Chapter 19 Order Hemiptera

The Hemiptera, or true bugs, comprise two suborders, the Heteroptera and the Homoptera. All aquatic and semiaquatic bugs belong to the suborder Heteroptera which has three aquatic infraorders: Nepomorpha, Gerromorpha and Leptopodomorpha. They are widespread and occur in both freshwater and marine habitats.

Gerromorpha have the ability to move on the water's surface using unwettable hydrofuge pile on the tarsi, and sometimes on the tibia. When gerrid and veliid bugs retract the wettable claws, the unwettable hydrofuge pile allows them to glide over the water. Other Gerromorpha walk on the surface with a tripodal locomotion which involves alternating movements of opposite legs. Unlike Gerromorpha, Nepomorpha can swim in the water. Various water bugs have different air-store replenishment methods depending on the family, and naucorid bugs even have plastron respiration. Leptopodomorpha are semiaquatic bugs that live on the shore of water bodies.

Nymphs of Heteroptera resemble the adults but differ in body proportions, number of tarsal segments and the lack of wings. Wing pads occur in the last two instars. In Gerromorpha, nymphs have 1-segmented tarsi but adults have 1-3 segments. Gerridae, Helotrephidae, Hydrometridae, Naucoridae and Veliidae have polymorphism in wing development. Adults may have fully-developed wings (macropterous), short wings (brachypterous) or lack wings (apterous).

Aquatic and semiaquatic bugs include approximately 4,000 known species globally (Dudgeon, 1999). In the Indochina region there are about 43 genera of Gerromorpha and 21 genera of Nepomorpha. Publications on the aquatic and semiaquatic bugs of Indochina and Southeast Asian regions include: Lansbury (1968), Cheng & Fernando (1969), Bishop (1973), Polhemus & Polhemus (1988), Sites *et al.* (1997), Nieser (1998), Zettel (1998, 1999a and b), Sites and Polhemus (2000). The following keys are modified from Fernando & Cheng (1963), Cheng & Fernando (1969), Chen & Zettel (1996, 1998), Nieser (1996, 1998, 1999), Zettel & Chen (1996), Hecher (1998), Nieser & Polhemus (1998), Zettel (1998, 1999a and b), and Dudgeon (1999). They are based on adults but Nieser (1996) has stated that, except for size and wings, most characters are valid for nymphs too.

Key to Infraorders and Families of Adult Aquatic and Semiaquatic Heteroptera of Indochina

1 Antennae shorter than the head, inserted beneath the eyes and not visible from above ..... infraorder Nepomorpha…2

1′ Antennae longer than the head, inserted in front of the eyes and visible from above 12

2(1) Ocelli present (Fig. 1,2) 3

2′ Ocelli absent 4

3(2) Tarsal formula 2-2-3; fore legs not conspicuously raptorial, fore femora not thickened (Fig. 1); rostrum very long and slender, reaching the hind coxae..... .....Ochteridae, *Ochterus*

3′ Tarsal formula 2-2-2; fore legs raptorial, fore femora strongly thickened (Fig. 2); rostrum short and stout, not reaching beyond the posterior margin of the prosternum ..... Gelastocoridae, *Nerthra*

4(2′) Rostrum short and broadly triangular, non segmented (Fig. 45b) 5

4′ Rostrum distinctly segmented and more or less parallel-sided 6

5(4) Scutellum exposed, rostrum without transverse grooves (Fig. 45a), small species, length less than 3 mm ..... Micronectidae (p. 154)

5′ Scutellum entirely or nearly entirely covered by pronotum (Fig. 3), length 3 mm or more .....Corixidae, *Sigara (Tropocorixa)*

6(4′) Long and non-retractable posterior respiratory appendages present (Fig. 51-53)..... .....Nepidae (p. 154)

6′ Posterior respiratory appendages very short (Fig. 10,11)..... 7

7(6′) Respiratory appendages cylindrical, strip-like and retractable (Fig. 10, 11); membranes with distinct veins (Fig. 10) .....Belostomatidae (p. 150)

7′ Respiratory appendages absent; membranes without veins 8

8(7′) Fore legs raptorial; dorsoventrally flattened; head and prothorax not fused 9

8′ Fore legs not raptorial; dorsum usually convex or elongated..... 10

9(8) Head usually longer than wide; rostrum long and slender, extending to hind coxae; fore femora slender (Fig. 7a) ..... Aphelocheiridae, (p. 149) *Aphelocheirus*

9′ Head much wider than long; rostrum short and stout, not extending beyond fore coxae; fore femora broad (Fig. 46) ..... Naucoridae (p. 154)

10(8′) Head and pronotum fused (Fig. 38a, 39); antennae with 1 or 2 segments ....Helotrephidae (p. 153)

10′ Head and pronotum separate (Fig. 4a); antennae with 3 or 4 segments..... 11

11(10′) Body ovoid, small insects, length about 2.5 mm or Less, 4a), hind tarsus with 2 well-developed claws (Fig. 4b) .....Pleidae, *Paraplea*

11′ Body elongate (Fig. 55a), usually over 3 mm long, claws of hind tarsus inconspicuous .....Notonectidae (p. 155)

12(1′) Macropterous, brachypterous or apterous forms; hind coxae small; coxal cavities socket-like..... INFRAORDER GERROMORPHA...13
12′ Macropterous; hind coxae large; coxal cavities broad .... INFRAORDER LEPTOPODOMORPHA...17

13(12) Head as long as or longer than thorax, eyes situated halfway along the head (Fig. 5) ..... HYDROMETRIDAE, *Hydrometra*
13′ Head not distinctly prolonged; eyes situated at base of head (Fig. 6a, 33a, 36a)... 14

14(13′) Metanotal elevation distinctly exposed, forming a large plate (Fig. 33a), claws inserted apically (Fig. 33a,34a) 15
14′ Metanotal elevation not present, claws not inserted apically 16

15(14) Tarsi two-segmented (Fig. 32b), ventral surface of head with bucculae covering the base of rostrum (Fig. 33b) ..... HEBRIDAE (p. 153)
15′ Tarsi three-segmented (Fig. 6b), bucculae absent (Fig. 6c)..... .....MESOVELIIDAE, *Mesovelia*

16(14′) Head medio-dorsally with a distinct impressed line (Fig. 65a), hind femora not longer than the abdomen; spacing between front and middle legs and between middle and hind legs is proximately equal length (Fig. 63a, 64a)..... .....VELIIDAE (p. 156)
16′ Head medio-dorsally without an impressed line (Fig. 18c), hind femora much longer than the abdomen; spacing between front and middle legs is much greater than that between middle and hind legs (Fig. 12a, 13a, 16a, 18a) .... GERRIDAE (p. 150)

17(12′) Antennae never extend beyond the body; rostrum long, tapering, reaching base of hind coxae or beyond..... SALDIIDAE (p. 155)
17′ Antennae longer than body; rostrum reaches to apex of fore coxae ....LEPTOPODIDAE (p. 154)

FAMILY APHELOCHEIRIDAE—KEY TO SPECIES OF APHELOCHEIRUS

1 Female with subgenital plate truncate (Fig. 7b); male with tab projecting from posterior margin of abdominal sternite V (Fig. 7c), not raised .... *Aphelocheirus grik*
1′ Female with subgenital plate triangular (Fig. 8,9); male with or without weakly developed tab on abdominal sternite V, if tab is present it is raised..... 2

2(1′) Trochanter and base of femora in male with well-defined brown patch; peg-like setae on subgenital plate absent (Fig. 8) ..... *Aphelocheirus femoratus*

2′ Trochanter and base of femora in male without brown patch; 4-6 peg-like setae present near apex of subgenital plate (Fig. 9) ..... *Aphelocheirus malayanus*

Family Belostomatidae—Key to Genera of Belostomatidae

1 Hind tibia and tarsus strongly compressed, thin, much broader than the middle (Fig. 10); basal segment of rostrum about half the length of the second segment; body length over 5 cm ..... *Lethocerus*

1′ Tibia and tarsus of middle and hind leg similar (Fig. 11); basal segment of rostrum longer than half of the second segment; body length less than 2 cm .... *Diplonychus*

Family Gerridae—Key to Genera of Gerridae

1 First abdominal sternite visible; tip of abdomen produced to a rod-like point (Fig. 12a,12c) ..... *Rhagadotarsus*

1′ First abdominal sternite not visible; tip of abdomen not produced to a rod-like point 2

2(1′) Middle femur shorter than middle tibia (Fig. 13) and usually shorter (except in *Cryptobates*) than hind femur 3

2′ Middle femur longer than middle tibia and subequal or longer than hind femur (Fig. 16a,18a,21) 5

3(2′) Third antennal segment much longer than the second 4

3′ Third antennal segment as long as or shorter than the second and distinctly shorter than the first (Fig. 13) ..... *Naboandelus*

4(3) Head predominantly yellowish (Fig. 14); third antennal segment approximately twice as long as the second; fore femur of male straight..... *Cryptobates*

4′ Head predominantly blackish with yellow median stripe (Fig. 15); third antennal segment three times as long as the second; fore femur of male curved ..... *Gnomobates*

5(2′) Body elongate, rarely stout (Fig. 16a, 18a, 21, 22, 25); metasternum well developed, clearly extending to the metacetabula laterally 6

5′ Body usually short, ovate or triangular (Fig. 29a, 30a, 31a); metasternum reduced.. 21

6(5) Metacetabular groove dorsally extending to anterior end of abdominal tergite I (Fig. 20a); fore tarsus at least 0.5 times as long as fore tibia (Fig. 16a,18a)..... 7

6′ Metacetabular groove not extending to anterior end of abdominal tergite I (Fig. 20b-c); fore tarsus less than 0.5 times as long as fore tibia (Fig. 21) 11

7(6) Large species, body length more than 15 mm; hind coxae with a small apical spine (Fig. 16b); hind femur much longer than mid femur; mid tibia of male with long fringe hairs (Fig. 16a) ..... *Ptilomera*

7′ Small species, body length less than 10 mm; hind coxae without spine; hind femur subequal or shorter than middle femur; mid tibia without fringe of long hairs..... 8

8(7′) Dorsal appearance predominantly yellowish; antennal segment I shorter than next 3 segments combined (Fig. 17b); in dorsal view head anteriorly more rounded (Fig. 17a); male distinctly smaller than female ..... *Rheumatogonus*

8′ Dorsal appearance predominantly blackish; antennal segment I distinctly longer or subequal to next 3 segments combined (Fig. 18a); in dorsal view head anteriorly with distinct corners at base of antennae (Fig. 18c); male slightly smaller than female 9

9(8′) Mesonotum with a yellow median line (Fig. 18a); fore femora ventrally with thin, hair-like bristles ..... *Rhyacobates*

9′ Mesonotum medianly black; fore femora ventrally with thick bristles..... 10

10(9′) Abdominal tergites I and II completely fused; female with hind coxae at least 3.5 times as long as wide; abdomen segment VI without processes ..... *Andersenius*

10′ Abdominal tergites I and II separated (Fig. 19a); female with hind coxae slight longer than wide; abdomen segment VI with long spinous processes (Fig. 19b) ..... *Pleciobates*

11(6′) Metacetabular groove distinct and extending to hind margin of the mesonotum (Fig. 20c); antennal segment IV short and curved; rostrum short, not extending beyond the posterior margin of prosternum; second fore tarsal segment more than twice as long as the first (Fig. 21); body very slender and cylindrical (Fig. 21) ..... *Cylindrostethus*

11′ Metacetabular groove dorsally indistinct (Fig. 20b); antennal segment IV straight; rostrum longer, always extending beyond the posterior margin of prosternum; second fore tarsal segment less than twice as long as the first; body of different shape usually stouter and not cylindrical..... 12

12(11′) Meso- and metacetabula with distinct patches of dense, silvery reflecting hairs; pronotum of apterous morph short, without pronotal lobe (Fig. 20c) 13

12′ Meso- and metacetabula with uniform hair layer; pronotum of apterous morph usually long, with well developed pronotal lobe (Fig. 20b)..... 15

13 (12) Hind leg shorter than mid leg (Fig. 22) ..... *Amemboa*
13′ Hind leg as long as mid leg 14

14(13′) Claws inserted at apex of tarsus; hind femur shorter than length of hind tibia and hind tarsus combined ..... *Eotrechus*
14′ Claws inserted before apex of tarsus (Fig. 23); hind femur longer than hind tibia and hind tarsus together ..... *Onychotrechus*

15(12′) Body large, length 30 mm and more ..... *Gigantometra*
15′ Body smaller, length up to 20 mm 16

16(15′) Pronotal lobe yellowish (Fig. 24); antenna as long as or longer than body (Fig. 25a) 17
16′ Pronotal lobe blackish (Fig. 27, 28); antenna shorter than body 18

17(16) Abdominal segment VI without spines; abdomen relatively short (Fig. 24) ..... *Tenagogonus*
17′ Abdominal segment VI with long distinct spines (Fig. 25b); abdomen slender elongate (Fig. 25a) ..... *Limnometra*

18(16′) Dorsal surface of head with black colour only 19
18′ Dorsal surface of head with longitudinal or transverse yellowish on black colour 20

19(18) Antennal segment I longer than segments II and III together; body length 11 mm or more ..... *Aquarius*
19′ Antennal segment I shorter than segments II and III together (Fig. 26); body length 9 mm or less ..... *Gerris*

20(18′) Pronotal lobe with a central orange spot (Fig. 27) ..... *Neogerris*
20′ Pronotal lobe with a yellow midline,or a pair of yellow spots, or both (Fig. 28) ..... *Limnogonus*

