

Chapter 12 Freshwater Crustacea

The crustacean body consists of three tagmata: head, thorax and abdomen. A carapace may cover the head and thorax. In the head area there are two pairs of antennae and a pair of stalked eyes. Surrounding the mouth are three pairs of appendages that are involved in feeding or creating water currents for respiration—the mandibles and two pairs of maxillae. The eight thoracic segments have the first, second and third maxillipeds (which function on food manipulation) and five pairs of walking legs (or **pereopods**). The first three pairs of walking legs may be chelate and function in feeding or defence. The first five abdominal segments have swimmerets (or **pleopods**) that function in generating respiratory currents, and in the female they all are used for holding the eggs and developing young. The last pair of abdominal appendages, the **uropods**, are flat and wide appendages and are used as a rudder for swift backward movement (Fig. 1).

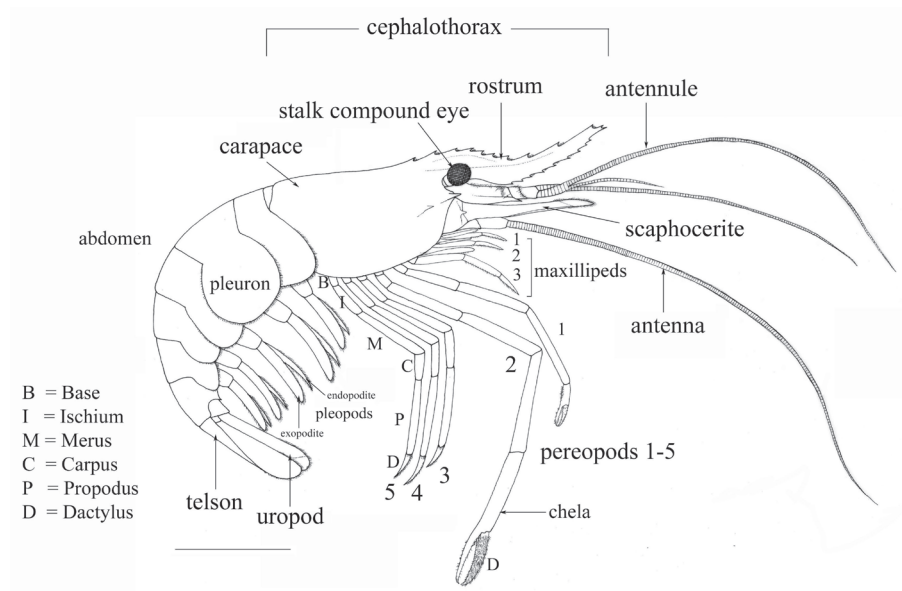


Fig. 1 Side view of female *Macrobrachium rosenbergii*.

There are three orders of crustaceans occurring in running water: Decapoda, Isopoda and Amphipoda. Decapoda includes crabs, shrimps and prawns. Shrimps (Atyidae) and prawns (Palaemonidae) have elongated bodies and appendages as previously mentioned. Atyidae are much smaller than Palaemonidae. They feed mainly on detritus. Unlike shrimps, crabs have a dorso-ventrally flattened carapace and a reduced abdomen which is folded under the carapace. External features of freshwater crabs are illustrated in Fig 2. Lotic crabs are in the families Gecarcinucidae, Potamidae and Parathelphusidae. The thicken and flattened carapace allows them to live in shelters under rocks. Some potamid crabs are intermediate hosts of the lung fluke (*Paragonimus* sp.) (Radomyos *et al.*, 1992). Unlike the decapods, amphipods and isopods have no carapace, only one pair of maxilliped are present, and sessile compound eyes are present (some isopods lack eyes). Isopods are flattened dorso-ventrally

and exchange gas through abdominal appendages, while amphipods are flattened laterally and have gills on the thorax, attached to the pereopods.

The following keys (to families of freshwater crabs and to species of freshwater prawns of the genus *Macrobrachium*) are modified from Ng (1988) and Cai *et al.* (2004).

