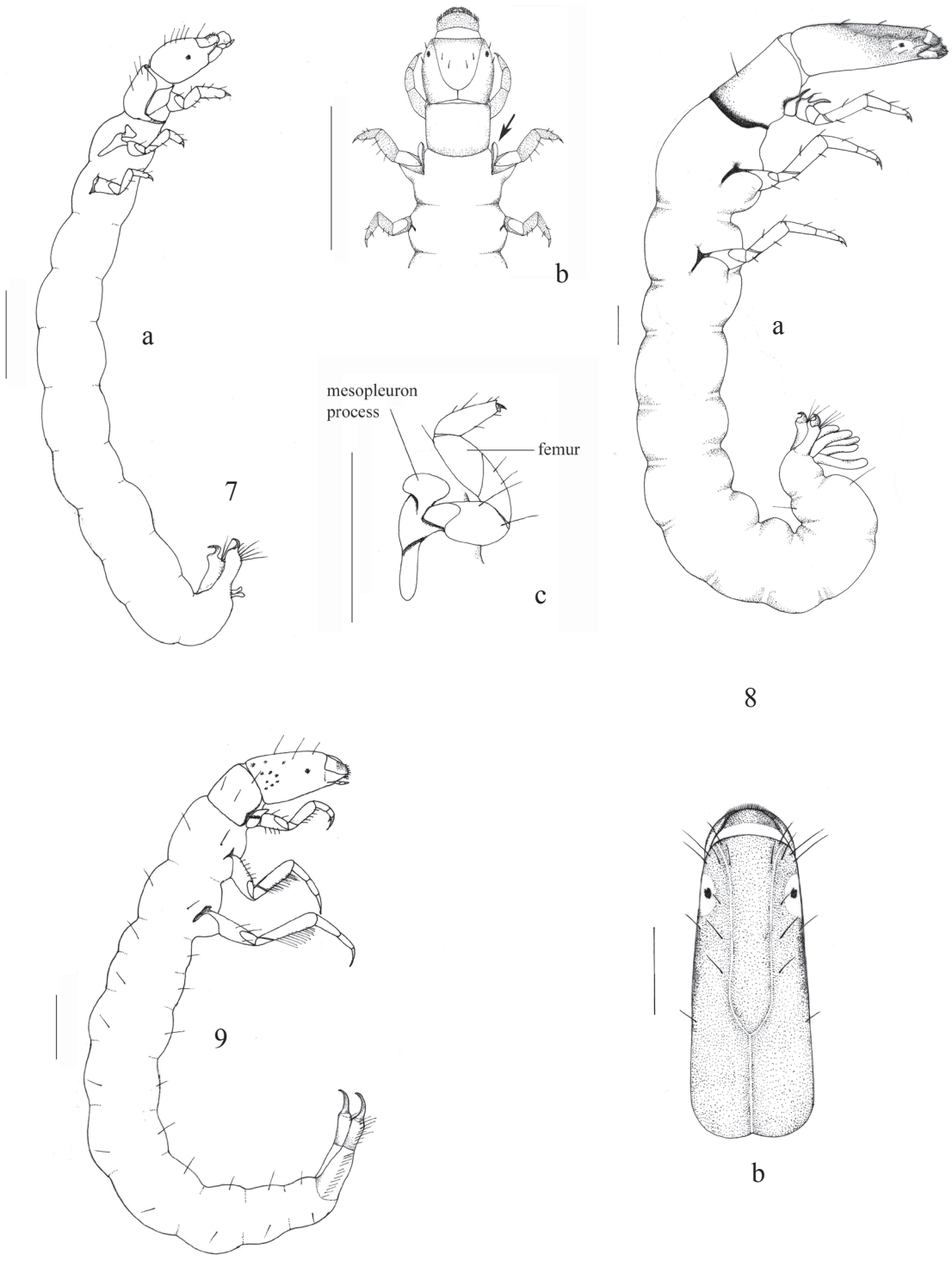


Fig. 7-9 7. Lateral view (a), dorsal view of head and thorax (b) and midleg (c) of *Melanotrichia* sp. larva (Xiphocentronidae); 8. Lateral view (a) and dorsal view of head (b) of *Stenopsyche siamensis* larva (Stenopsychidae); 9. Lateral view of Polycentropodidae larva.
Scale: (7a-b,8a-b,9)1 mm; (7c) 0.5 mm.

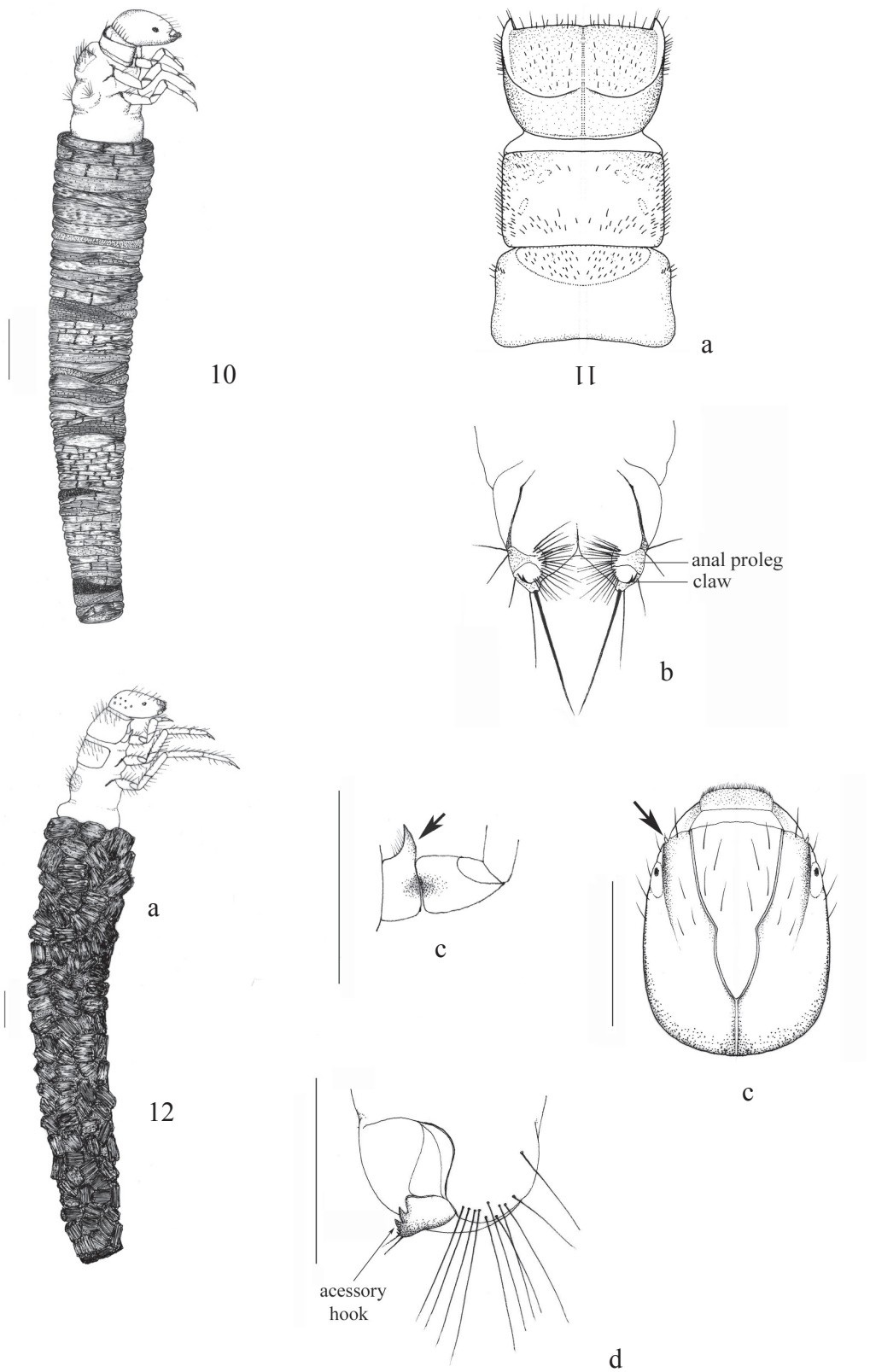


Fig. 10-12 10. Lateral view of *Micrasema* sp. larva (Brachycentridae); 11. Dorsal view of thorax (a) and ventral view of anal proleg (b) of Beraeidae (redrawn from Wiggins, 1996, fig. 13.1B-D); 12. Lateral view (a), trochantin (b), dorsal view of head (c) and lateral view of anal proleg (d) of Sericostomatidae larva Scale = 1 mm.