21(5′) Eyes not extending beyond anterolateral angles of mesonotum (Fig. 29b) ..... *Metrocoris*
21′ Eyes extending beyond anterolateral angles of mesonotum (Fig. 31b) 22

22(21′) Anterior portion of thorax as wide as metanotum: antennal segment III of male enlarged and with a fringe of stiff hairs along margin (Fig. 30b) ..... *Esakia*
22′ Anterior portion of thorax distinctly narrowed (Fig. 31a); antennal segment III of male not modified (Fig. 31c) ..... *Ventidius*

Family Hebridae—Key to Genera of Hebridae

1 Head short and broad; slender femora (Fig. 34a, 36a) 3
1′ Head long, narrow and pointed (Fig. 33a); stout femora (Fig. 33b)..... 2

2(1′) Antennal segment I shorter than segments II and IV (Fig. 32a); head below eyes without conspicious long bristles, only with some relatively short hairs; legs slender (Fig. 32b)..... *Nieserius*
2′ Antennal segment I longer than segments II and subequal to segment IV (Fig. 33b); head below eyes with a tuft of conspicious long bristles; legs stout ..... *Hyrcanus*

3(1) Antennae 5-segmented (Fig. 35a, 36b), last segment divided by a desclerotized zone..... 4
3′ Antennae 4-segmented (Fig. 34), desclerotized zone absent..... *Merragata*

4(3) Paired, longitudinal carinae of thoracic venter converging and meeting before hind margin of metasternum (Fig. 35b) ..... *Timasius*
4′ Paired, longitudinal carinae of thoracic venter parallel throughout and continuing separately onto the base of abdomen (Fig. 36c) ..... *Hebrus*

Family Helotrephidae—Key to Genera of Helotrephidae

1 Tarsal formula 3-3-3 (Fig. 37a-b); body depressed ..... *Fischerotrephes*
1′ Tarsal formula 2-2-3 or 1-1-2, body usually globular 2

2(1′) Tarsal formula 2-2-3 (Fig. 38b); hemelytron with pseudendocorium (Fig. 38a)..... ..... *Trephotomas*
2′ Tarsal formula 1-1-2; hemelytron without pseudendocorium 3

3(2′) Cephalonotum dull, with densely punctuate; postero-lateral margin of cephalonotum continued under the eye 4
3′ Cephalonotum shining; postero-lateral margin of cephalonotum not continued under the eye..... 5

4(3) Abdominal sternite IV (or IV and V) with median keel ..... *Helotrephes*
4′ Abdominal sternite IV and V without median keel ..... *Hydrotrephes*

5(3′) Eyes divided into dorsal and ventral part (Fig. 39a); female subgenital plate with asymmetrical middle lobe (Fig. 39b)..... *Distotrephes*
5′ Eyes indented (Fig. 41a); female subgenital plate with one or two incisions (Fig. 40b) 6

6(5′) Lateral margin of cephalonotum not extending onto eye surface, only indistinctly indenting the eye at posterior margin (Fig. 40a)..... *Tiphotrephes*
6′ Lateral margin of cephalonotum clearly extending onto eye surface, deeply indenting the eye (Fig. 41a)..... 7

7(6′) Female subgenital plate asymmetrical (Fig. 41b) or with less deep dextrocaudal incision and usually with distinct dextrocaudal break..... *Idiotrephes*
7′ Female subgenital plate subsymmetrical, simple, without incision or break ..... *Limnotrephes*

Family Leptopodidae—Key to Genera of Leptopodidae

1 Eyes dorsally chitinous, opaque and nonfunctional (Fig. 42) .....*Leotichius*
1′ Eyes dorsally normal, set with ommatidia, unctional..... 2

2(1′) Head, pronotum, and hemelytral margins spinose (Fig. 43)..... .....*Patapius* (*Pseudopatapius)*
2′ Head, pronotum, and hemelytral margins non-spinose (Fig. 44) ..... *Valleriola*

Family Micronectidae—Key to Genera of Micronectidae

1 Vertex with an impression; fore tibia and tarsus of male fused.....*Synaptonecta*
1′ Vertex convex (rarely flattened); fore tibia and tarsus of male separated (Fig. 45a). .....*Micronecta*

Family Naucoridae Key to Genera of Naucoridae

1 Front leg with one-segmented tarsus and a single claw (Fig. 46) .....*Naucoris*
1′ Front leg with two-segmented tarsus and two claw (Fig. 47a)..... 2

2(1′) Venter of metatibia with subapical spines arranged in two or more parallel rows (Fig. 47b).....*Heleocoris*
2′ Venter of metatibia not as above..... *Ctenipocoris* or *Laccocoris*

Family Nepidae—Key to Genera of Nepidae

1 Body dorso-ventrally flattened; parasternites visible (Fig. 48a)..... Nepinae…..2
1′ Body more or less cylindrical; parasternites concealed by the ventral laterotergites (Fig. 49a-b) ..... Ranatrinae……4

2(1) Venter of pronotum with spiracular apertures (Fig. 50); siphon as long as half the length of the inner margin of hemelytra .....*Telmatotrephes*
2′ Ventral spiracular apertures on pronotum vestigial or absent, siphon more than two thirds the length of inner margin of hemelytra 3

3(2′) Membrane of hemelytra and corium different; siphon longer than inner margin of hemelytra (Fig. 51) ..... *Laccotrephes*
3′ Membrane of hemelytra not different from corium, siphon shorter than inner margin of hemelytra..... *Borborophyes*

4(1′) Siphon short and rigid; fore femora shorter than pronotum (Fig. 52) .... *Cercotmetus*
4′ Siphon long and flexible; fore femora as long as or longer than pronotum (Fig. 53) ..... *Ranatra*

Family Notonectidae—Key to Genera of Notonectidae

1 With a seta-lined pit at anterior end of hemelytral commissure (Fig. 55a) 2
1′ Without a seta-lined pit at anterior end of hemelytral commissure..... 4

2(1) Hind coxal plate covered with long black setae (Fig. 54) ..... *Paranisops*
2′ Hind coxal plate not covered with long black setae (Fig. 55b) 3

3(2) Antennae three-segmented; rostrum of male with a prominent lateral prong (Fig. 55c), fore tibia with stridular pegs packed closely together and situated on a protuberance (Fig. 55d) ..... *Anisops*
3′ Antennae two-segmented; rostrum of male without a prominent lateral prong, fore tibia without stridular pegs packed closely together and situated on a protuberance (Fig. 56) ..... *Walambianisops*

4(1′) Anterolateral margins of prothorax foveate (Fig. 57a,58,59)..... 5
4′ Anterolateral margins of prothorax not foveate..... *Notonecta*

5(4) Middle femora with an ante-apical pointed protuberance (Fig. 57a-b)..... *Enithares*
5′ Middle femora without an ante-apical pointed protuberance..... 6

6(5′) Basal half of eyes meet in the middle (Fig. 58)..... *Nychia*
6′ Eyes widely separated at base (Fig. 59) ..... *Aphelonecta*

Family Saldidae—Key to Genera of Saldidae

1 Hemelytral membrane with five large parallel cells (Fig. 60)..... *Pentacora*
1′ Hemelytral membrane with four large parallel cells 2

2(1′) Anterior margin of pronotum strongly narrowed (Fig. 61a), with a pair of dorsal outgrowths (Fig. 61b)..... *Saldoida*
2′ Anterior margin of pronotum not strongly narrowed, without outgrowths (Fig. 62) ..... *Saldula*, and *Micracanthia*

Family Veliidae—Key to genera of Veliidae

1 Mid-tarsi with three segments (basal segment sometimes very short) 2
1′ Mid-tarsi with two segments 7

2(1) Tarsal formula 2-3-3, basal segment of fore tarsi very short; first segment of mid-tarsi subequal in length to segment I and III together; fore wings divided into proximal coriaceous part with two closed cells and distal membranous part (Fig. 63b); bright orange or reddish coloured ..... *Perittopus*
2′ Tarsal formula 3-3-3, basal segment of fore and hind tarsi sometimes very short; fore wings not as above, with four closed cells (Fig. 66a); blackish or yellowish brown coloured 3

3(2′) Mid-tarsi deeply cleft, with leaf-like claws and plumose swimming fans arising from base of cleft, which are folded up at rest (Fig. 64b) 4
3′ Mid- tarsi not deeply cleft, without plumose swimming fans 6

4(3) Hind tarsi deeply cleft, with swimming fans; pronotum long ..... *Rhagovelia*
4′ Hind tarsi not cleft and without swimming fan; pronotum short (Fig. 64a) 5

5(4) Stridulatory devices present on connexival margin of sternites II and III (Fig. 65b) and on hind femur (Fig. 65c); anterior margin of pronotum laterally with a narrow and deep incision (Fig. 65d) ..... *Chenevelia*
5′ Stridulatory devices absent; anterior margin of pronotum with indistinct or no incision ..... *Tetraripis*

6(3′) Apical part of fore wing with one large, irregular white spot surrounded by 2-4 small spots (Fig. 66a); head distinctly deflected in front of eyes (Fig. 66b); fore tibia with long grasping comb in both male and female ..... *Angilia*
6′ Macropterous morph with apex of pronotum without finger-like projection; head moderately deflected in front of eyes; only fore tibia in male with grasping comb ... . *Angilovelia*

7(1′) Tarsal formula 2-2-2 (basal segment of fore tarsi very short); middle leg obviously longer than hind leg; mid-tarsal length three or more times as long as hind tarsi 8
7′ Tarsal formula 1-2-2; middle leg subequal to hind leg; mid-tarsal length rarely more than twice as long as hind tarsi 9

8(7) Second segment of antenna longer than or subequal to the first (Fig. 67b); hind tarsal segments subequal in length (Fig. 67c); body with yellow markings, but without dense pilosity (Fig. 67a) ..... *Strongylovelia*

8′ Second segment of antenna shorter than the first (Fig. 68a); first hind tarsal segment about half as long as second segment (Fig. 68b); body without yellow markings, but with dense pilosity ..... *Entomovelia*

9(7′) Head posteriorly produced, extending well behind margin of eyes, anterior margin of pronotum notched; elongated and relative slender body 10

9′ Head not produced; anterior margin of pronotum straight or slightly convex (Fig. 69,70); relatively short and stout body 11

10(9) Male fore tibia with grasping comb; femora usually modified on posterior margin . ..... *Neoalardus*

10′ Male fore tibia without grasping comb; femora simple 12

11(9′) Eyes not close to anterior margin of pronotum (Fig. 69)..... *Lathriovelia*

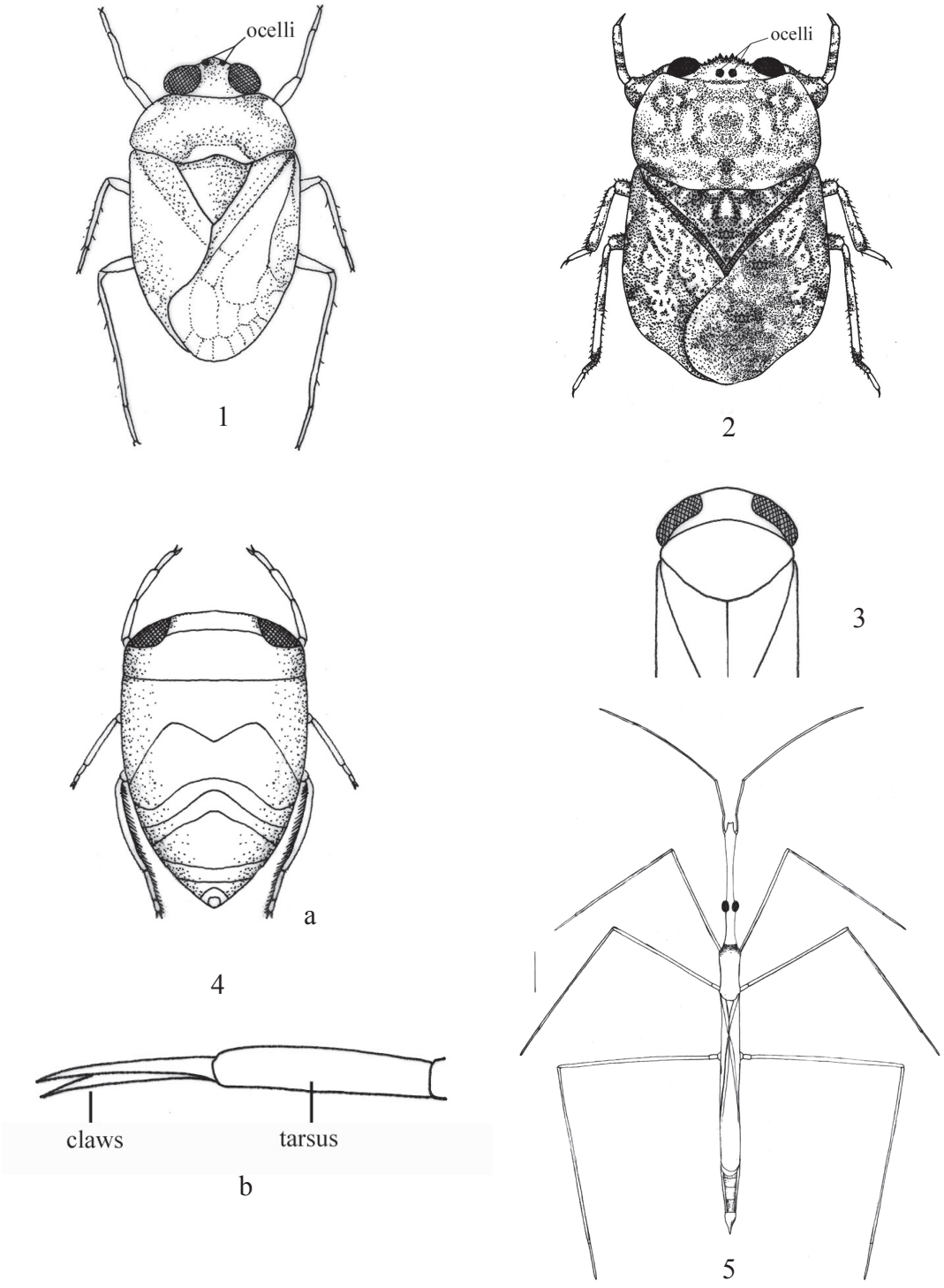
11′ Eyes close to anterior margin of pronotum (Fig. 70)..... *Baptista*