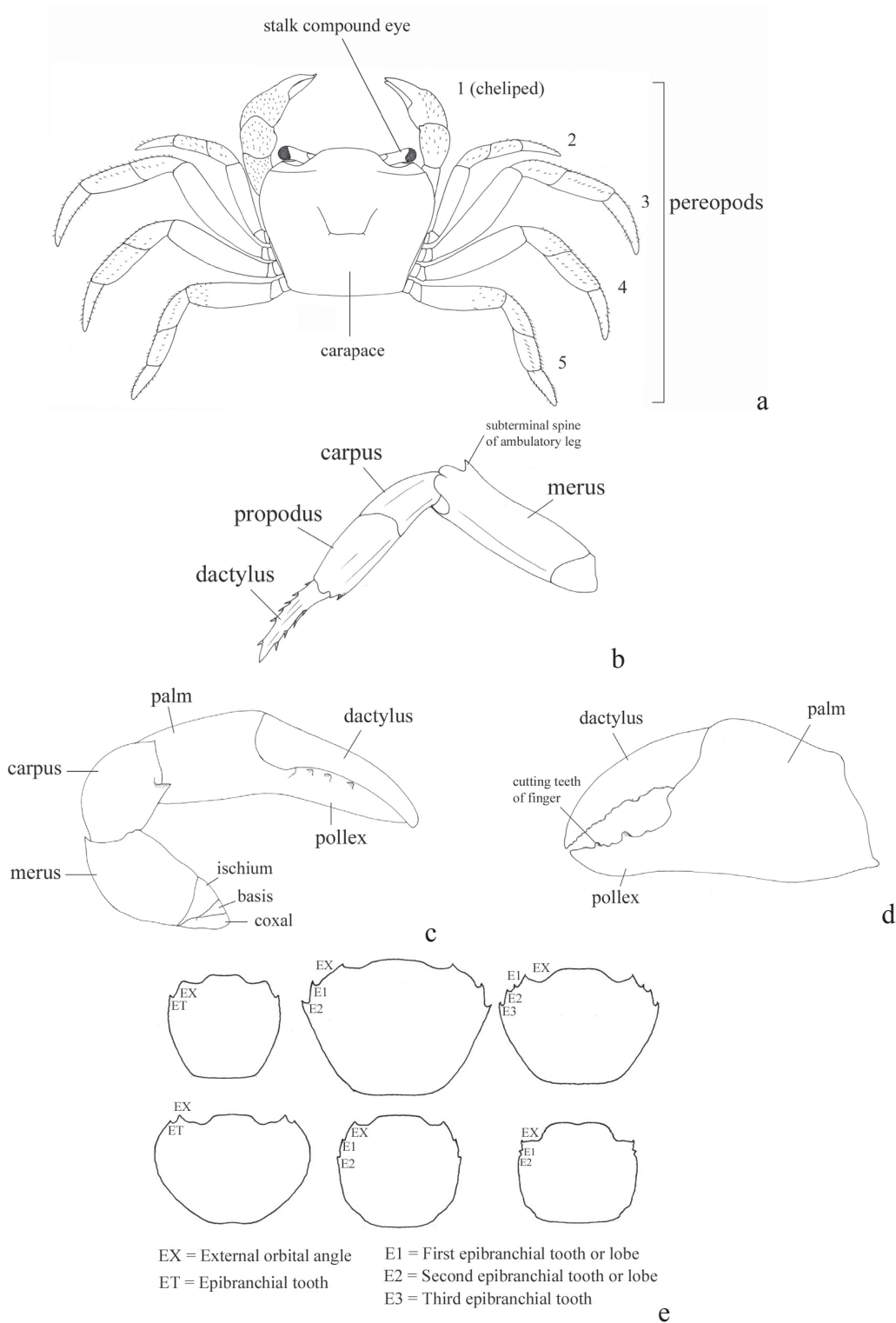


Fig. 2 a. Dorsal view of a Potamid crab; b. Walking leg; c. Left cheliped; d. Chela; e. Carapace shapes of various freshwater crabs (redrawn from Ng, 1988, fig. 5).

KEY TO CLASSES AND ORDERS OF FRESHWATER CRUSTACEA

- 1 Cephalothorax with 8 segments, abdomen with 6 segments; usually with uropods (except crabs) (Fig. 1,13,14).....CLASS MALACOSTRACA...11
- 1' Body divided into head and trunk; if cephalothorax present, abdomen with 3-5 segments;abdomen without uropods 2
- 2(1') Trunk with more than 10 segments and with leaf-like appendages (Fig. 8,9,10)..... CLASS BRACHIOPODA...8
- 2' Appendages not leaf-like 3
- 3(2') External parasites of fishes 4
- 3' Animals free living 5
- 4(3) Body flattened and disc-like with a pair of ventral surface circular sucker (Fig. 3) .. CLASS BRACHIURA
- 4' Body various formed; if body flattened, not disc-like and without sucker..... CLASS COPEPODA (part parasitic form)
- 5(3') Head indistinctly set off from trunk and covered with bivalve carapace; thorax with only two pairs of appendages (Fig. 4) CLASS OSTRACODA
- 5' Body long, cylindrical or pear-shaped, with cephalothorax, thorax and abdomen; thorax with 4-6 pairs of appendages; cephalothorax with a nauplius eye CLASS COPEPODA.....8
- 6(5') Cephalothorax not distinctly broader than abdomen, body pear-shaped, up to 3 mm long (Fig. 6,7) 7
- 6' Cephalothorax broader than abdomen, body more or less cylindrical; less than 1 mm long (Fig. 5)..... ORDER HARPACTICOIDA
- 7(6') The first antenna very long, usually longer than whole body; egg sacs single (Fig. 6) ORDER CALANOIDA
- 7' The first antenna moderate; egg sacs paired (Fig. 7)..... ORDER CYCLOPOIDA
- 8(2) Carapace present; eyes sessile 9
- 8' Carapace absent; eyes stalked (Fig. 8)..... ORDER ANOSTRACA
- 9(8) Telson with two long filamentous cerci; univalve carapace covers head and some of trunk; tadpole-like (Fig. 9)..... ORDER NOTOSTRACA
- 9' Telson without filamentous cerci; abdomen covered by carapace..... 10