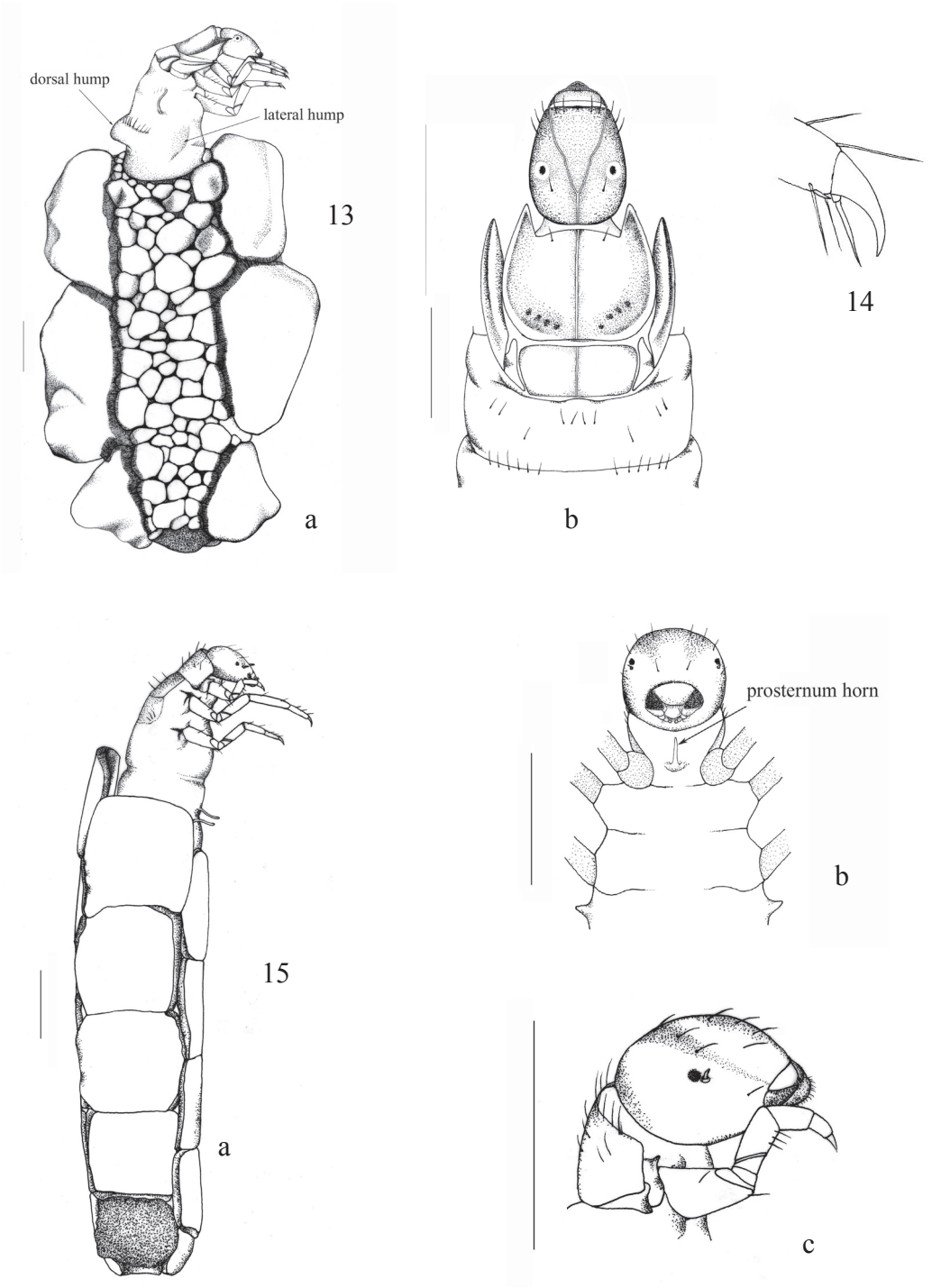


Fig. 13-15 13. Lateral view (a) and dorsal view of thorax (b) of *Goera* sp. larva (Goeridae);14. Tarsal claw of Apataniidae (redrawn from Wiggins, 1996, fig. 12.2A); 15. Lateral view larva (a), ventral view of head and thorax (b) and lateral view of head (c) of *Lepidostoma* sp. larva (Lepidostomatidae). Scale = 1 mm.

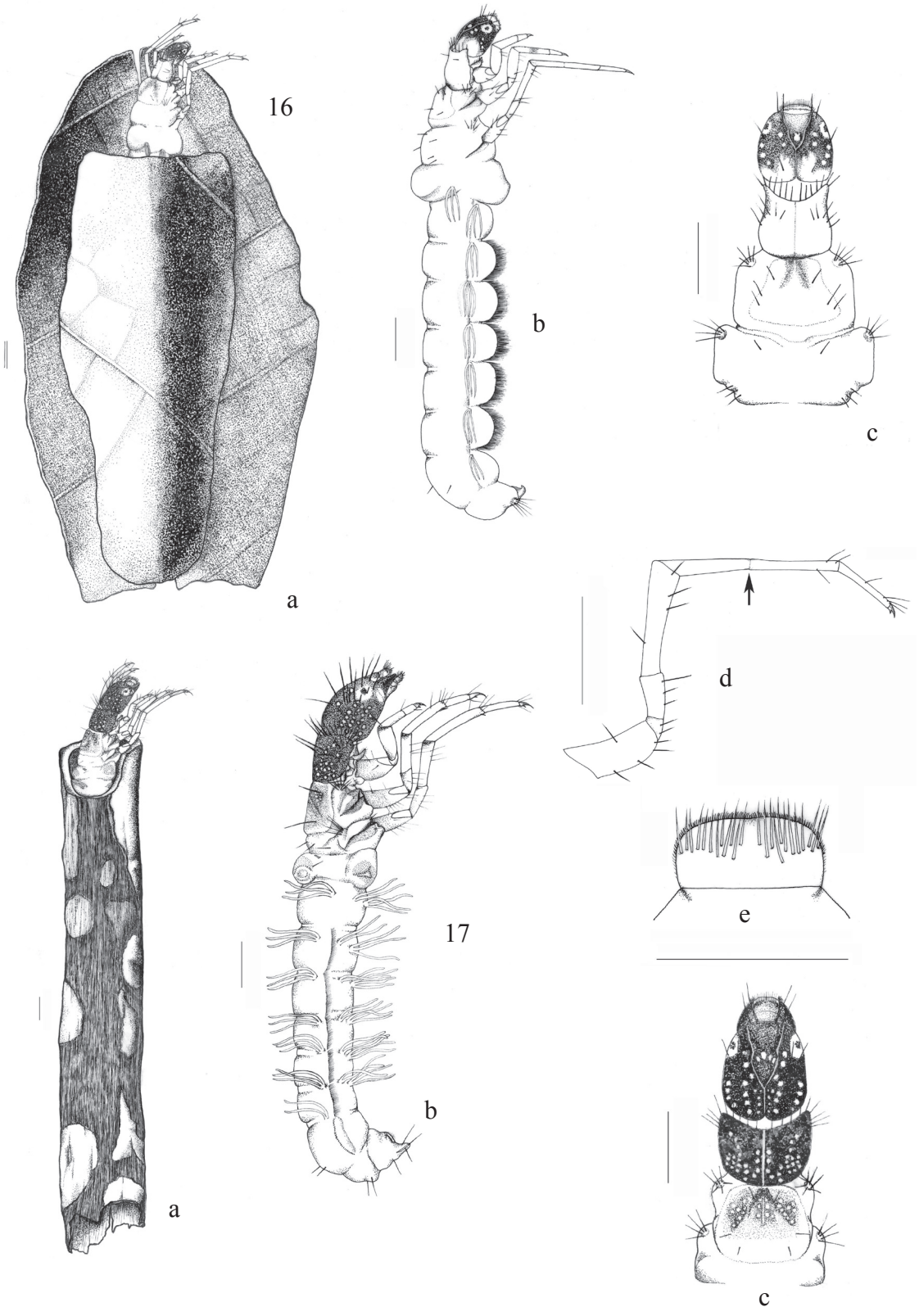


Fig. 16-17 16. Larva in portable case (a), lateral view of larva (b), dorsal view of head and thorax (c), hind leg (d) and dorsal view of labrum (e) of *Anisocentropus brevi* (Calamoceratidae); 17. Larva in portable case (a), lateral view of larva (b) and dorsal view of head and thorax (c) of *Ganonema extensum* (Calamoceratidae) Scale: (16a-c, 17a-c) 1 mm; (16d-e) 0.5 mm.