12(10′) Antennal segment I incrassate (Fig. 71b); in macropterous morph apical cells of fore wings reduced (Fig. 71a); in apterous morph pronotal lobe long..... *Pseudovelia*

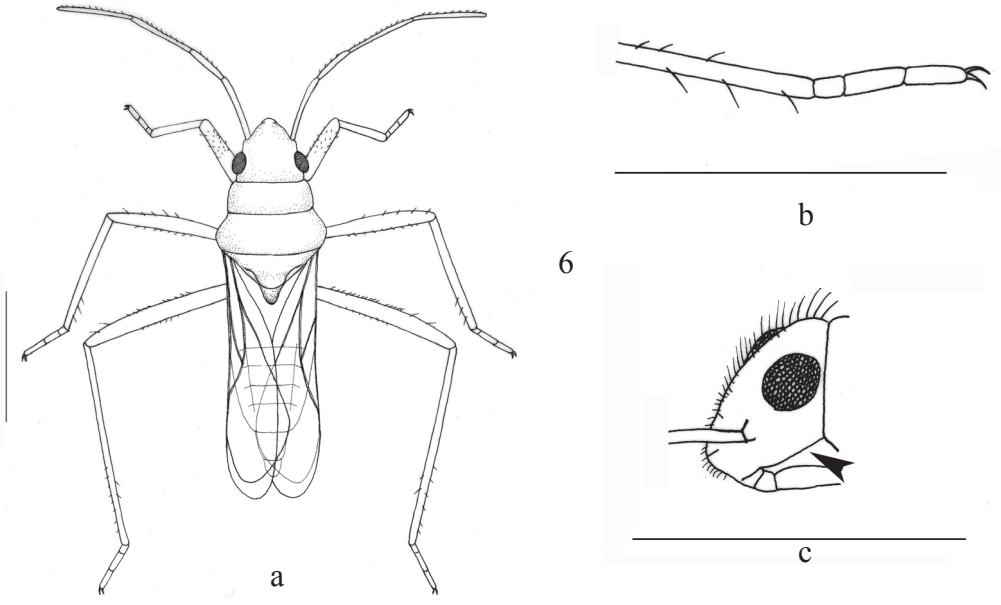
12′ Antennal segment I slender and much shorter; macropterous morph with fore wing venation normal (Fig. 73a) 13

13(12′) .Mid-tarsi with arolium and ventral claws (Fig. 72b); pronotum of apterous morph short (Fig. 72)..... *Xiphovelia*

13′ Mid-tarsi normal (Fig. 73b); pronotum of apterous morph long (Fig. 73a) .... *Microvelia*



Figs. 1-5 1. Dorsal view of *Ochterus* sp. (Ochteridae) (redrawn from Nieser, 1996, fig. 3); 2. Dorsal view of *Nerthra* sp. (Gelastocoridae) (redrawn from Nieser, 1996, fig. 4); 3. Dorsal view of *Sigara* sp. (redrawn from Fernando & Cheng, 1963, fig. 73); 4. Dorsal view (a) and hind tarsus (b) of *Paraplea* sp. (redrawn from Dudgeon, 1999, fig. 4.77A); 5. Dorsal view of *Hydrometra* sp. Scale = 1 mm.



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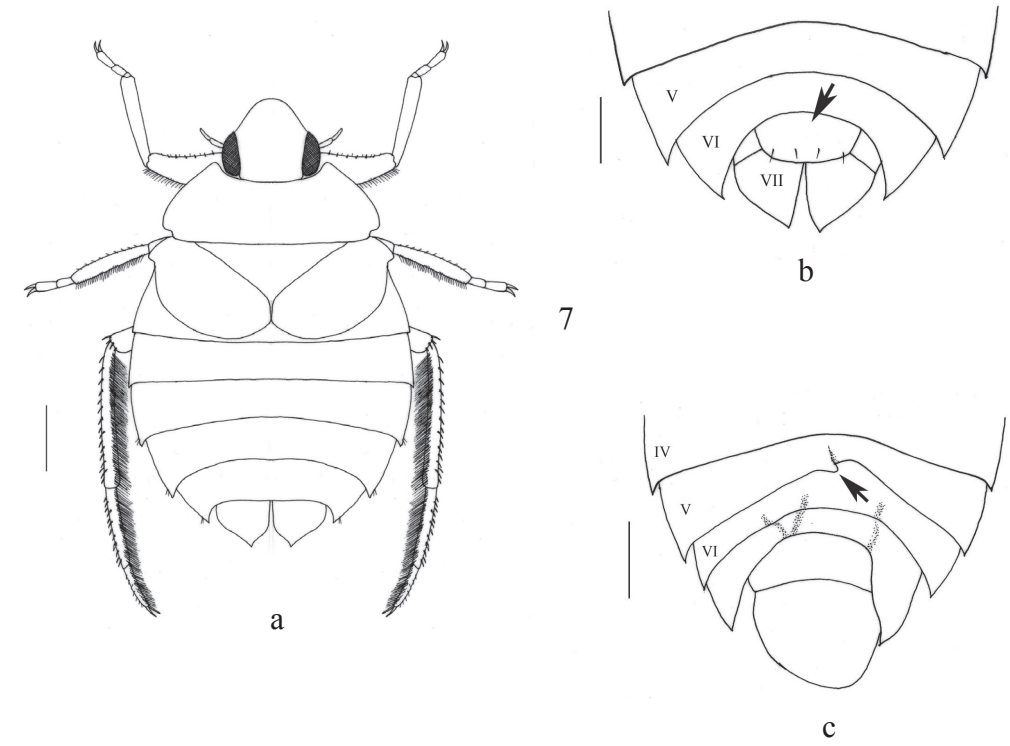

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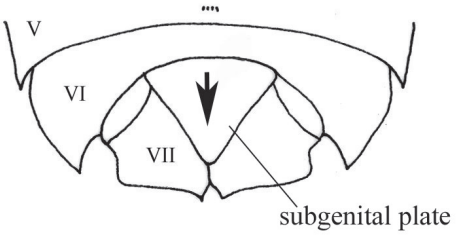
Fig. 6-7 6. Dorsal view of adult (a), hind tarsi (b) and lateral head (c) of *Mesovelia* sp.;
7. Dorsal view of brachypterous female (a), subgenital plate of female (b) and abdominal sternite V of male (c) of *Aphelocheirus grik*.
Scale = 1 mm.



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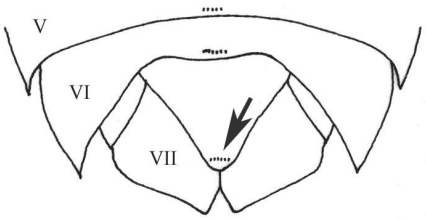

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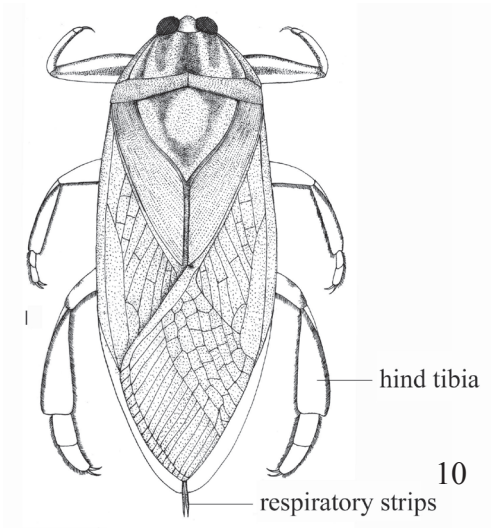

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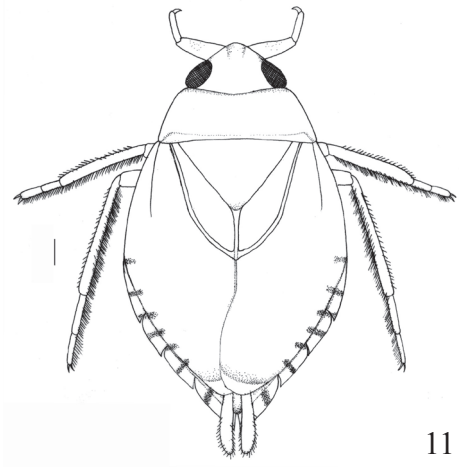

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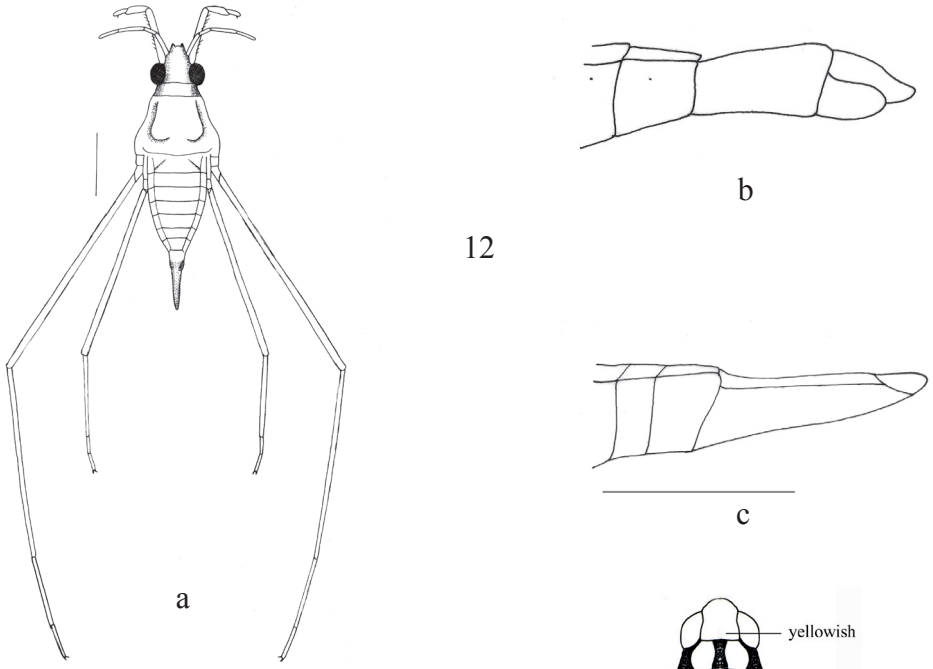
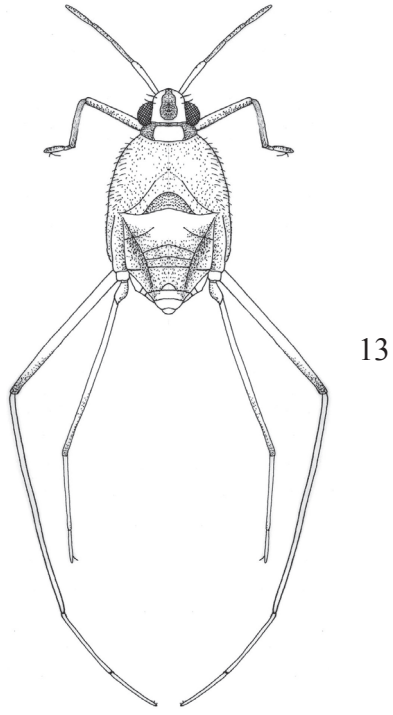
Fig. 8-11 8. Subgenital plate of female of *Aphelocheirus femorantus* (redrawn from Sites *et al*., 1997, fig. 5); 9. Subgenital plate of female of *Aphelocheirus malayanus* (redrawn from Sites *et al*., 1997, fig. 6); 10. Dorsal view of adult of *Lethocerus indicus*; 11. Dorsal view of adult of *Diplonychus rusticus*.
Scale = 1 mm.