- 10(9') Carapace a single folded plate, covering thorax and abdomen but not covering head; 4-6 pairs of thoracic appendages (Fig. 10)..... ORDER CLADOCERA
- 10' Carapace bivalve, covering thorax and trunk; 11-28 pairs of thoracic appendages (Fig. 11) ORDER CONCHOSTRACA
- 11(1) Carapace absent; eyes sessile 12
- 11' Carapace present; eyes stalked 13
- 12(11) Body laterally flattened (Fig. 12)ORDER AMPHIPODA
- 12' Body dorsoventrally compressed (Fig. 13)..... ORDER ISOPODA
- 13(11') Thoracic appendages not chelate ORDER MYSIDACEA
- 13' Five pairs of walking legs of which at least the first pair is chelate (Fig. 14,15a) ORDER DECAPODA..... 14
- 14(13') Abdomen reduced and folded beneath the cephalothorax; swimming legs not developed (Fig. 14)..... INFRAORDER BRACHYURA (crabs)
- 14' Abdomen and swimming legs well developed; carapace with conspicuous rostrum; body more or less laterally compressed.....INFRAORDER CARIDEA.... 15
- 15(14') First two pairs of thoracic legs slender, without apical tufts of setae; (Fig. 15a-b) small to large size; in streams and rivers PALAEMONIDAE, *Macrobrachium*
- 15' First two pairs of thoracic legs broad, with apical tufts of setae (Fig. 16a-b); very small size, length less than 35 mm; in small stony streams ATYIDAE, *Caridina*

KEY TO FAMILIES OF FRESHWATER CRABS OF INDOCHINA

- 1 Mandibular palp with two lobes (Fig. 17); frontal margin of carapace usually with a distinctly or indistinctly marked median triangle (Fig. 20,21); abdomen of male T-shape (Fig. 23)..... SUPERFAMILY GECARCINUCOIDEA ...2
- 1' Mandibular palp with three lobes (Fig. 18); frontal margin of carapace entire (Fig. 19); abdomen of male triangular shape (Fig. 22)..... SUPERFAMILY POTAMOIDEA (POTAMIDAE)
- 2(1) Anterolateral margin with one tooth (Fig. 24) frontal median triangle indistinctly marked (Fig. 20); exopod of the third maxilliped with very short or without flagellum (Fig. 25)..... GECARCINUCIDAE
- 2' Anterolateral margin with one or more teeth (Fig. 26); frontal median triangle distinctly demarcated (Fig. 21); exopod of the third maxilliped with long flagellum (Fig. 27) PARATHELPHUSIDAE

KEY TO SPECIES OF FRESHWATER PRAWNS OF THE GENUS *MACROBRACHIUM* OF INDOCHINA

- 1 Carpus of the second pereopod covered with dense velvety pubescence (Fig. 28,29,31) 2
- 1' The second pereopod without dense velvety pubescence (Fig. 34) 6
- 2(1) Pubescence occurs on both palm and finger 3
- 2' Pubescence occurs only on proximal half or third of fingers (Fig. 28) (cutting edge of fixed finger not razor-like)..... *M. sintangense*
- 3(2) Carpus cup-shaped; less than twice as long as high, cutting edges of fingers of second pereopod with less than 18 teeth 4
- 3' Carpus elongate, more than twice as long as high, cutting edges of fingers of second pereopod with more than 20 teeth (Fig. 29) *M. dienbienphuense*
- 4(3) Propodus of third pereopod more than three times as long as dactylus (epistome trilobed, cutting edges of fingers of second pereopod with 12-15 teeth (Fig. 30).....
..... *M. eriocheirum*
- 4' Propodus of third pereopod less than three times as long as dactylus..... 5
- 5(4') Epistome trilobed, second pereopod of both sexes are similar in size
..... *M. amplimanus*
- 5' Epistome bilobed, second pereopod of female much smaller than that of male (Fig. 31) *M. hirsutimanus*
- 6(1') Carpus of second pereopod longer than chela (Fig. 32), (rostrum upturned, reaching distinctly beyond end of scaphocerite, second pereopods shorter than body, anterior of rostrum unteethed) *M. lanchesteri*
- 6' Carpus as long as or shorter than chela 7
- 7(6') Carpus of the second pereopod longer than palm but shorter than chela (Fig. 33) (rostrum upturned with more than 10 ventral teeth, fingers of second pereopods with teeth on cutting edges)..... *M. rosenbergii*
- 7' Carpus of the second pereopod shorter than palm..... 8
- 8(7') Second pereopods equal in length, movable spines on uropodal diaeresis shorter than outer angle 9
- 8' Second pereopods subequal in length, movable spines on uropodal diaeresis longer than outer angle (Fig. 34) (fingers of second pereopod with one row of 10-20 small teeth on cutting edges)..... *M. thai*

- 9(8) Rostrum not reaching beyond end of antennular peduncle (Fig. 35), antennular peduncle 0.4 times as long as carapace*M. yui*
- 9' Rostrum reaching beyond end of antennular peduncle (Fig. 36), antennular peduncle 0.5 times as long as carapace*M. mieni*