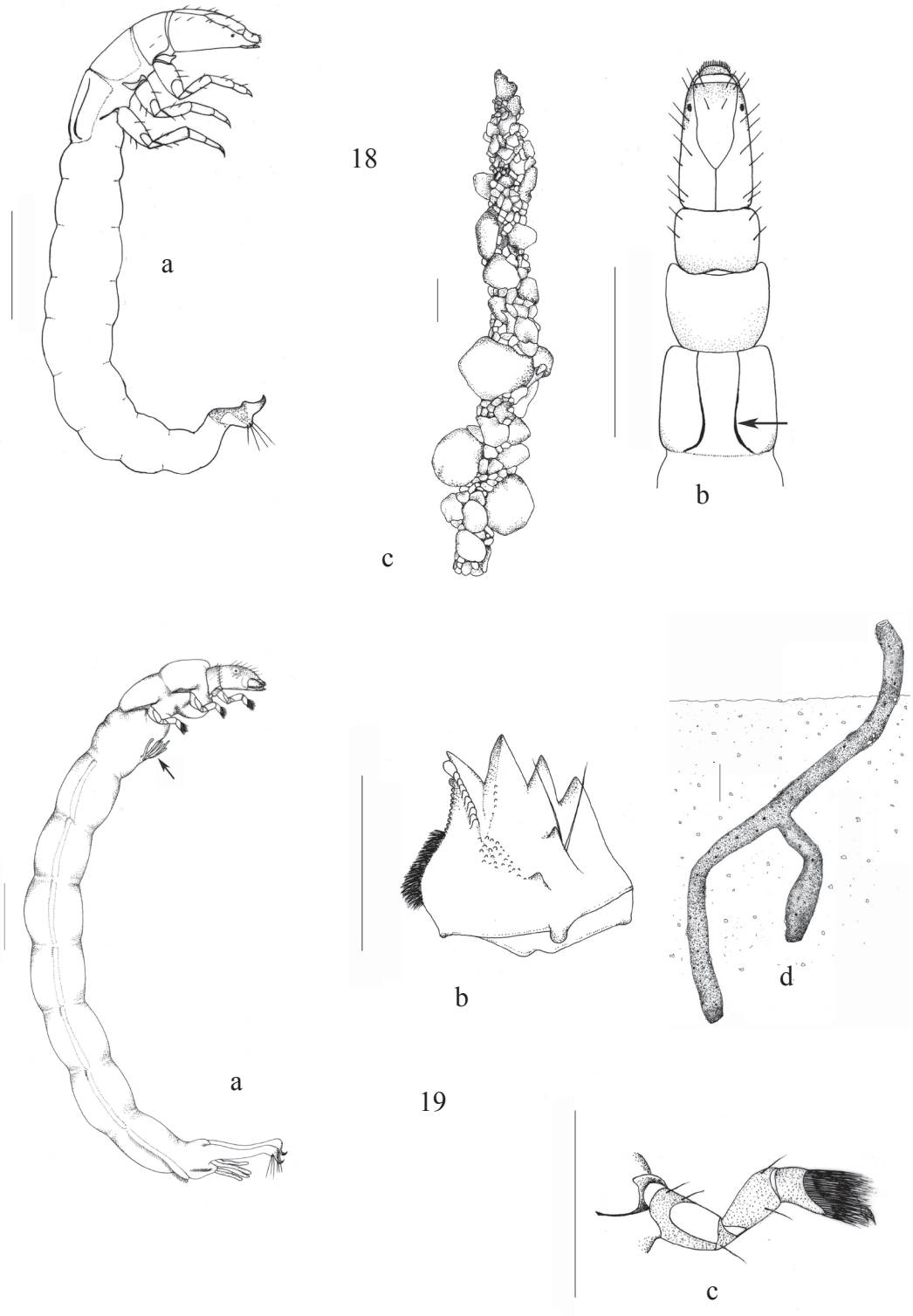


Fig. 18-19 18. Lateral view (a), dorsal view of head and thorax (b) and retreat (c) of *Pseudoneureclipsis* sp. larva (Dipseudopsidae); 19. Lateral view (a), dorsal view of right mandible (b), foreleg (c) and retreat (d) of *Dipseudopsis* sp. larva (Dipseudopsidae) .
Scale: (18c,19d) 2 mm; (18a-b,19a,19c) 1 mm; (19b) 0.5 mm.

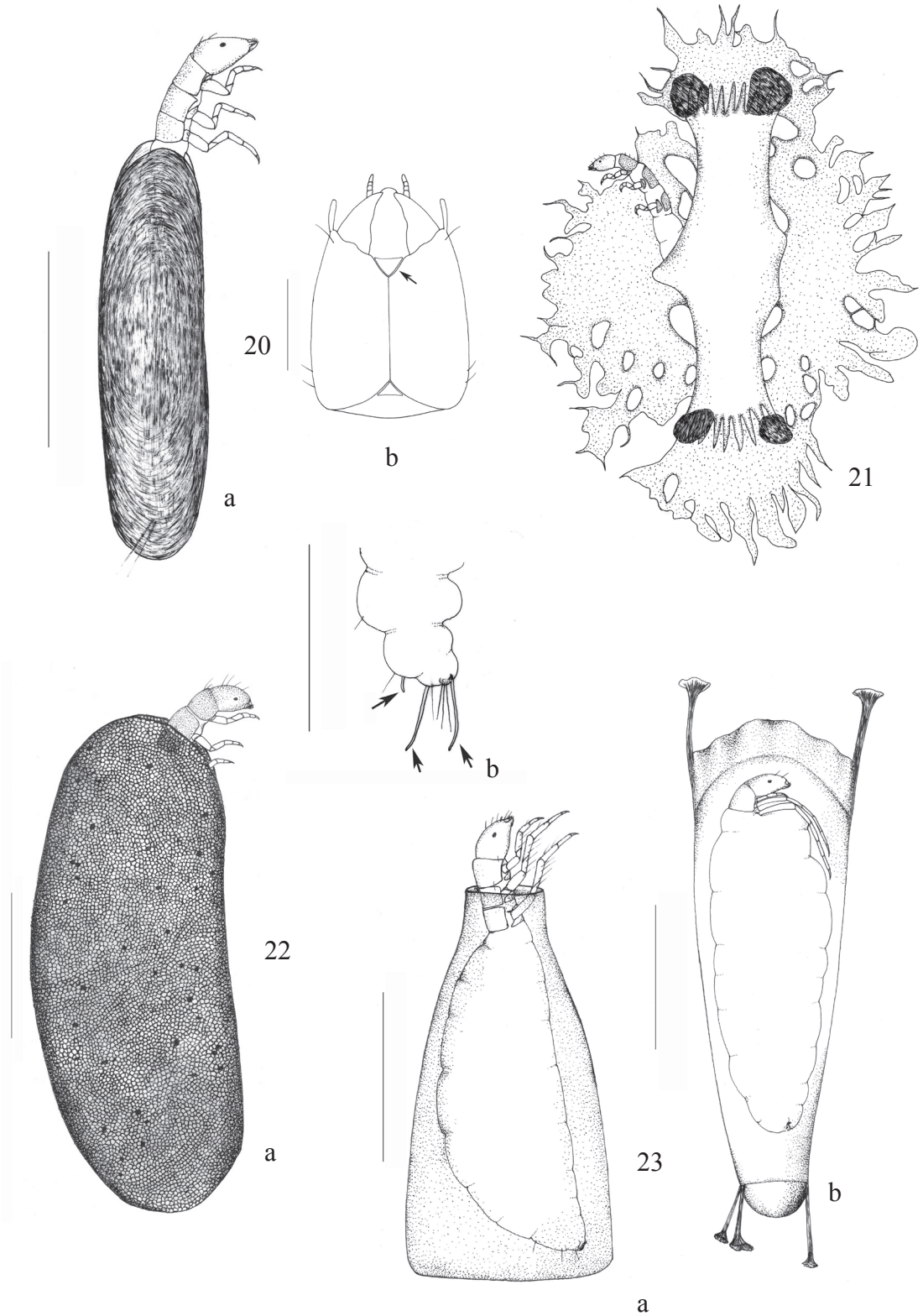


Fig. 20-23 20. Portable case (a) and ventral view of head (b) of *Orthotrichia* sp. larva (Hydroptilidae); 21. Fixed case of *Ugandatrichia* sp. larva (Hydroptilidae) (redrawn from Malicky, 1998, fig 5); 22. Portable case (a) and apical abdomen (b) of *Hydroptila* sp. larva (Hydroptilidae); 23. Portable case (a) and prepupa (b) of *Oxyethira* sp. larva (Hydroptilidae).
Scale: (20a,22a,23a-b) 1 mm; (20b,22b) 0.5 mm.

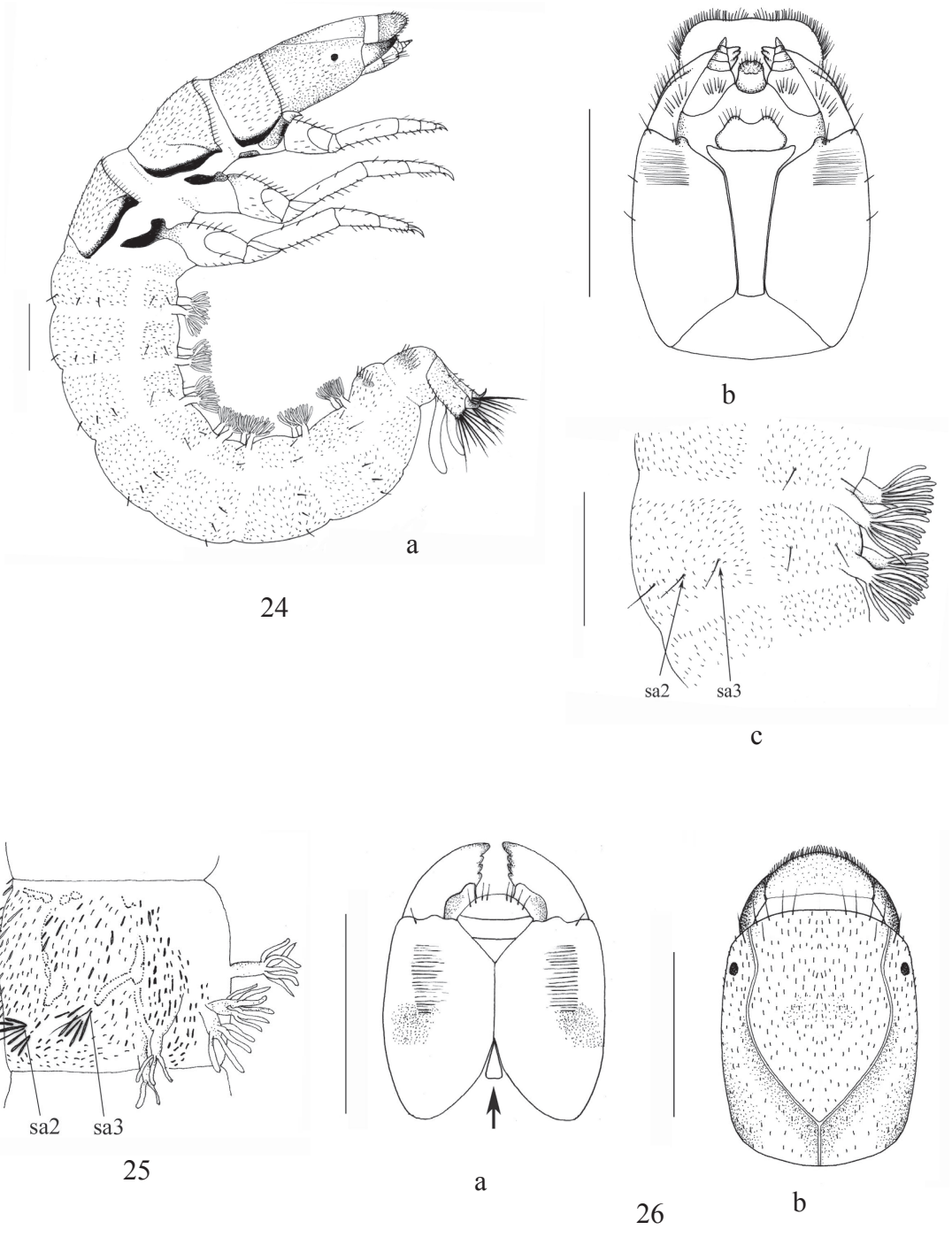


Fig. 24-26 24. Lateral view (a), ventral view of head (b) and lateral of abdominal segment (c) of *Arctopsyche* sp. larva (Hydropsychidae); 25. Lateral view of abdominal segment of *Parapsyche* sp. larva (redrawn from Wiggins, 1996, fig. 7.8B); 26. Ventral view (a) and dorsal view (b) of head of *Diplectrona* sp. larva (Hydropsychidae).
Scale = 1 mm.