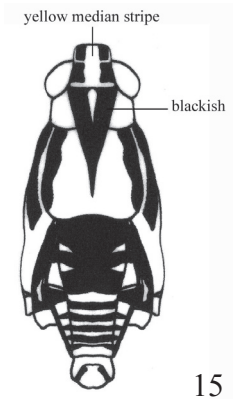
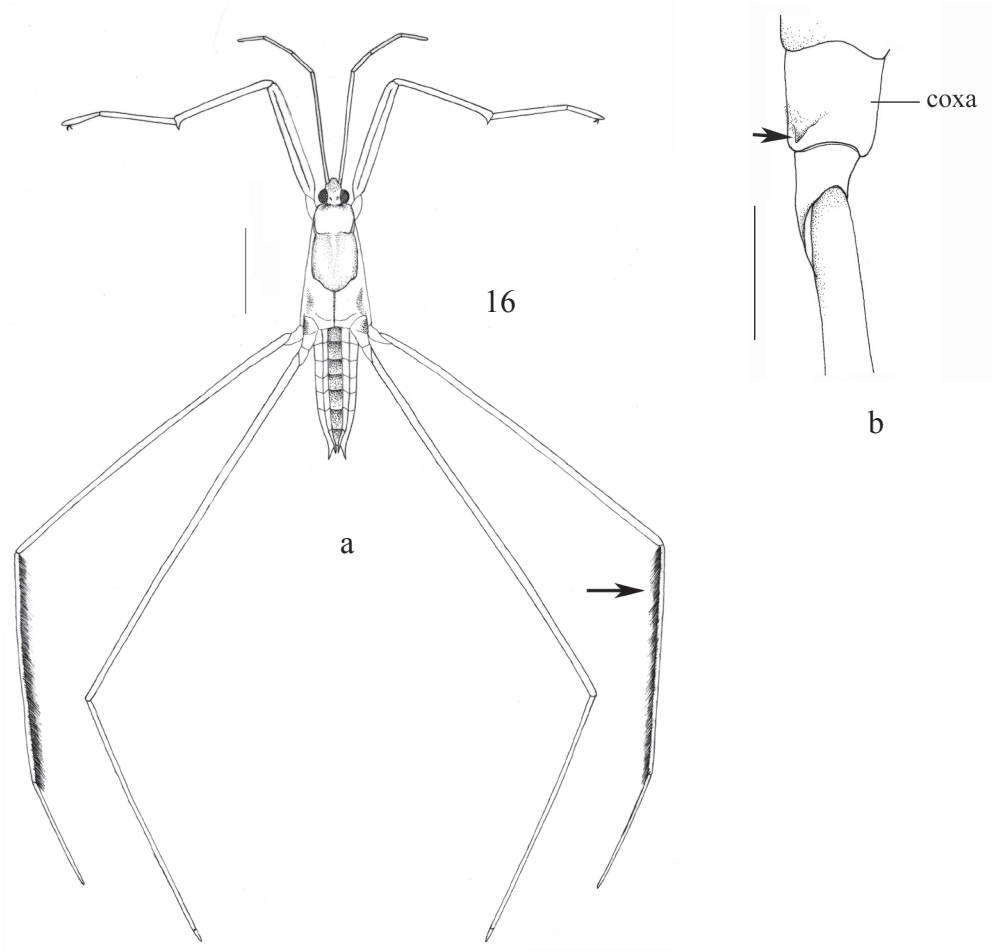


Fig. 12-13 12. Dorsal view of apterous female (a), lateral view of tip of male abdomen (b) and lateral view of tip of female abdomen (c) of *Rhagadotarsus kraepelini* (redrawn from Hecher, 1998, fig. 3); 13. Dorsal view of apterous form of *Naboandelus signatus* (redrawn from Chen & Zettel, 1998, fig. 6,10); 14. Dorsal view of apterous form of *Cryptobates johorensis* (redrawn from Polhemus & Polhemus, 1995, fig. 2); 15. Dorsal view of apterous form of *Gnomobates kuiterti* (redrawn from Polhemus & Polhemus, 1995, fig. 21).
Scale = 1 mm.



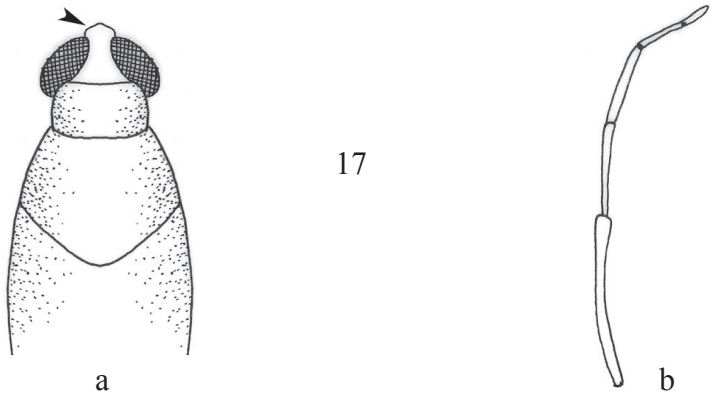


Fig. 16-17 16. Dorsal view of apterous form (a) and ventral view of hind coxa (b) of *Ptilomera tigrina*; 17. Dorsal view (a) and antennae (b) of *Rheumatogonus intermedius* (redrawn from Cheng & Fernando, 1969, fig. 207,196). Scale: (16a) 5 mm; (16b) 1 mm.

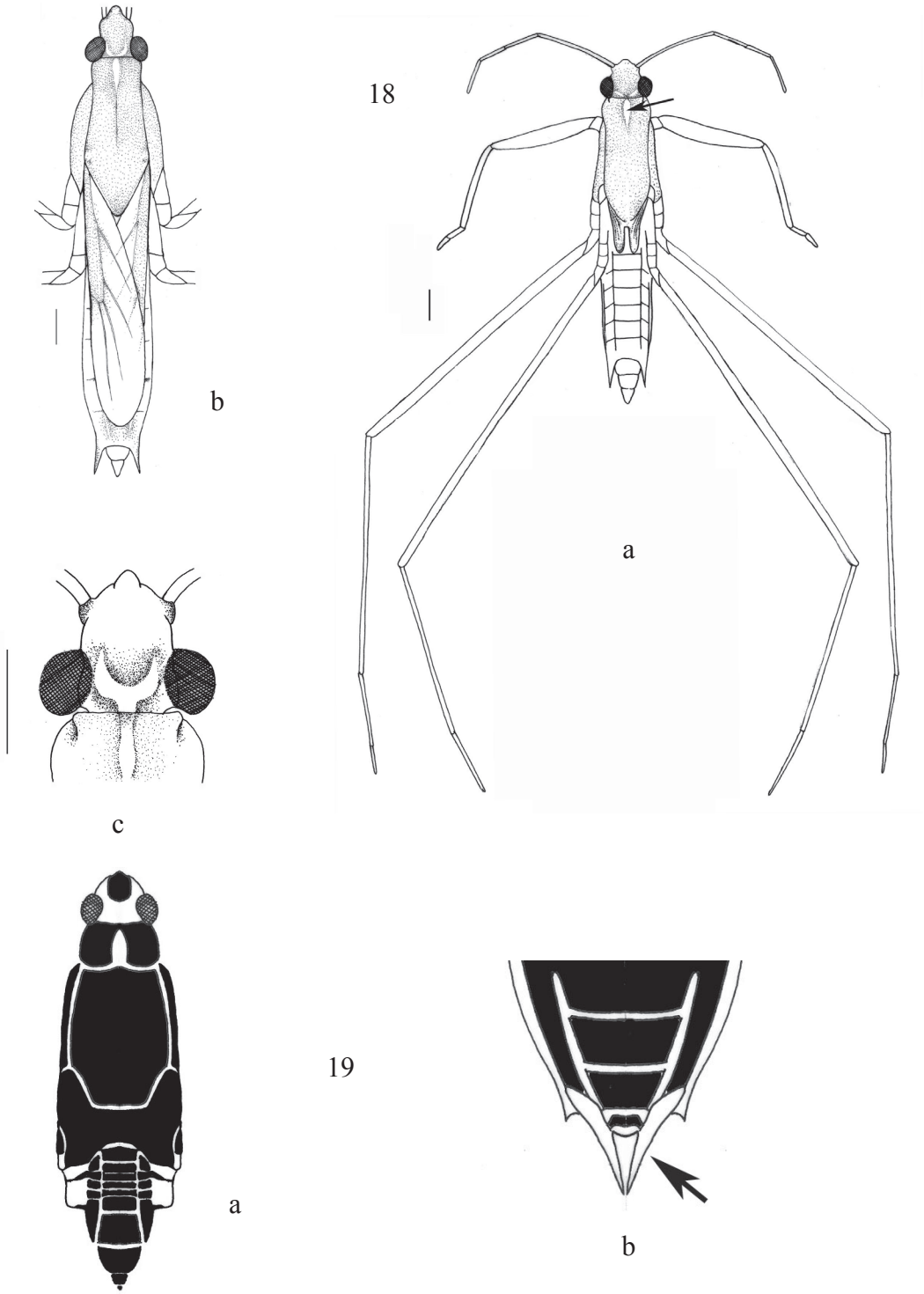


Fig. 18-19 18. Dorsal view of brachypterous (a), macropterous forms (b) and head and pronotum (c) of *Rhyacobates malaisei*; 19. Dorsal view apterous male (a) and dorsal view of apical abdominal segment (b) *Pleciobates* sp. (redrawn from Cheng & Fernando, 1969, fig. 179,193).
Scale = 1 mm.

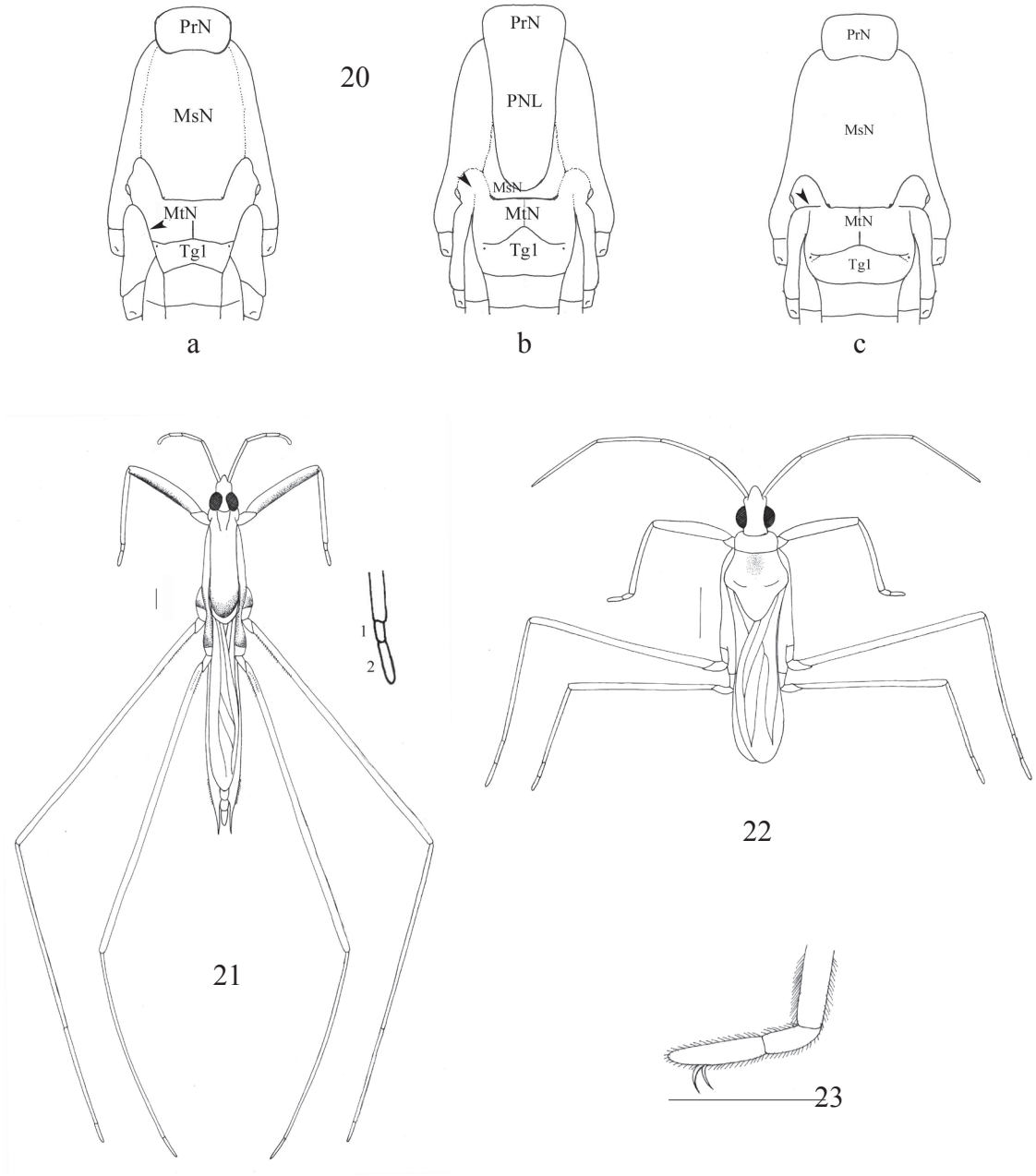


Fig. 20-23 20. Dorsal view of thorax and base of abdomen of Ptilomerinae (a), Gerrinae (b), Cylindrostethinae (c) (arrows pointing at the metacetabular grooves; MsN=mesonotum, MtN=metanotum, PNL=pronotal lobe, PrN=pronotum, Tg1=tergite I) (redrawn from Chen & Zettel, 1998, fig. 7,8,9). 21. Dorsal view of macropterous form of *Cylindrostethus costalis*; 22. Dorsal view of macropterous form of *Amemboa (Amemboides)* sp; 23. Fore tarsus with claw of *Onychotrechus* sp.
Scale = 1 mm.