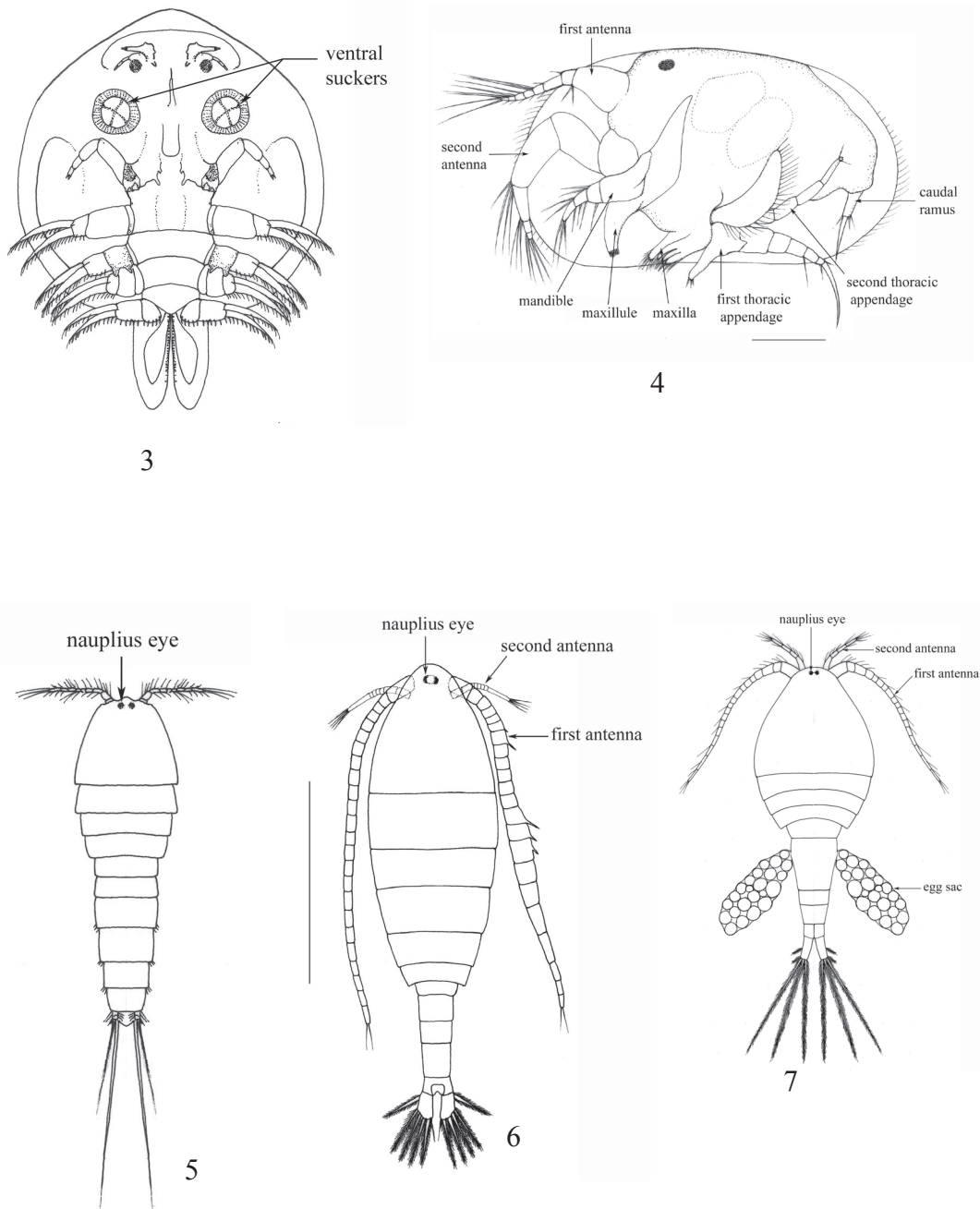


Fig. 3-7 3. Ventral view of Argulidae (redrawn from Pennak, 1989, fig. 9); 4. Side view of an ostracod; 5. Dorsal view of harpacticoid copepod (modified from Pennak, 1989, fig. 3A); 6. Dorsal view of calanoid copepod; 7. Dorsal view of cyclopoid copepod.