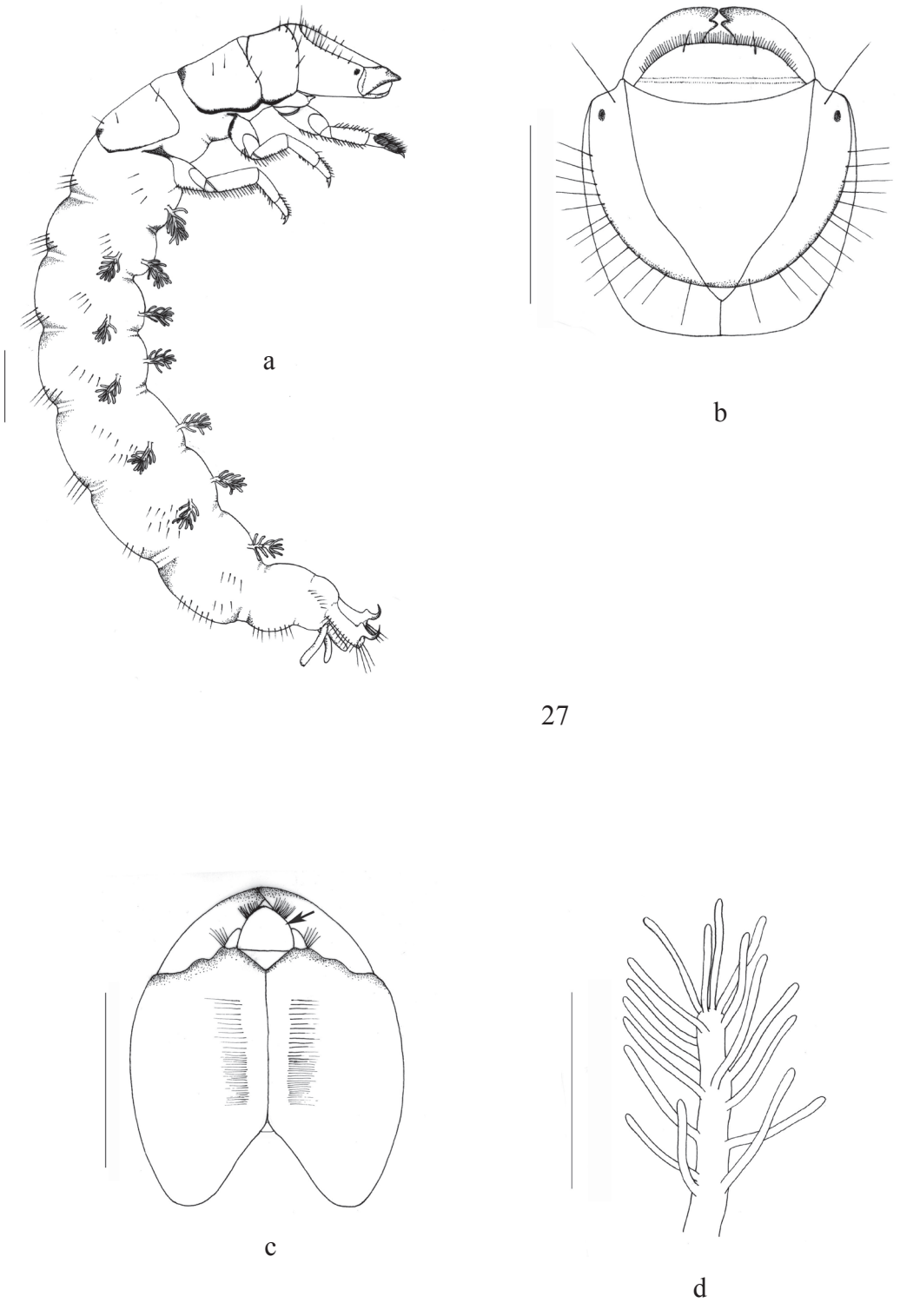
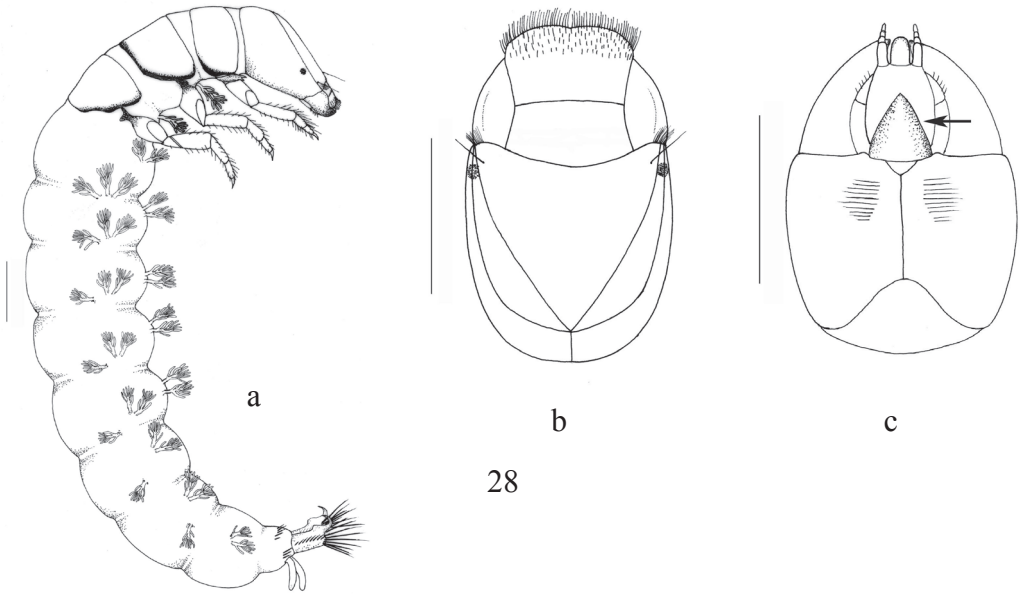


Fig. 27 27. Lateral view (a), dorsal view of head (b) and ventral view of head (c) and gill (d) of *Macrostemum* sp. larva (Hydropsychidae).
Scale: (7a-b,7d) 1 mm; (27c) 0.5 mm.



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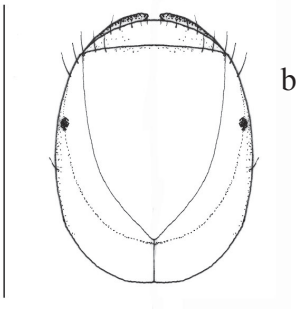
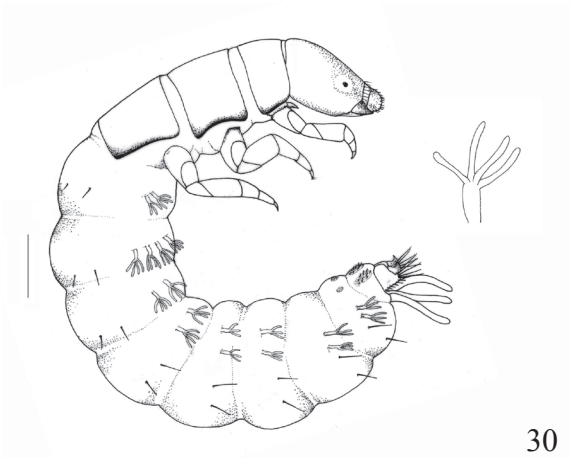
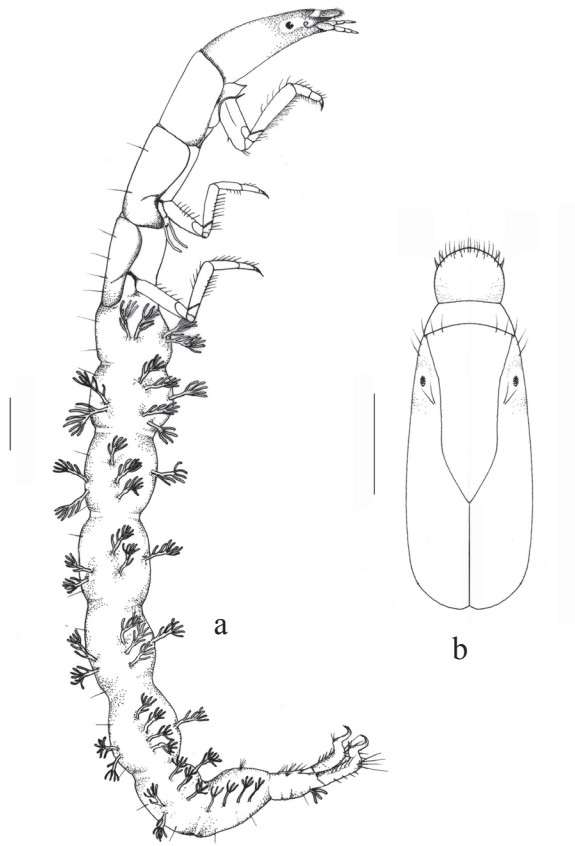


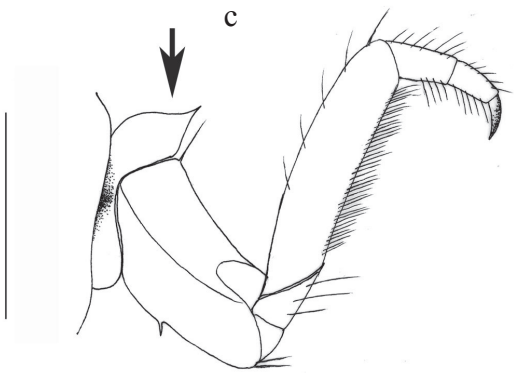


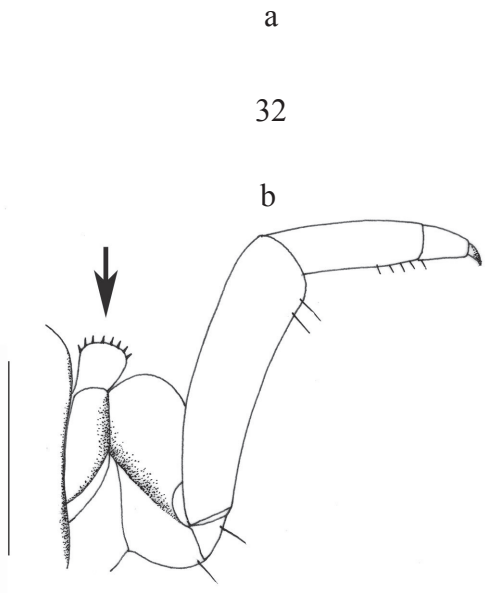
30

Fig. 28-30 28. Lateral view (a), dorsal view of head (b) and ventral view of head (c) of *Amphipsyche* sp. larva (Hydropsychidae); 29. Lateral view (a) and dorsal view of head (b) of *Pseudoleptonema supalak* larva (Hydropsychidae); 30. Lateral view of *Trichomacronema* sp. larva (Hydropsychidae).
Scale = 1 mm.