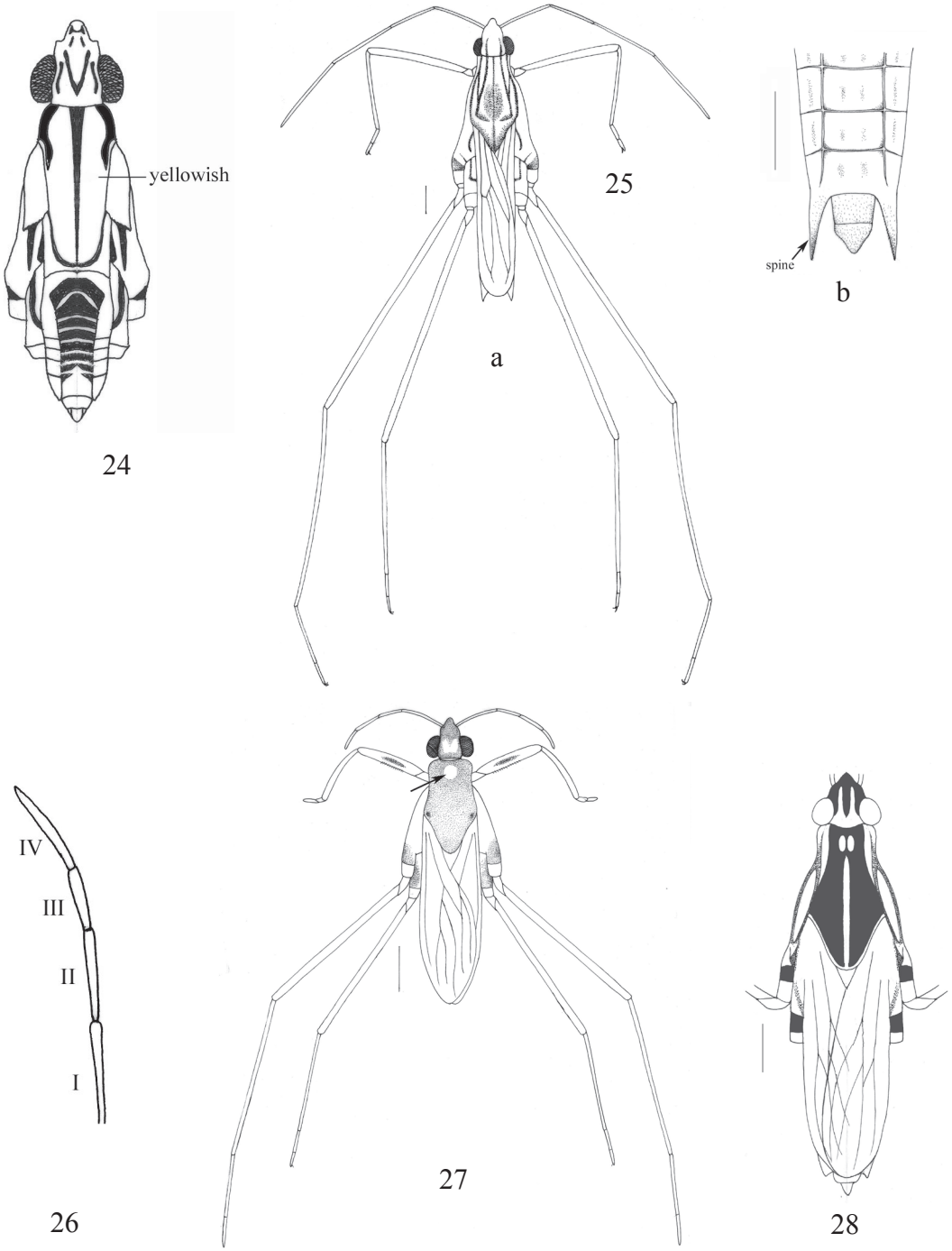


Fig. 24-28 24. Dorsal view of apterous male of *Tenagogonus* sp. (redrawn from Cheng & Fernando, 1969, fig. 34); 25. Dorsal view of macropterous form (a) and posterior end (b) of *Limnometra matsudai;* 26. Antennae (b) of *Gerris* sp. (redrawn from Cheng & Fernando, 1969, fig. 148,153); 27. Dorsal view of macropterous form of *Neogerris parvulus*; 28. Dorsal view of macropterous form of *Limnogonus fossarum* (redrawn from Cheng & Fernando, 1969, fig. 6). Scale = 1 mm.

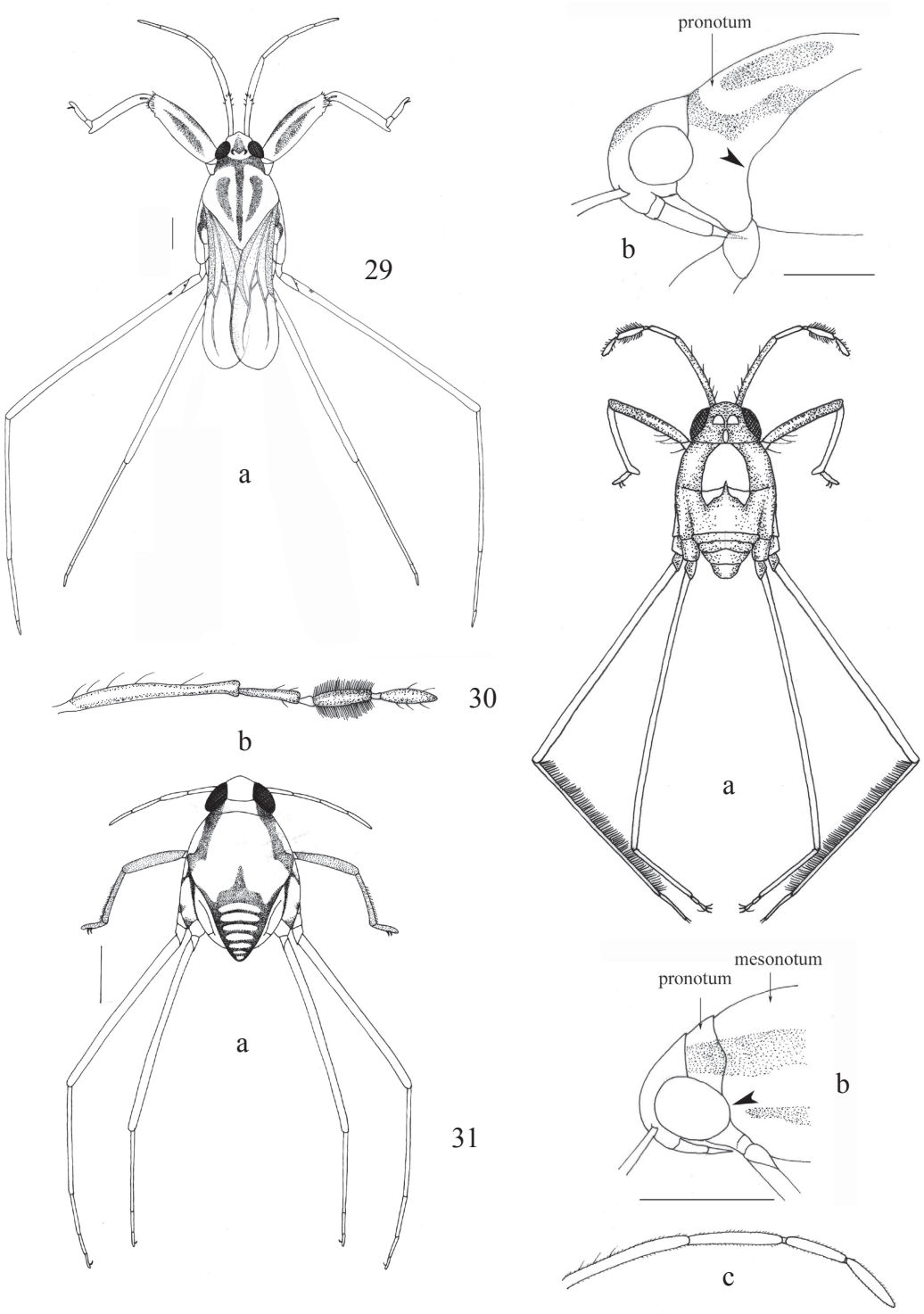


Fig. 29-31 29. Dorsal view of macropterous form (a) and lateral view of head and prothorax (b) of *Metrocoris* sp.; 30. Dorsal view of apterous male (a) and antennae of male (b) of *Esakia* sp. (redrawn from Chen & Zettel, 1998, fig. 25,24) ; 31. Dorsal view of apterous male (a), lateral view of head and prothorax (b), and antennae of male (c) of *Ventidius (Ventidius)* sp. Scale = 1 mm.

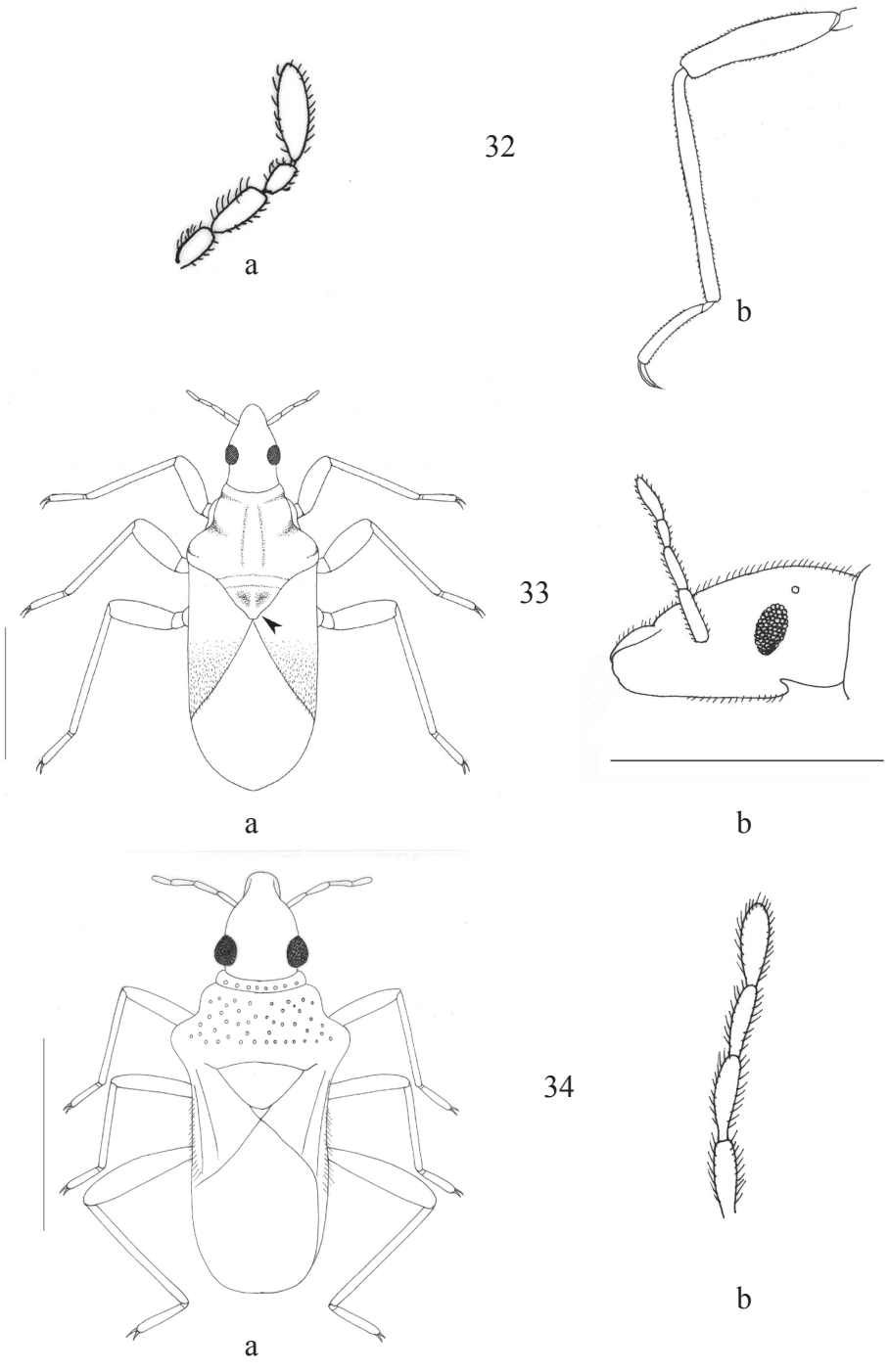


Fig. 32-34 32. Antennae (a) and hind leg (b) of *Nieserius* sp. (redrawn from Zettel, 1999b, fig. 2,6); 33. Dorsal view (a) and lateral view of head (b) of *Hyrcanus* sp. (arrow indicated metanotal elevation); 34. Dorsal view (a) and antennae (b) of *Merragata* sp.
Scale = 1 mm.