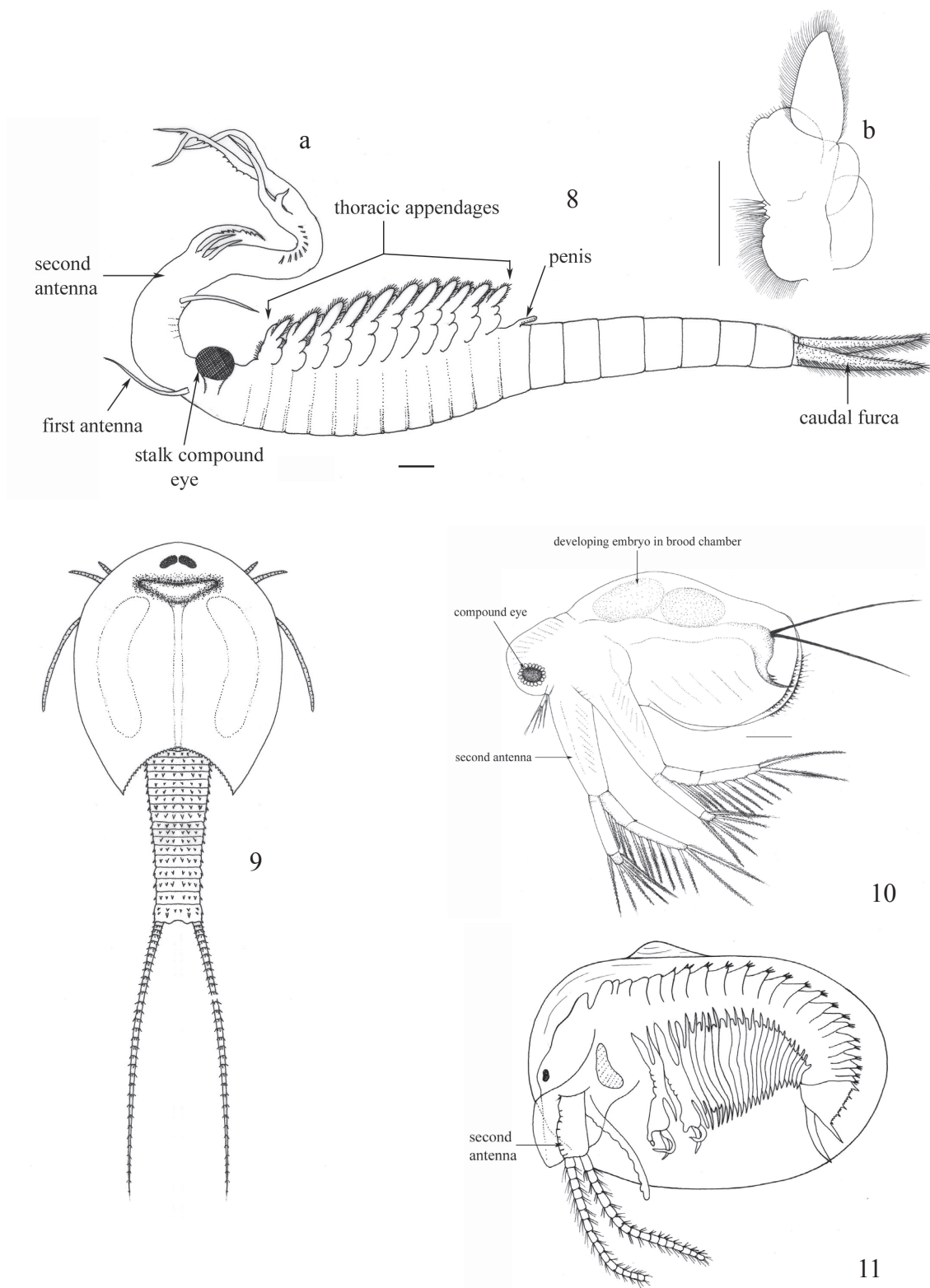


Fig. 8-11 8. Side view (a) and leaf-like thoracic appendage (b) of male *Streptocephalus sirindhornae*; 9. Dorsal view of tadpole shrimp (modified from Pennak, 1989, fig. 3D); 10. Side view of cladoceran; 11. Side view of conchostacan (redrawn from Barnes, 1963, fig. 15-9A).
 Scale = 1 mm.