31





32

Fig. 31-32 31. Lateral view (a), dorsal view of head (b) and right trochantin (c) of *Polymorphanisus* sp. larva (Hydropsychidae); 32. Lateral view (a) and right trochantin (b) of *Oestropsyche* sp. larva (Hydropsychidae).
Scale = 1 mm.

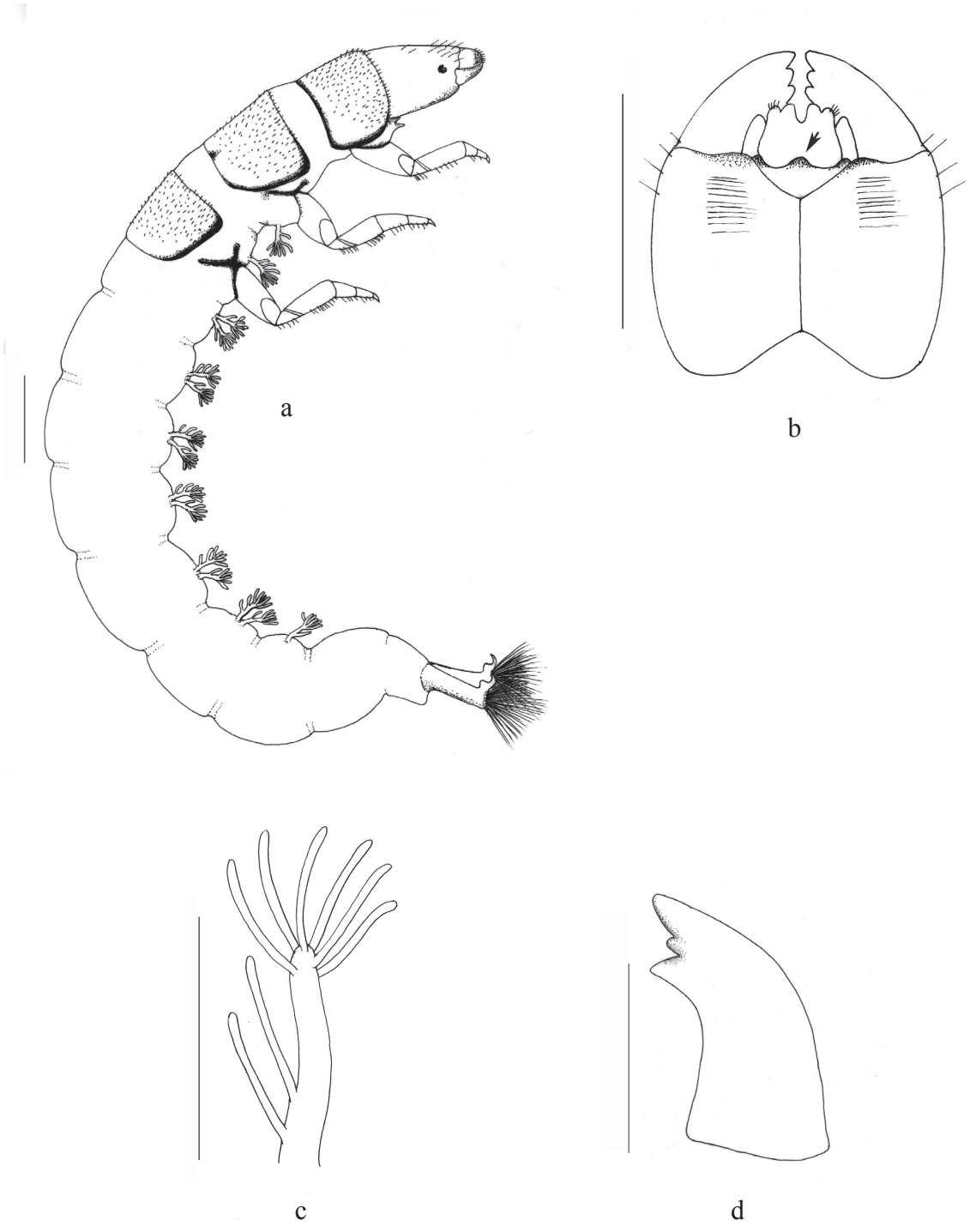


Fig. 33 Lateral view (a), ventral view of head (b), gill (c) and dorsal view of right mandible (d) of *Potamyia* sp. larva (Hydropsychidae).
Scale = 1 mm.

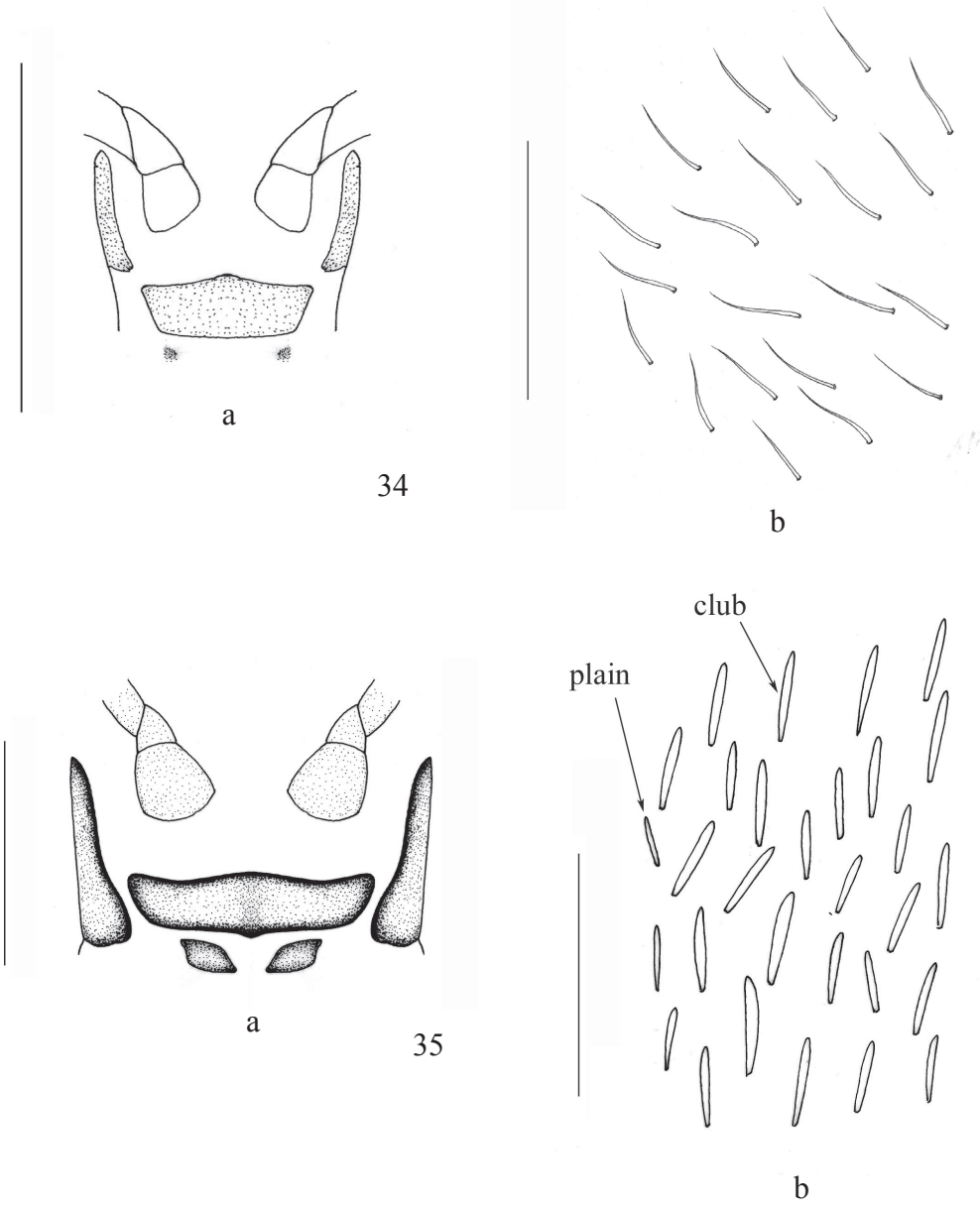


Fig. 34-35 34. Ventral view of prosternum (a) and detail of setation on abdominal tergum (b) of *Cheumatopsyche* sp. larva (Hydropsychidae); 35. Ventral view of prosternum (a) and detail of setation on abdominal tergum (b) of *Ceratopsyche* sp. larva (Hydropsychidae).
Scale: (34a, 35a) 1 mm; (34b, 35c) 0.1 mm.