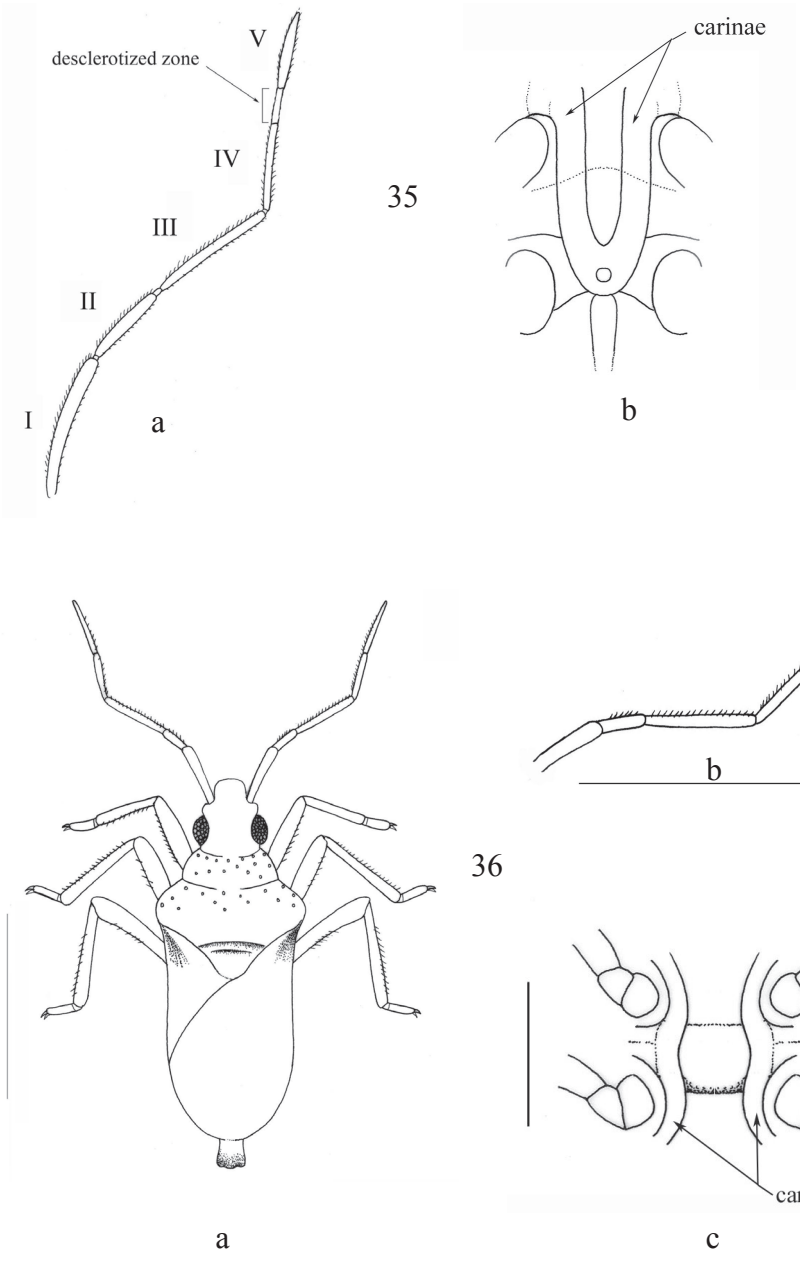


Fig. 35-36 35. Antennae (a) and meso- and metasternum (b) of *Timasius miyamotoi* (redrawn from Zettel, 1999, fig. 5,11); 36. Dorsal view (a), antennae (b) and meso- and metasternum (c) of *Hebrus* sp.
Scale = 1 mm.

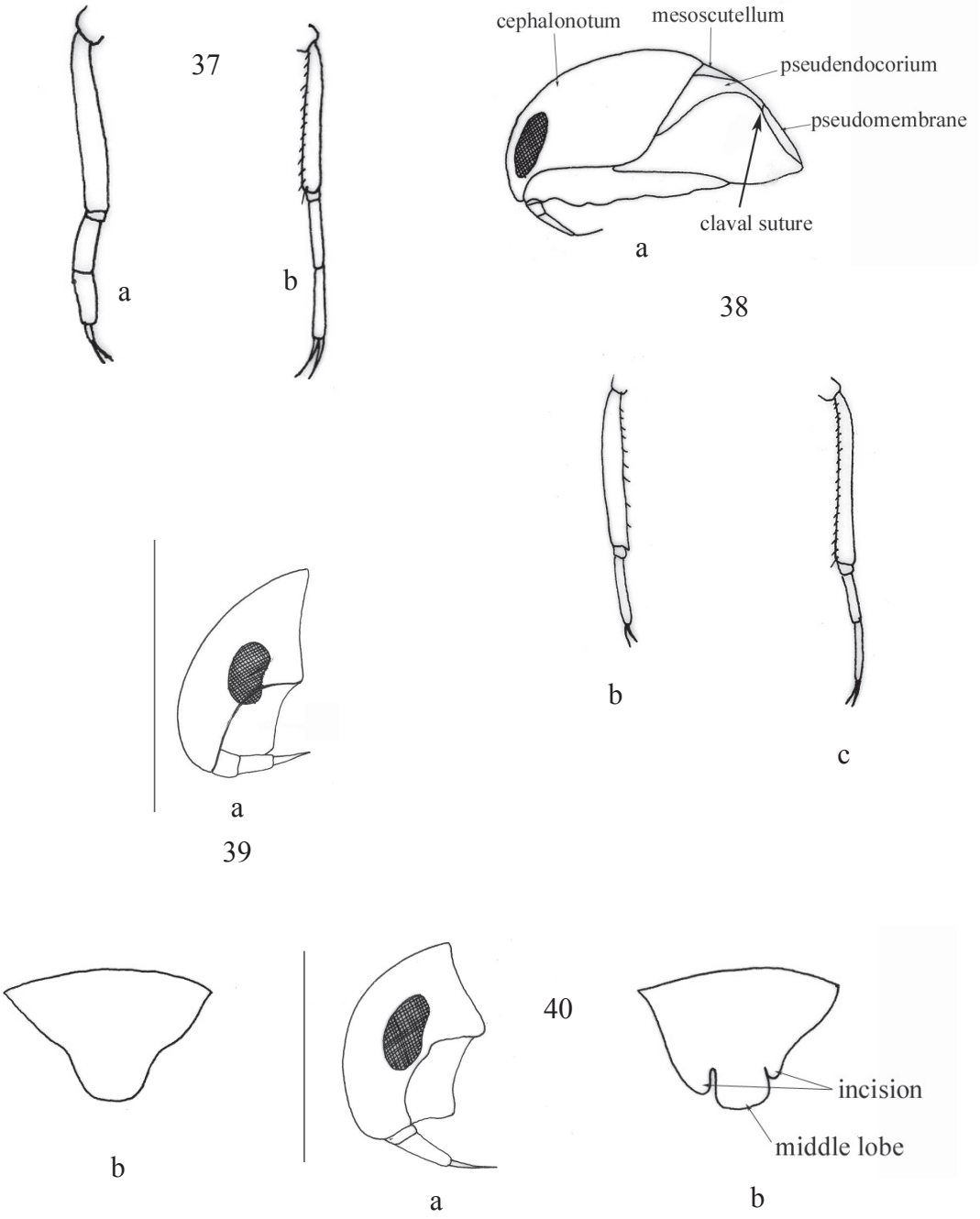
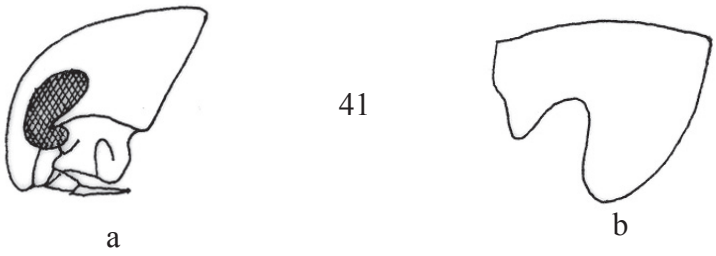
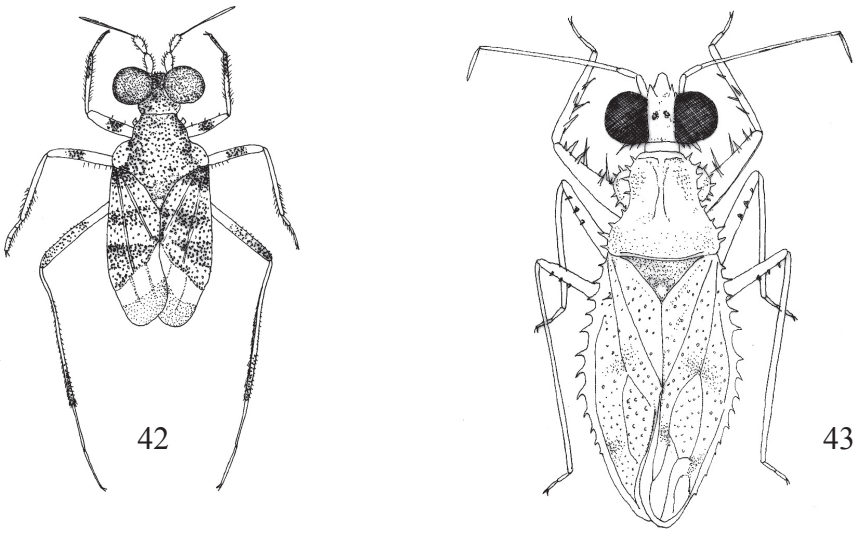


Fig. 37-40 37. Fore tarsi and tibiae (a) and hind tarsi and tibiae (b) of *Fischerotrephes jaechi* (redrawn from Zettel, 1998, fig. 3, 7); 38. Lateral view of cephalonotum (a), fore tarsi and tibiae (b) and hind tarsi and tibiae (c) of *Trephotomas compactus* (redrawn from Zettel, 1998, fig. 1,4,8); 39. Lateral view of cephalonotum (a) and female subgenital plate (b) of *Distotrephes stysi* (redrawn from Zettel, 1998, fig. 12); 40. Lateral view of cephalonotum (a) and female subgenital plate (b) of *Tiphotrephes indicus* (redrawn from Zettel, 1998, fig. 14; Zettel, 1999b, fig, 1).
Scale = 1 mm.





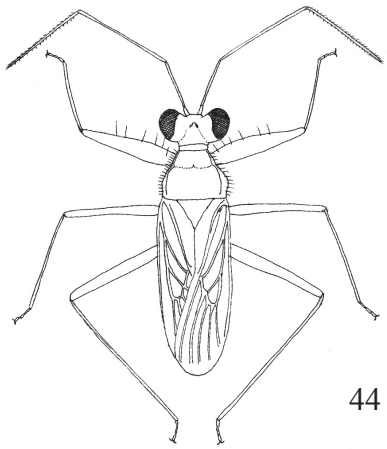


Fig. 41-44 41. Lateral view of cephalonotum (a) and female subgenital plate (b) of *Idiotrephes* sp. (redrawn from Zettel, 1998, fig. 13; Zettel, 1999b, fig, 2); 42. Dorsal view of *Leotichius* sp. (redrawn from Polhemus & Polhemus, 1999, fig. 4); 43. Dorsal view of *Patapius (Pseudopatapius) thaiensis* (redrawn from Polhemus & Polhemus, 1999, fig. 2); 44. Dorsal view of *Valleriola* sp. (redrawn from Polhemus & Polhemus, 1999, fig. 3).

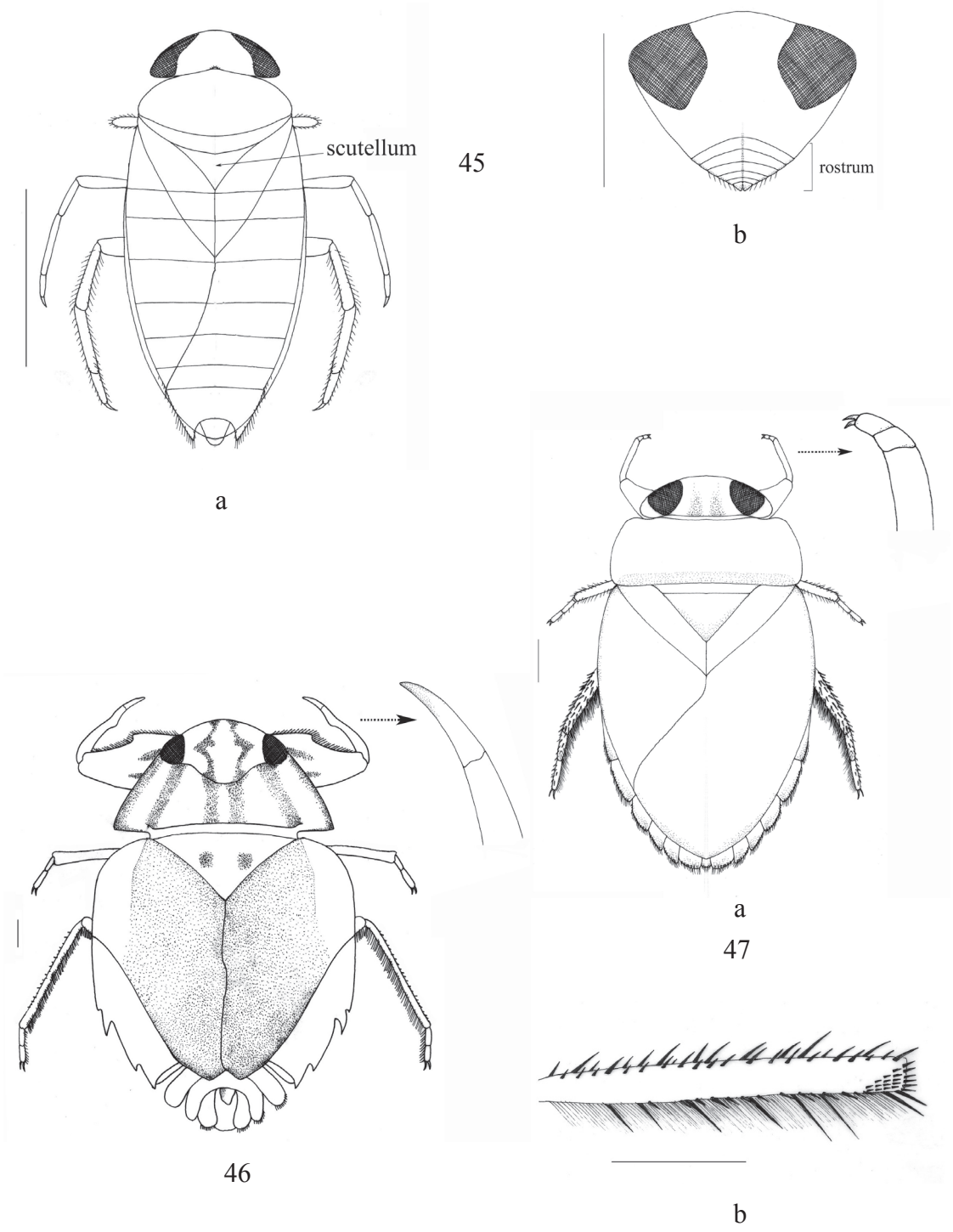


Fig. 45-47 45. Dorsal view (a) and ventral view of rostrum (b) of *Micronecta* sp.;
46. Dorsal view of *Naucoris* sp.; 47. Dorsal view (a) and distal end of metatibia (b) of *Heleocoris* sp.
Scale = 1 mm.