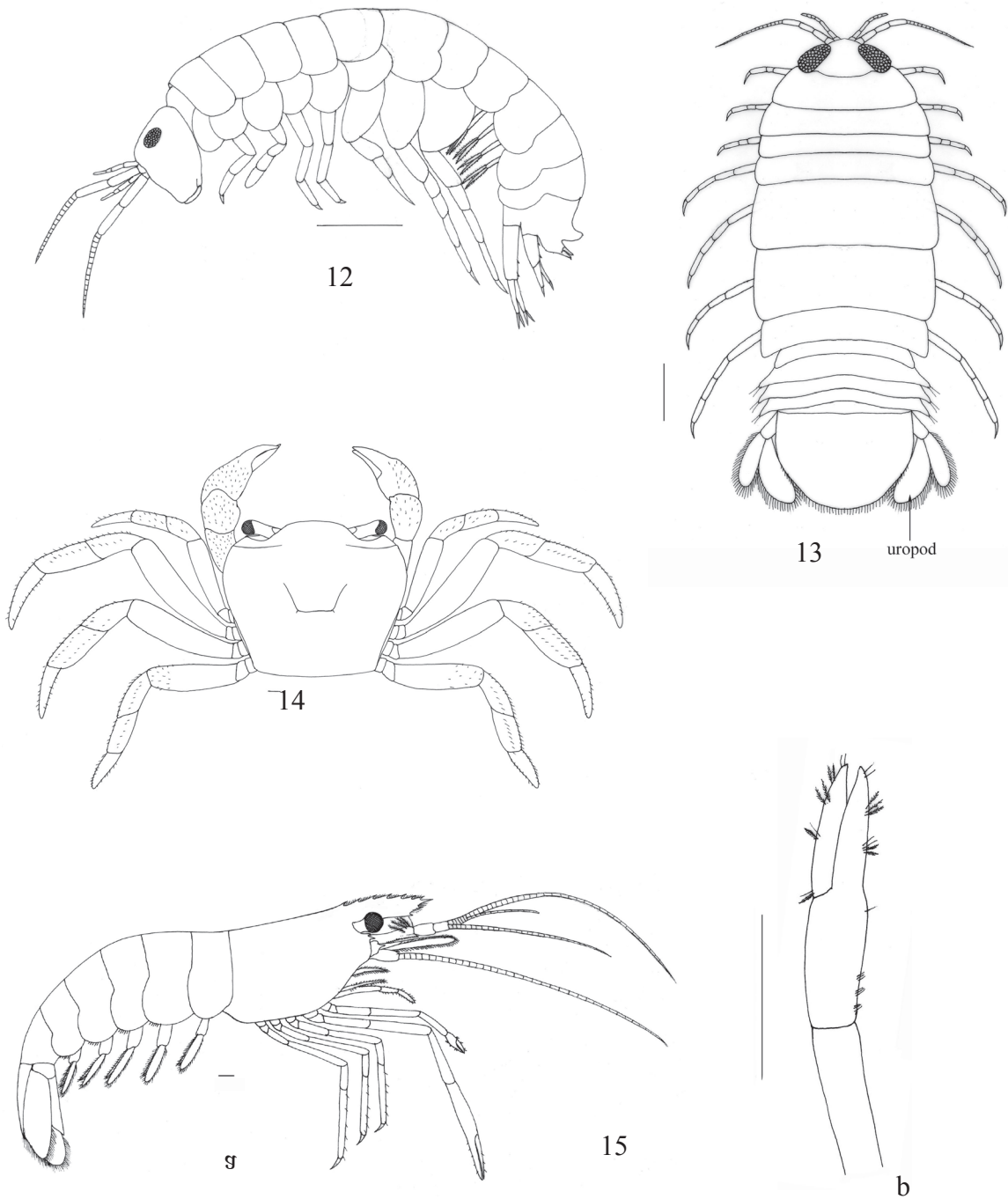


Fig. 12-15 12. Side view of amphipod; 13. Dorsal view of isopod; 14. Dorsal view of potamid crab; 15. Side view (a) and thoracic leg (b) of *Macrobrachium* sp. Scale: (12,13,14,15a) 1 mm; (15b) 0.5mm.