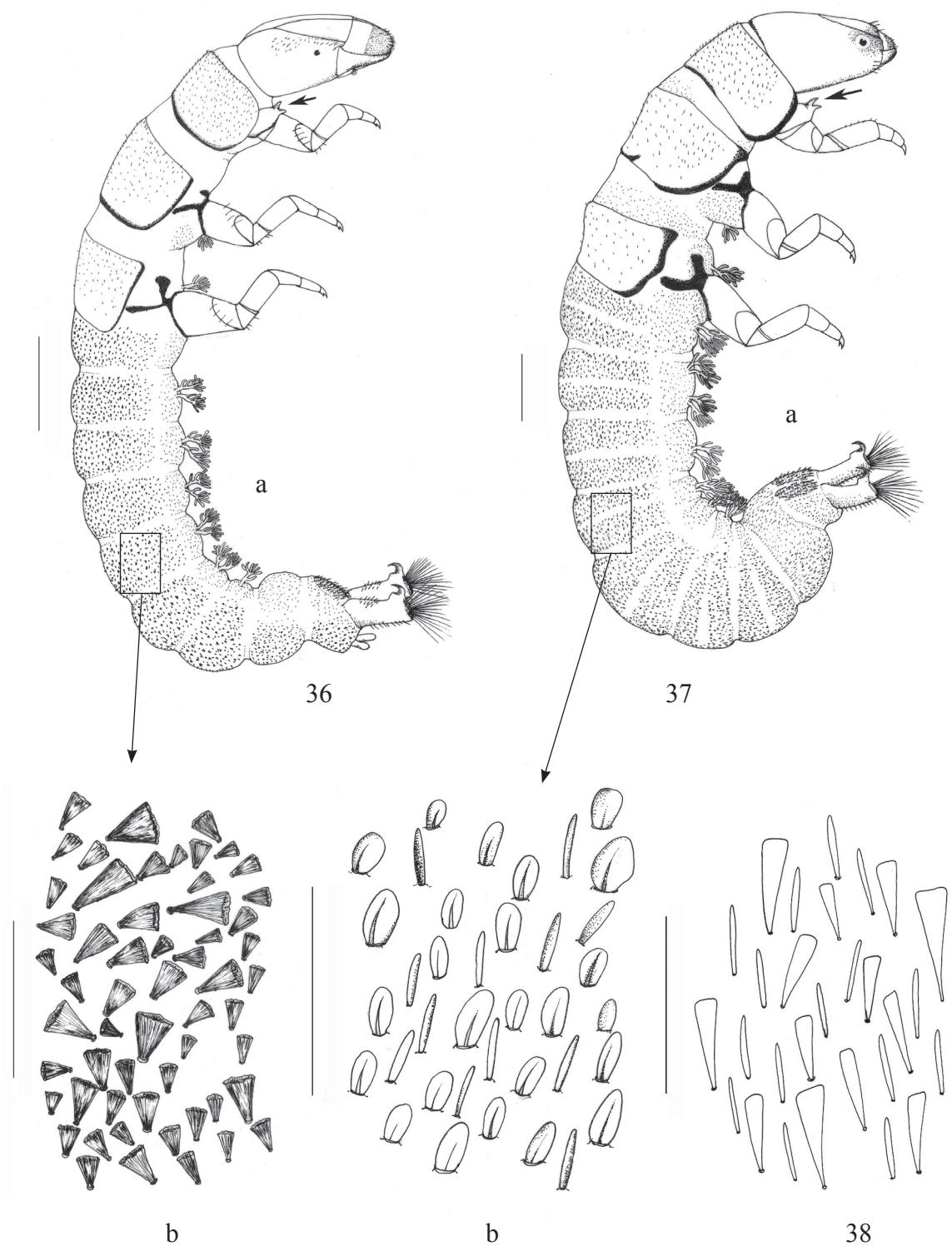


Fig. 36-38 36. Lateral view (a) and detail of setation on abdominal tergum (b) of *Hydatomanicus* sp. larva (Hydropsychidae); 37. Lateral view of larva (a) and detail of setation on abdominal tergum (b) of *Hydromanicus* sp. larva (Hydropsychidae); 38. Detail of setation on abdominal tergum of *Hydrosyche* sp. larva (Hydropsychidae).
Scale: (36a, 37b) 1 mm; (36b, 37b, 38) 0.1 mm.

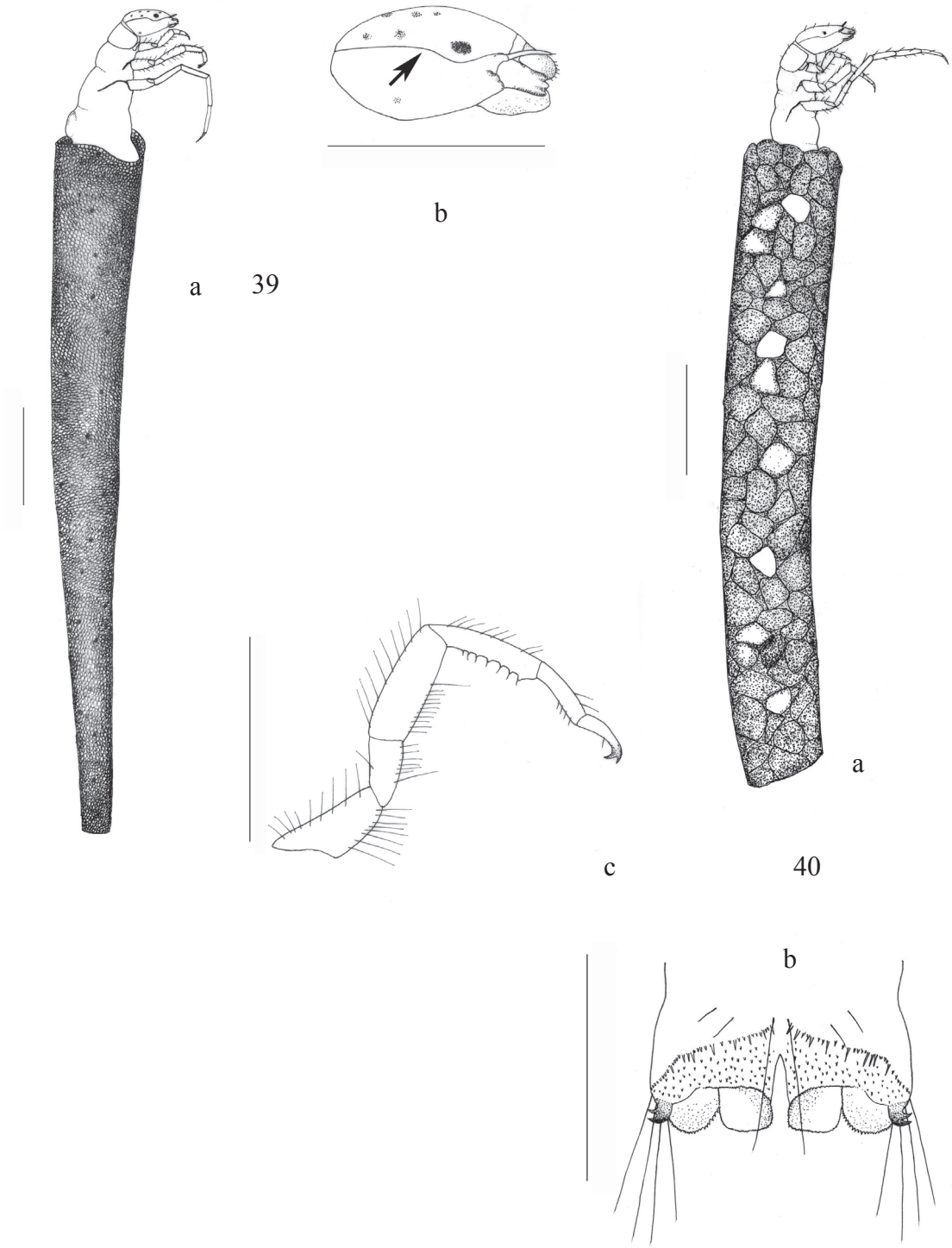


Fig. 39-40 39. Portable case (a), lateral view of head (b) and midleg (c) of *Leptocerus* sp. larva (Leptoceridae); 40. Portable case (a) and ventral view of anal proleg (b) of *Setodes* sp. larva (Leptoceridae).
Scale (39a-b, 40a-b) 1 mm; (39c) 0.5 mm.