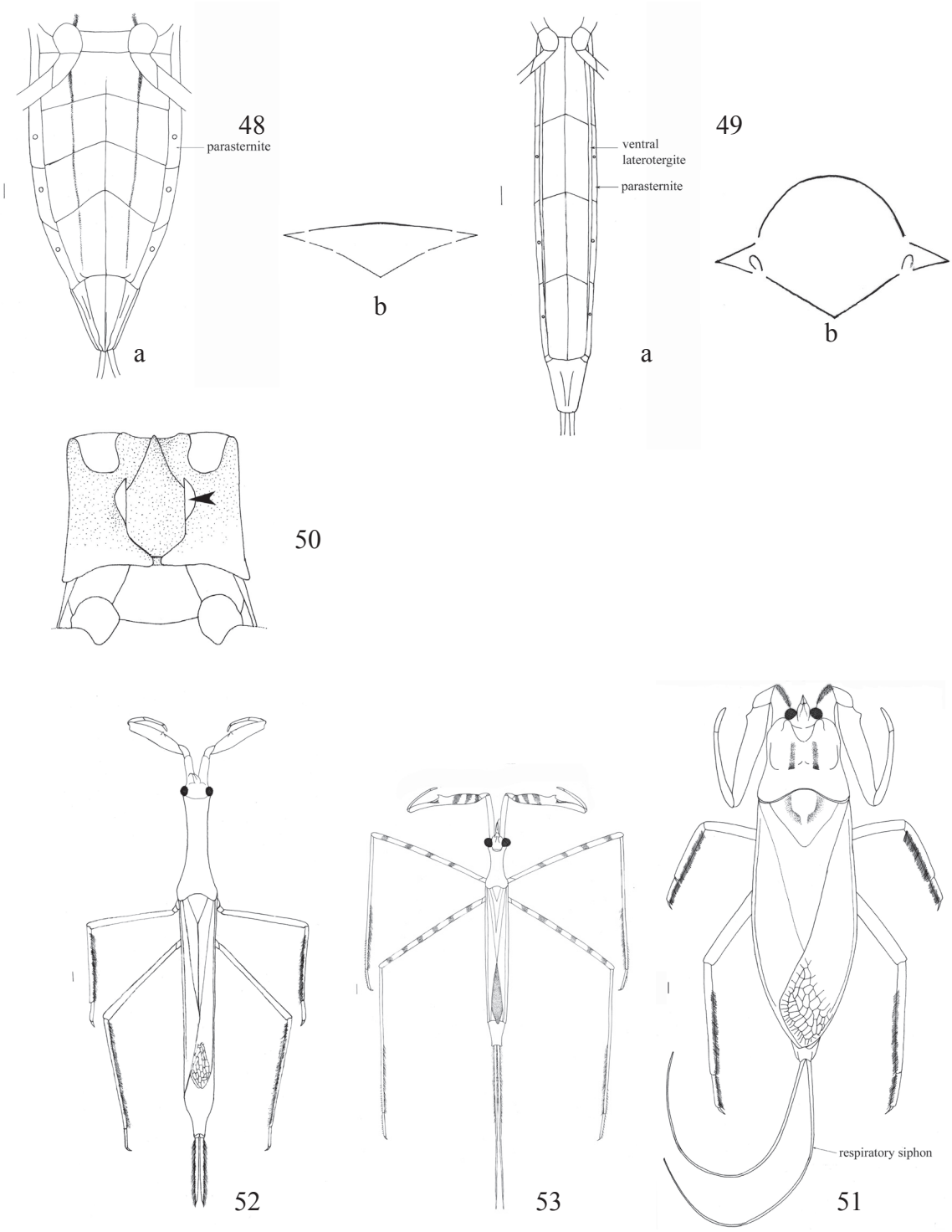


Fig. 48-53 48. Ventral view of abdomen (a) and schematic cross section (b) of Nepinae (redrawn from Nieser & Polhemus, 1998, fig. 2); 49. Ventral view of abdomen (a) and schematic cross section (b) of Ranatrinae (redrawn from Nieser & Polhemus, 1998, fig. 4). 50. Prosternum and mesosternum of *Telmatotrephes* sp. (arrow indicated spiracularaperture) (redrawn from Nieser & Polhemus, 1998, fig. 8); 51. Habitus of *Laccotrephes* sp.; 52. Habitus of *Cercotmetus* sp.; 53. Habitus of *Ranatra* sp.
Scale = 1 mm.

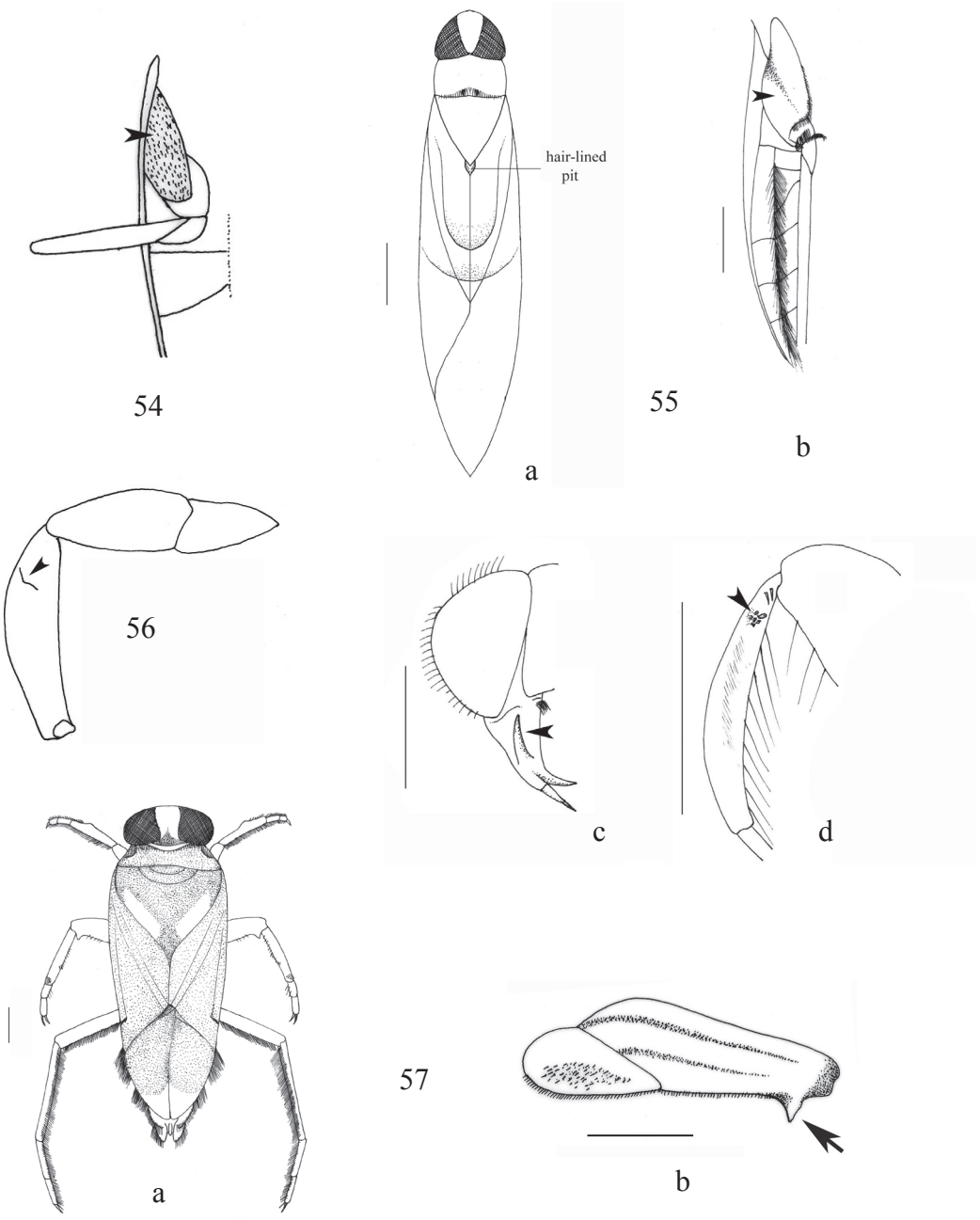


Fig. 54-57 54. Ventral view of right side of metathorax and base of abdomen (arrow indicates coxal plate with setae) of *Paranisops* sp. (Notonectidae) (redrawn from Nieser, 1998, fig. 2); 55. Dorsal view (a), ventral view of right side of metathorax and base of abdomen (b) (arrow indicated coxal plate), lateral view of tibia of rostrum (c) and fore leg (d) (arrow indicates tibial protuberance with closely packed pegs and rostral prong) of *Anisops* sp.; 56. Trochanter, femur and tibia of fore leg of *Walambianisops wandjina* (redrawn from Nieser, 1998, fig. 5) (arrow indicates tibial pegs not on protuberance and not closely packed together); 57. Dorsal view (a) and mid femur (b) of *Enithares* sp. (Notonectidae), arrow indicates ante-apical protuberance.
Scale = 1 mm.

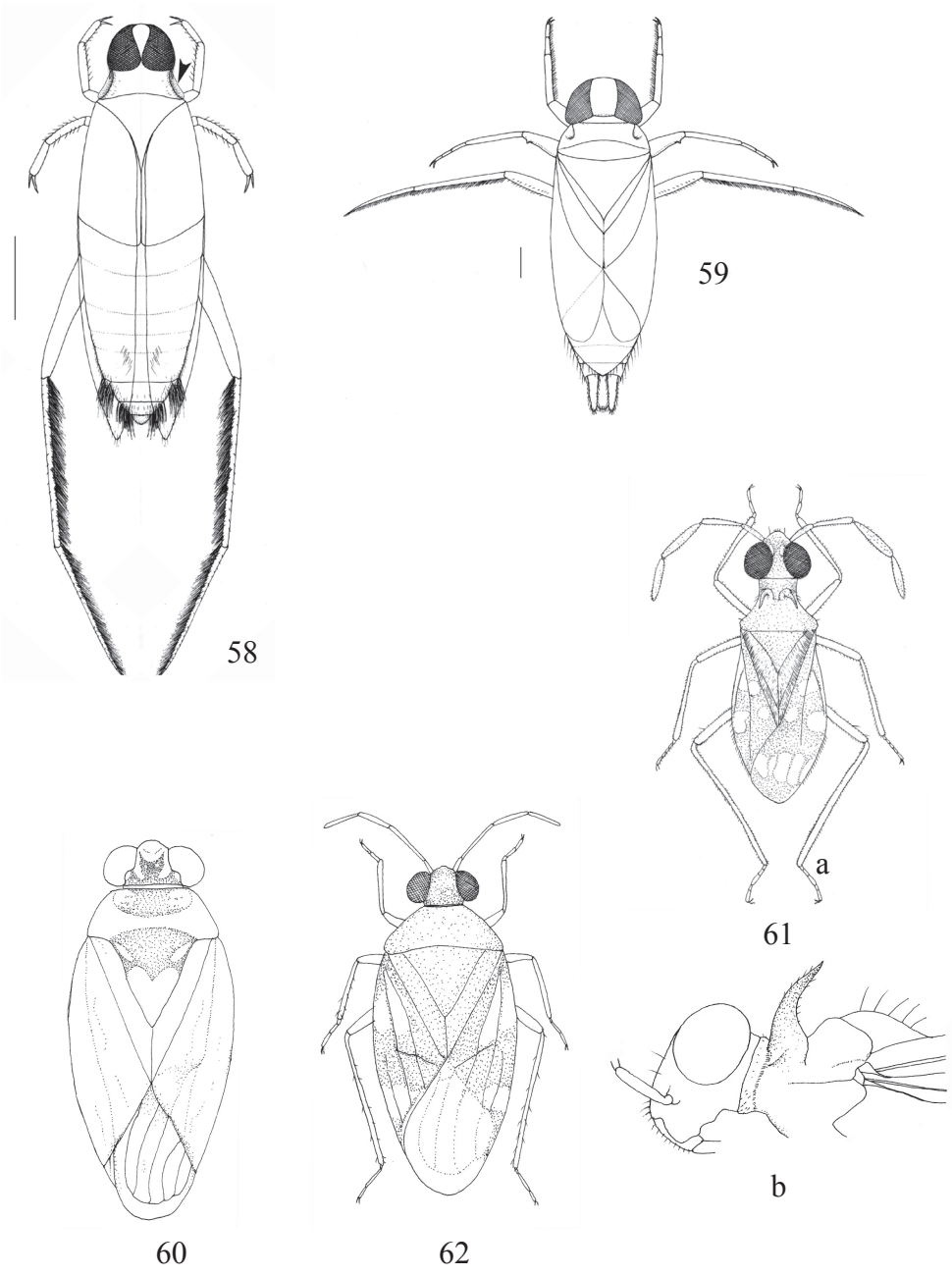


Fig. 58-62 58. Dorsal view of *Nychia sappho* (arrow indicates pronotal fovea and ocular commissure); 59. Dorsal view of *Aphelonecta gavini*; 60. Dorsal view of *Pentacora* sp. (redrawn from Polhemus & Polhemus, 1999, fig. 7b); 61. Dorsal view (a) and lateral view of head and thorax (b) of *Saldoida armata* (redrawn from Polhemus & Polhemus, 1999, fig. 8a-b); 62. Dorsal view of *Saldula* sp. (redrawn from Polhemus & Polhemus, 1999, fig. 4.).
Scale = 1 mm.