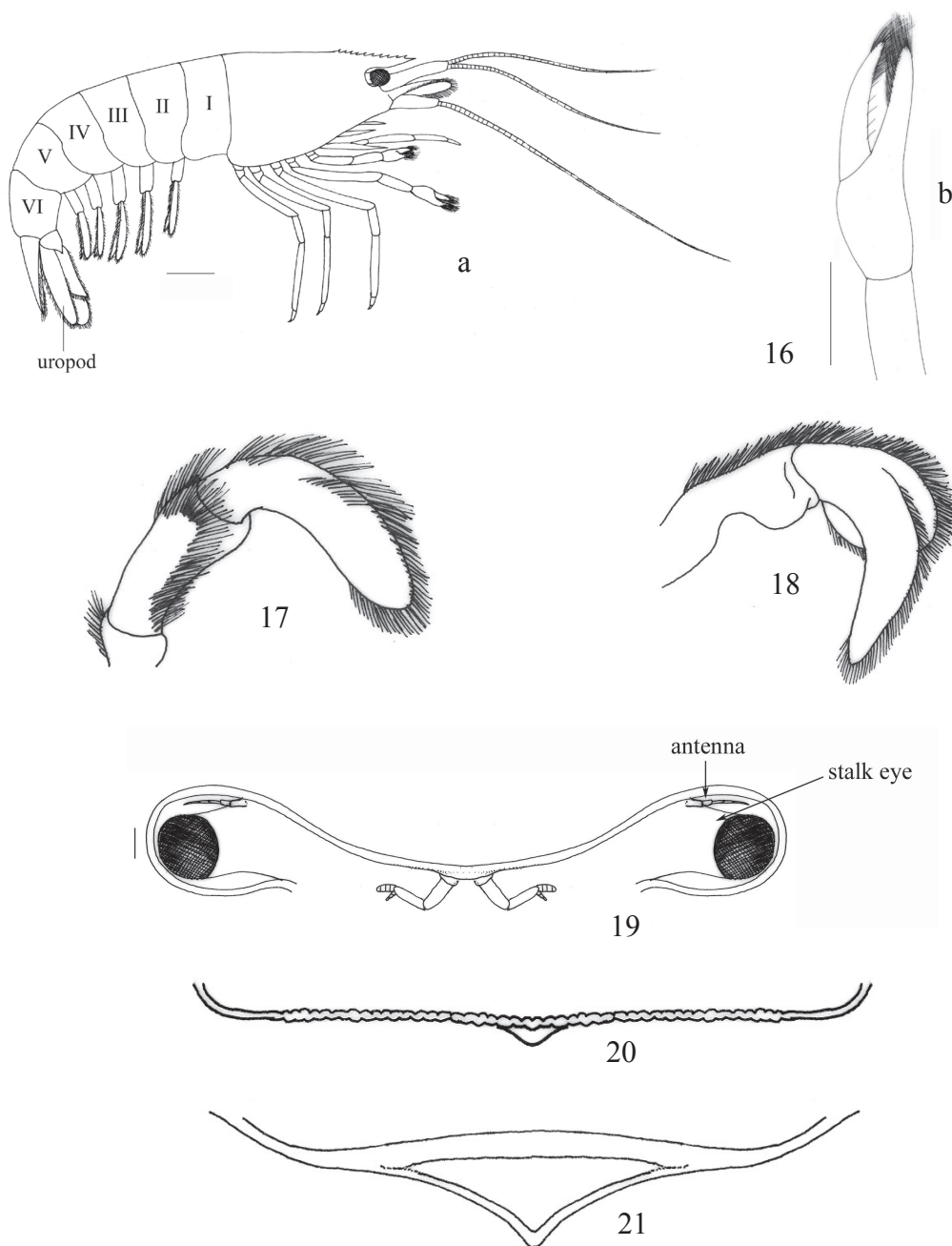


Fig. 16-21 16. Side view (a) and thoracic leg (b) of *Caridina* sp.; 17. Mandibular palps of Potamoidea (redrawn from Ng, 1988, fig. 2A); 18. Mandibular palps of Gecarcinucoidea (redrawn from Ng, 1988, fig. 2B); 19. Frontal margin of potamid crab; 20. Frontal median triangles of Gecarcinucidae (redrawn form Ng, 1988, fig. 38A); 21. Frontal median triangles of Parathelphusidae (redrawn form Ng, 1988, fig. 38B).(redrawn from Ng, 1988, fig. 11A). Scale = 1 mm.

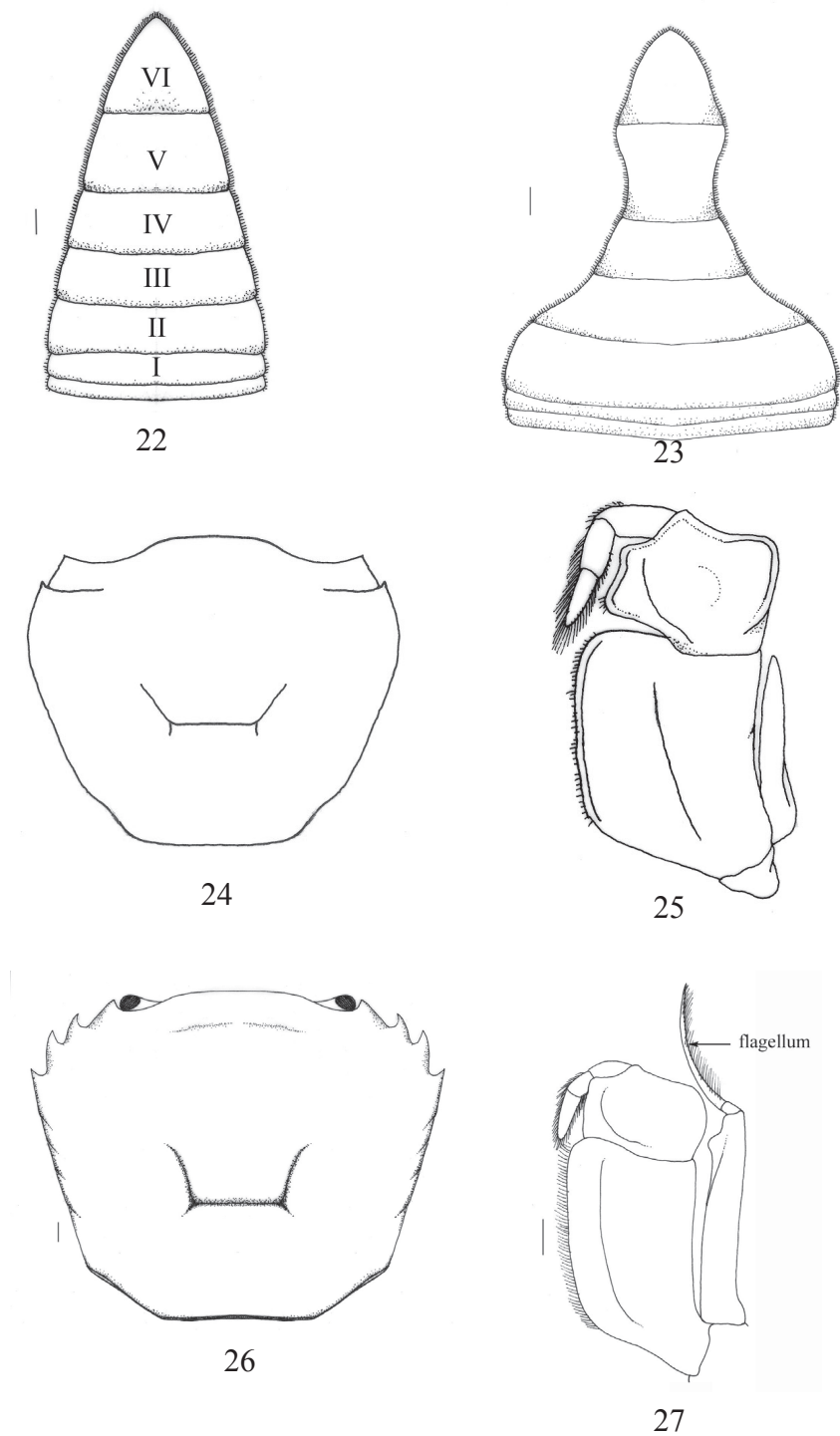


Fig. 22-27 22. Dorsal view of abdomen of Potamidae; 23. Dorsal view of abdomen of Parathelphusidae; 24. Dorsal view of carapace of Gecarcinucidae (modified from Ng, 1988, fig. 18A); 25. Left third maxilliped of Gecarcinucidae (redrawn from Ng, 1988, fig. 40C); 26. Dorsal view of carapace of Parathelphusidae; 27. Left third maxilliped of Parathelphusidae. Scale = 1 mm.