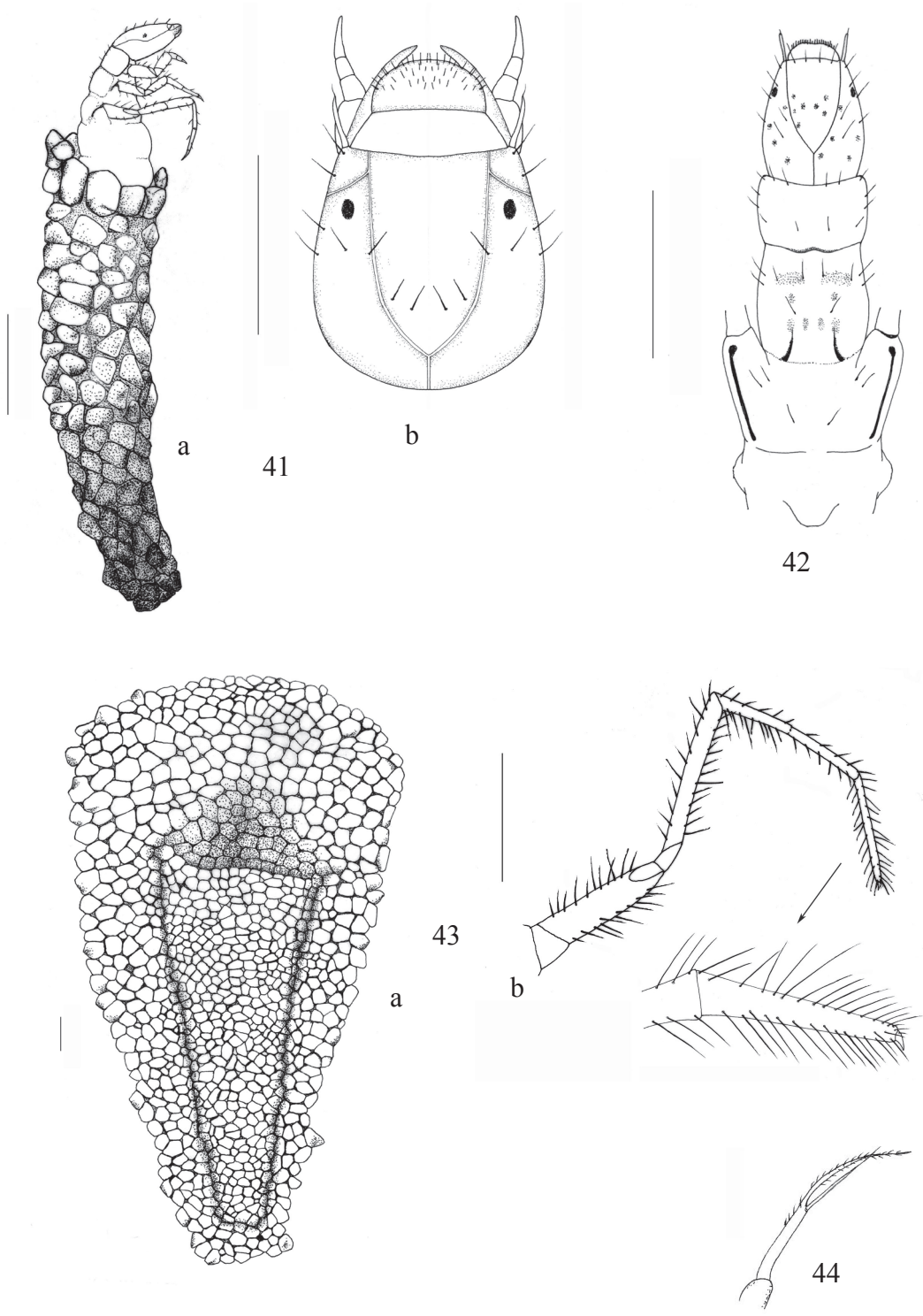


Fig. 41-44 41. Portable case (a) and dorsal view of head (b) of *Oecetis* sp. larva (Leptoceridae); 42**.** Dorsal view of head and thorax of *Ceraclea* sp. larva (Leptoceridae); 43**.** Ventral view of portable case (a) and hindleg (b) of *Molanna* sp. larva (Molannidae); 44**.** Tarsal claw of hindleg of *Molannodes* sp. larva (Molannidae) (redrawn from Wiggins, 1996, fig. 21.2A).
Scale: (41a, 42, 43a-b) 1 mm, (41b) 0.5 mm.

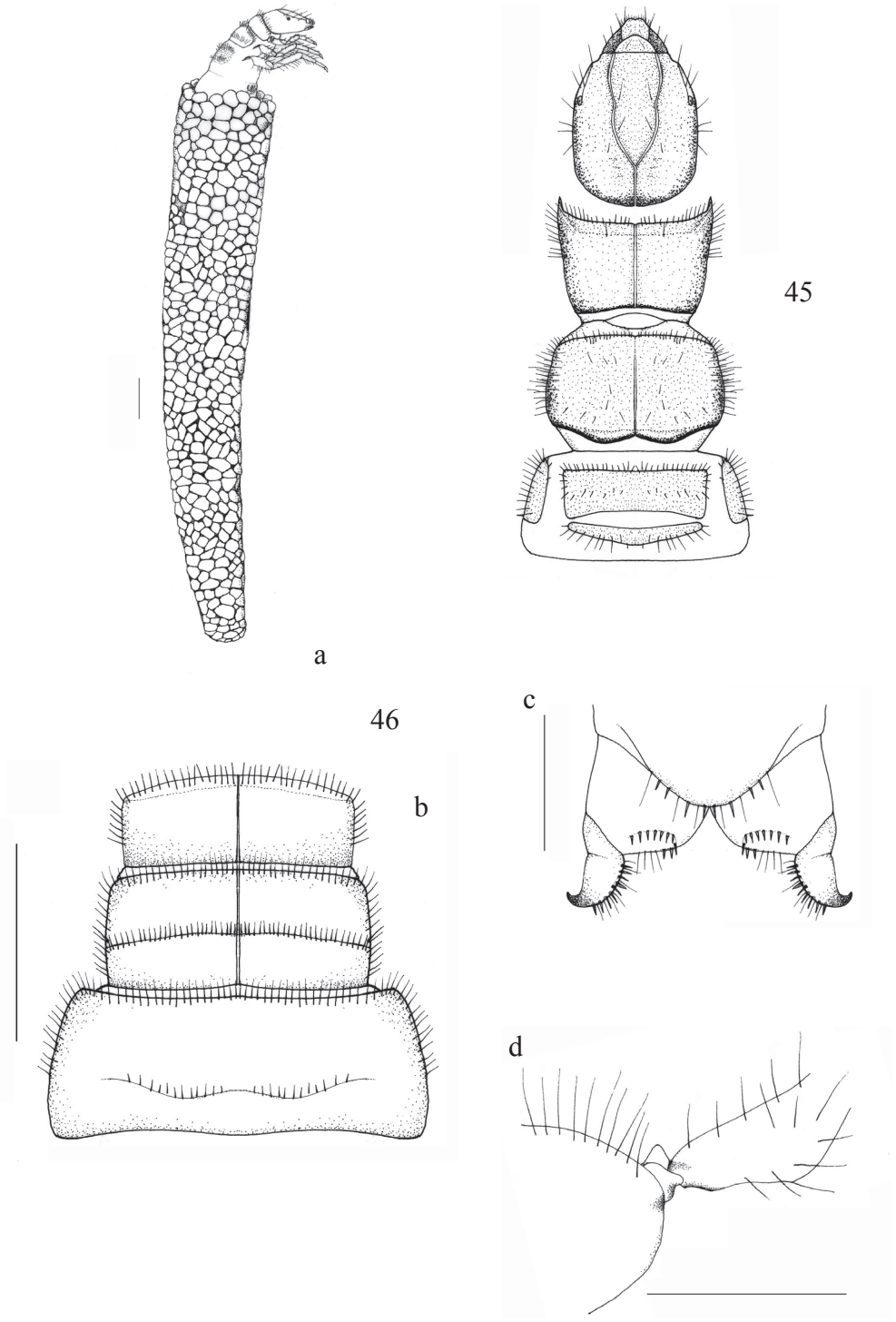


Fig. 45-46 45. Dorsal view of head and thorax of *Psilotreta* sp. larva (Odontoceridae) (redrawn from Wiggins, 1996, fig. 22.6); 46. Portable case (a), dorsal view of thorax (b), dorsal view of anal proleg (c) and trochantin (d) of *Marilia* sp. larva (Odontoceridae).
Scale: (46a-c) 1 mm, (46d) 0.5 mm.

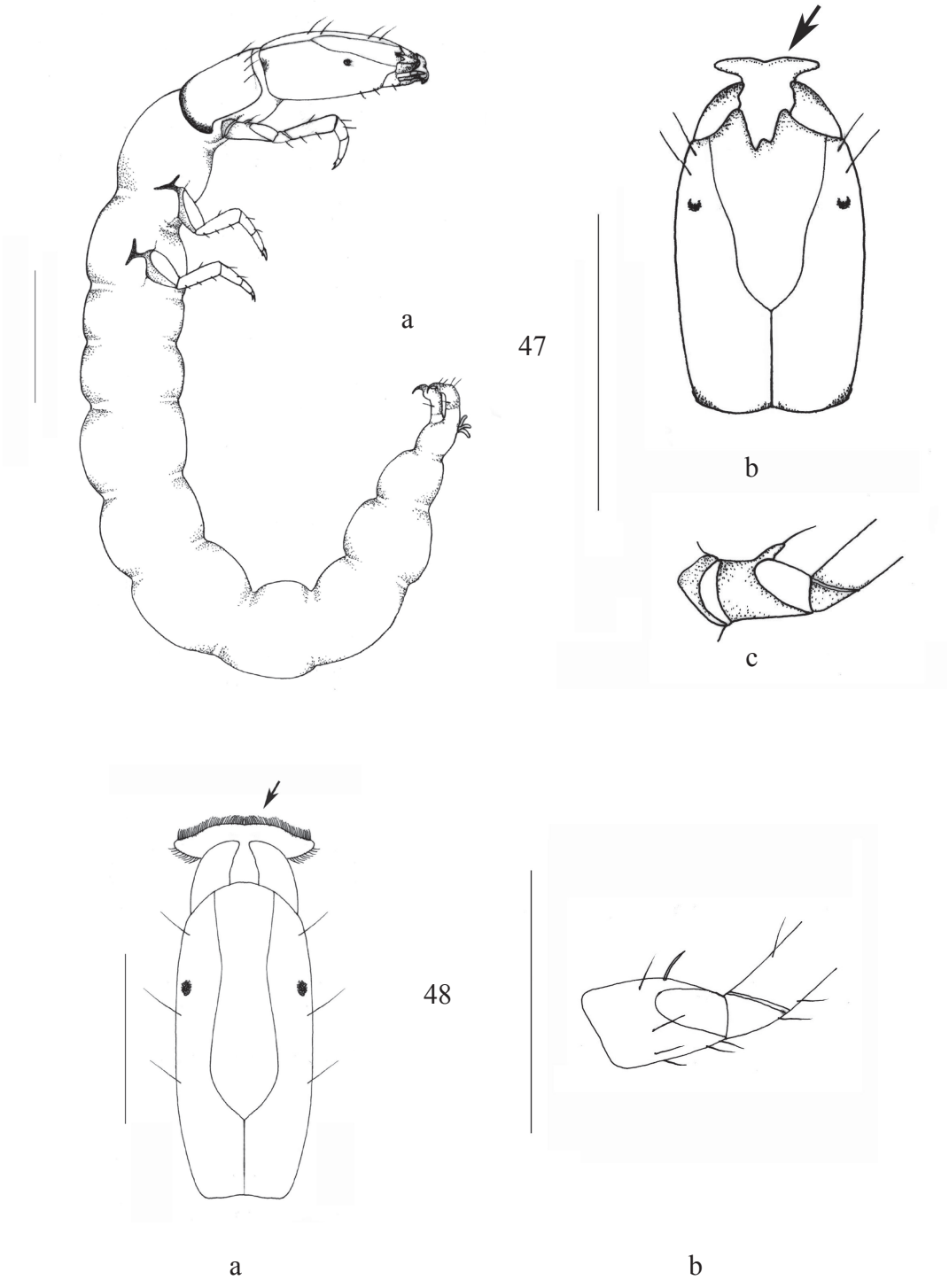


Fig. 47-48 47. Lateral view (a) and dorsal view of head (b) and foreleg (c) of *Chimarra* sp. larva (Philopotamidae); 48. Dorsal view of head (a) and foreleg (b) of *Wormaldia* sp. larva (Philopotamidae).
Scale: (47a) 1 mm; (47b-c,48a-b) 0.5 mm.