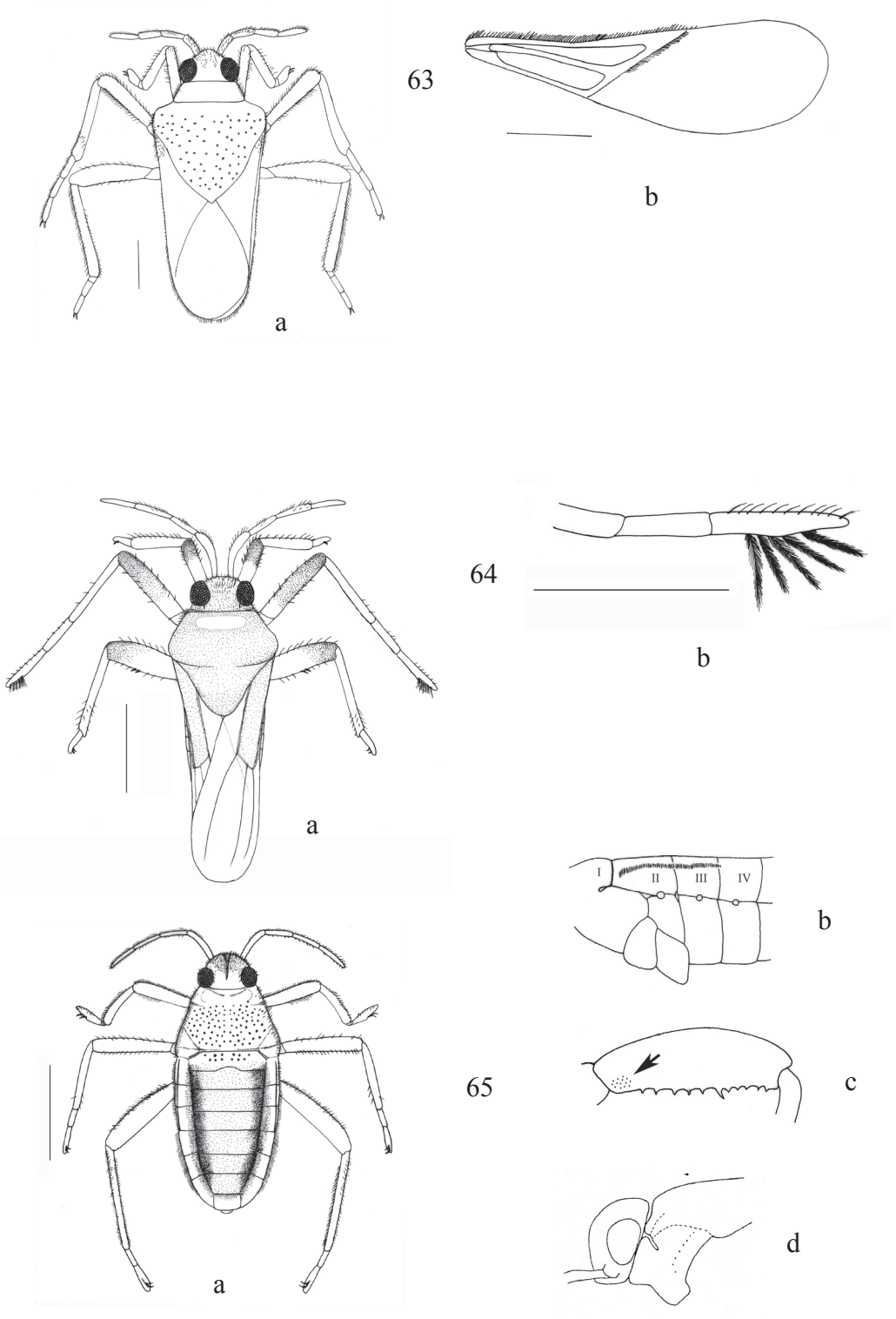


Fig. 63-65 63. Dorsal view (a) and fore wing (b) of *Perittopus* sp.; 64. Dorsal view (a) and swimming fan of mid-leg (b) of *Rhagovelia* sp.; 65. Dorsal view of apterous female (a), lateral view of sternites II-IV (b), lateral view of male hind femur (c) and lateral view of head and pronotum (d) of *Chenevelia stridulans* (redrawn from Hecher, 1998, fig. 5,6,7).
Scale = 1 mm.

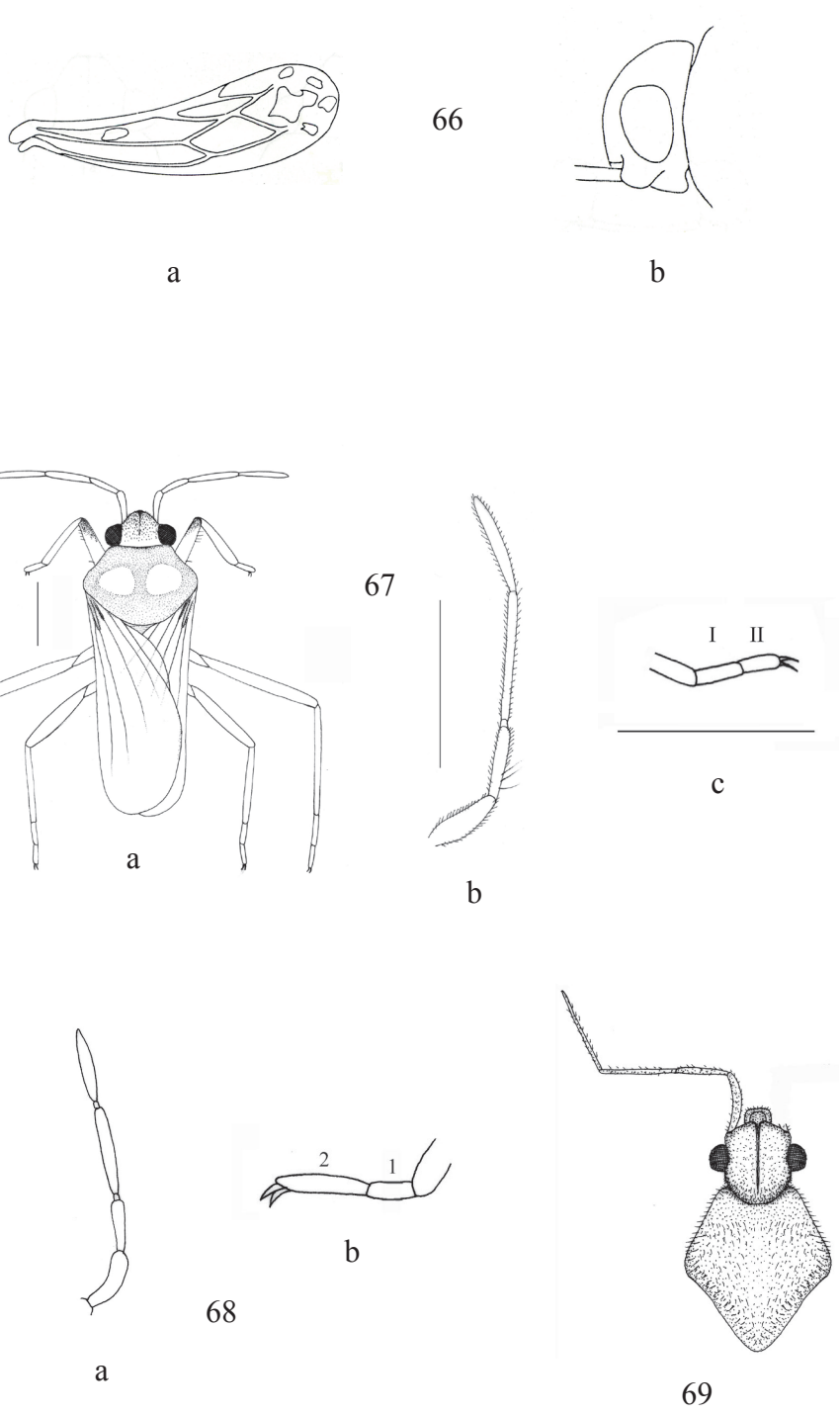


Fig. 66-69 66. Fore wing, (a) and lateral view of head (b) of *Angilia orientalis* (redrawn from Hecher, 1998, fig. 4 ,9); 67. Dorsal view of adult (a), antennae (b) and hind tarsus (c) of *Strongylovelia* sp.; 68. Antennae (a) and hind tarsus (b) of *Entomovelia* sp. (redrawn from Hecher, 1998, fig. 18,23); 69. Dorsal view of head and pronotum of *Lathriovelia capitata* (redrawn from Hecher, 1998, fig. 43).
Scale = 1 mm.

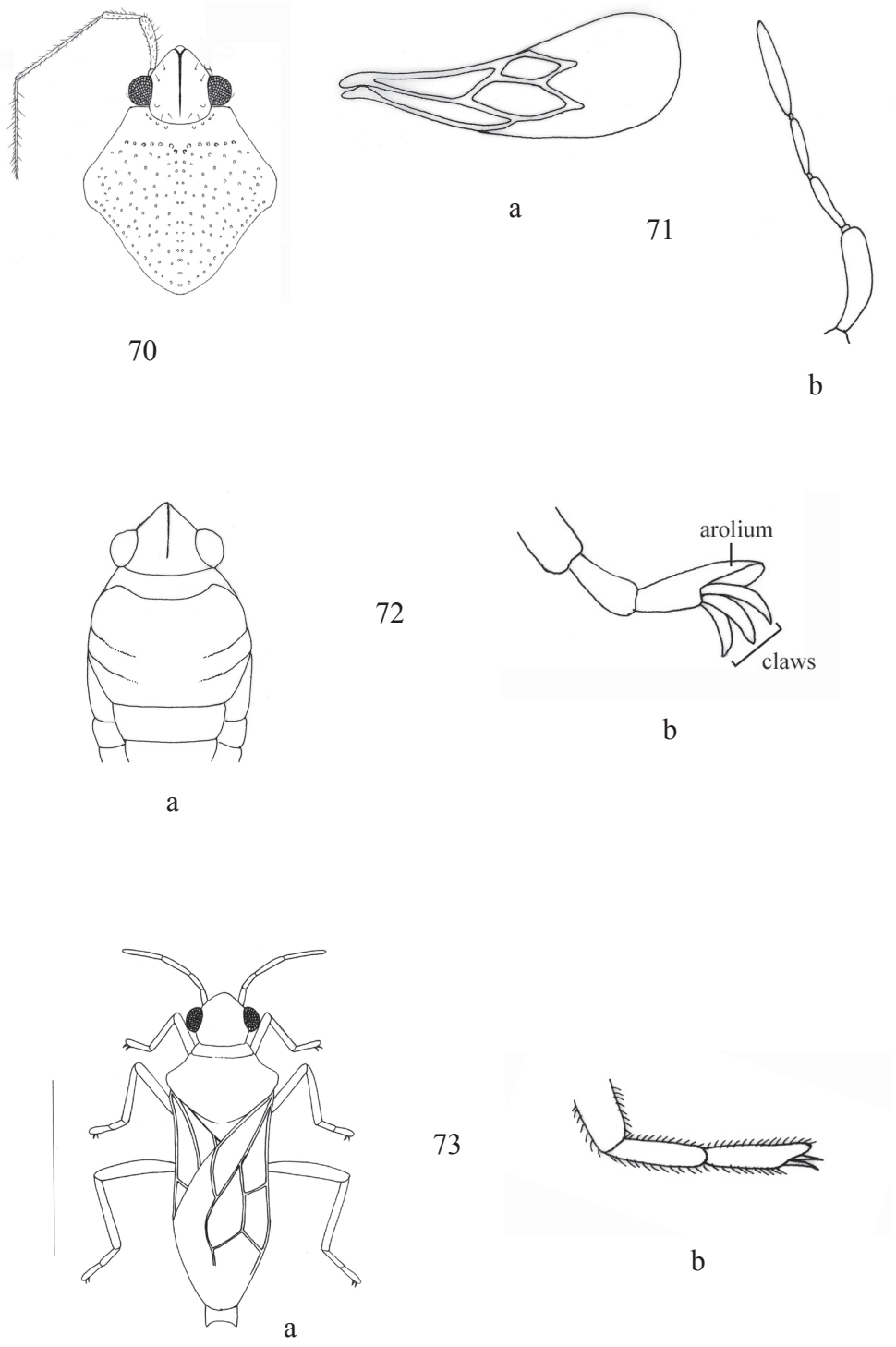


Fig. 70-73 70. Dorsal view of head and pronotum of macropterous female of *Baptista gestroi*; 71. Fore wing (a) and antennae (b) of *Pseudovelia* sp. (redrawn from Hecher, 1998, fig. 2,20); 72. Head and thoracic nota (a) and middle tarsus (b) of *Xiphovelia* sp. (redrawn from Hecher, 1998, fig. 11, 21); 73. Dorsal view (a) and middle tarsus (b) of *Microvelia* sp.; (redrawn from Hecher, 1998, fig. 1). Scale = 1 mm.