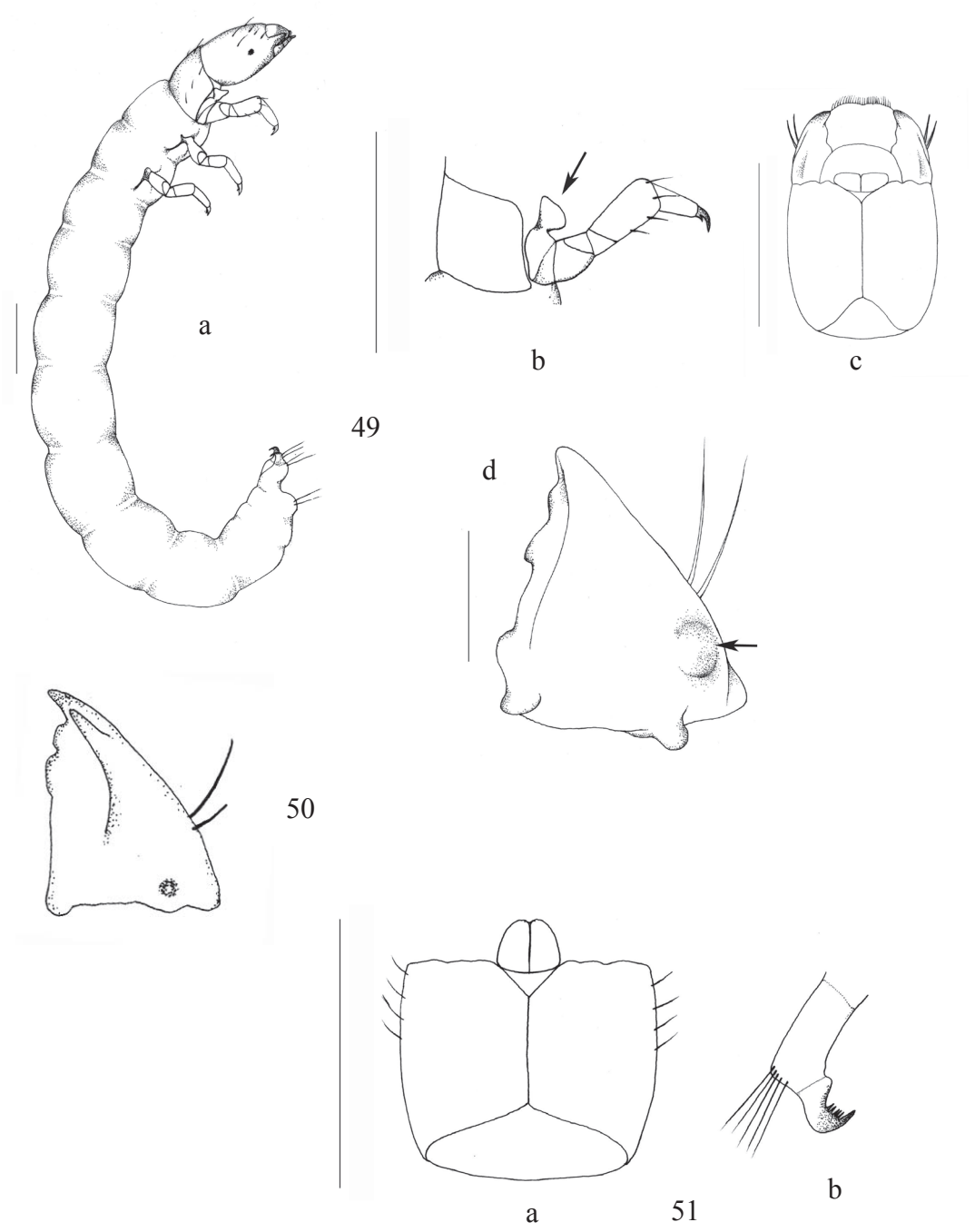


Fig. 49-51 49. Lateral view (a), foreleg (b), ventral view of head (c) and dorsal view of right mandible (d) of *Tinodes* sp. larva (Psychomyiidae); 50. Dorsal view of right mandible of *Lype* sp. larva (Psychomyiidae) (redrawn from Wiggins, 1996, fig. 10.1c); 51. Ventral view of head (a) and anal hook (b) of *Psychomyia* sp. larva (Psychomyiidae).
Scale: (49a-b) 1 mm; (49c-d,51a-b) 0.5 mm.

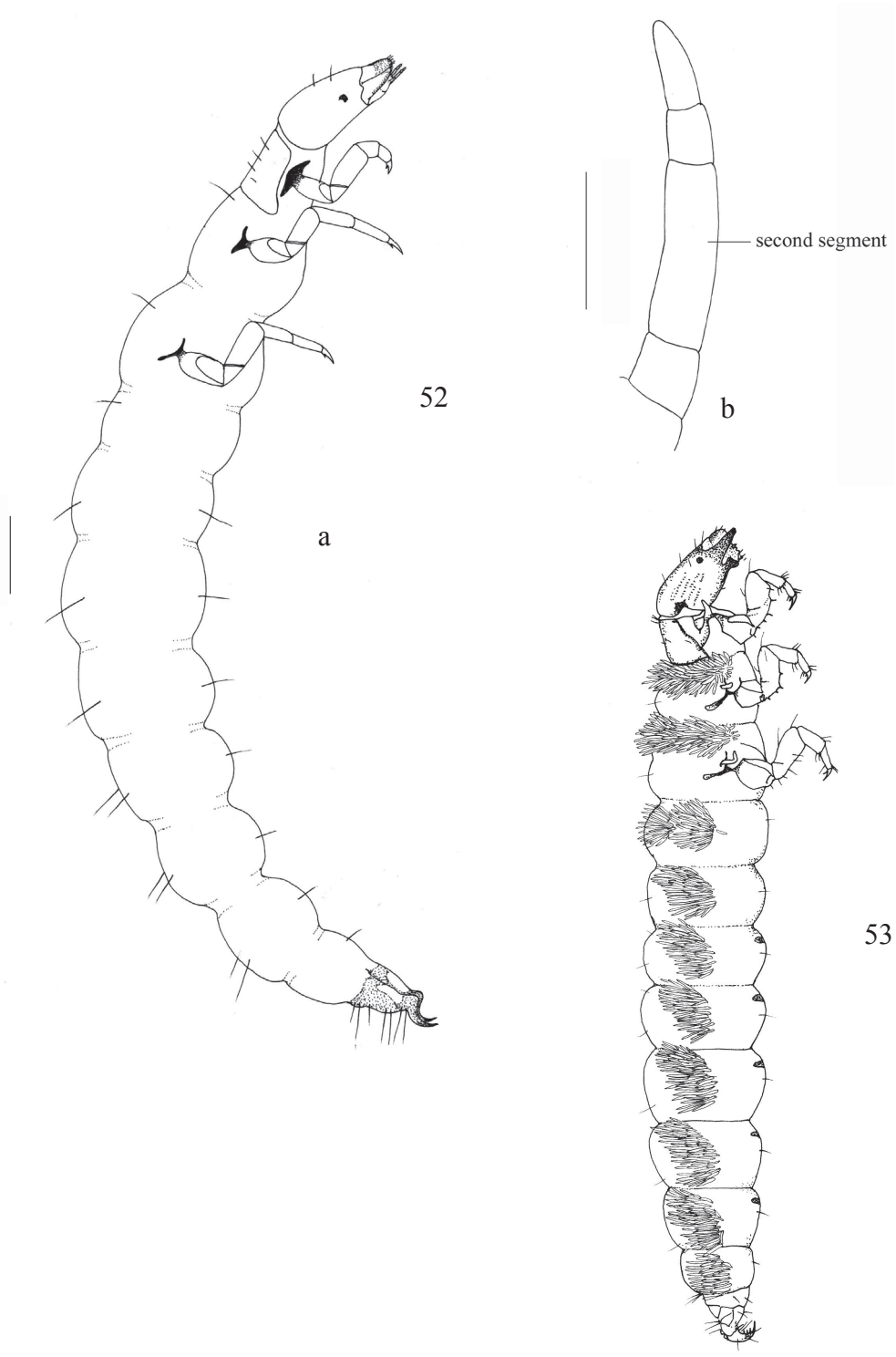


Fig. 52-53 52. Lateral view (a) and maxillary palp (b) of *Rhyacophila* sp. larva (Rhyacophylidae); 53. Lateral view of *Himalopsyche* sp. larva (Rhyacophylidae) (redrawn from Wiggins, 1996, fig. 4.1A). Scale: (52a) 1 mm; (52b) 0.5 mm.