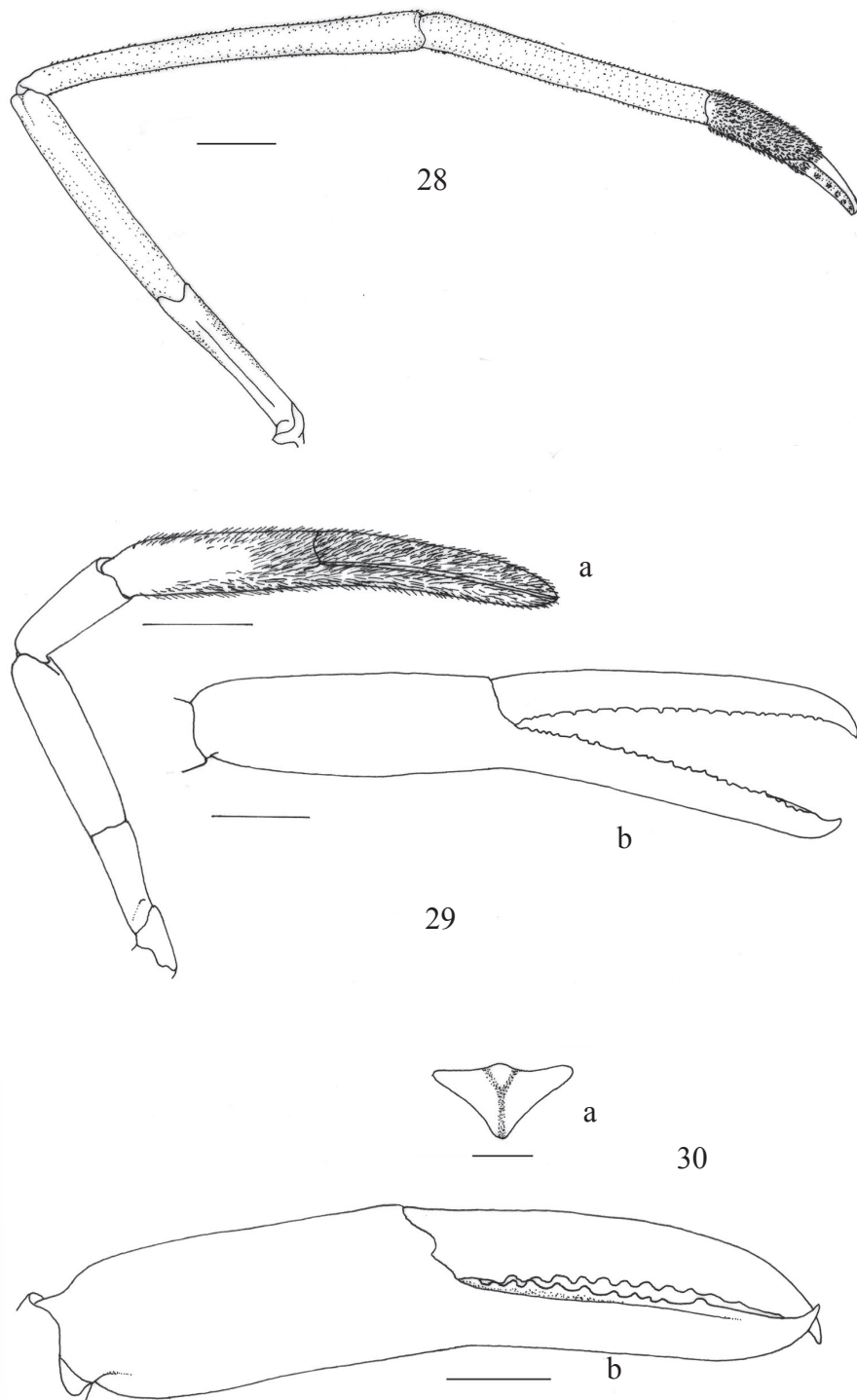


Fig. 28-30 28. Second pereopod of *Macrobrachium sintangense* (redrawn from Cai *et al.*, 2004, fig. 2H); 29. Second pereopod (a) and chela of second pereopod (b) of *M. dienbienphuense* (redrawn from Cai *et al.*, 2004, fig. 20J,K); 30. Epistome (a) and chela of second pereopod (b) of *M. eriocheirum* (redrawn from Cai *et al.*, 2004, fig. 18B, D).
Scale: (28,29,30b) 5 mm; (30a) 2 mm.

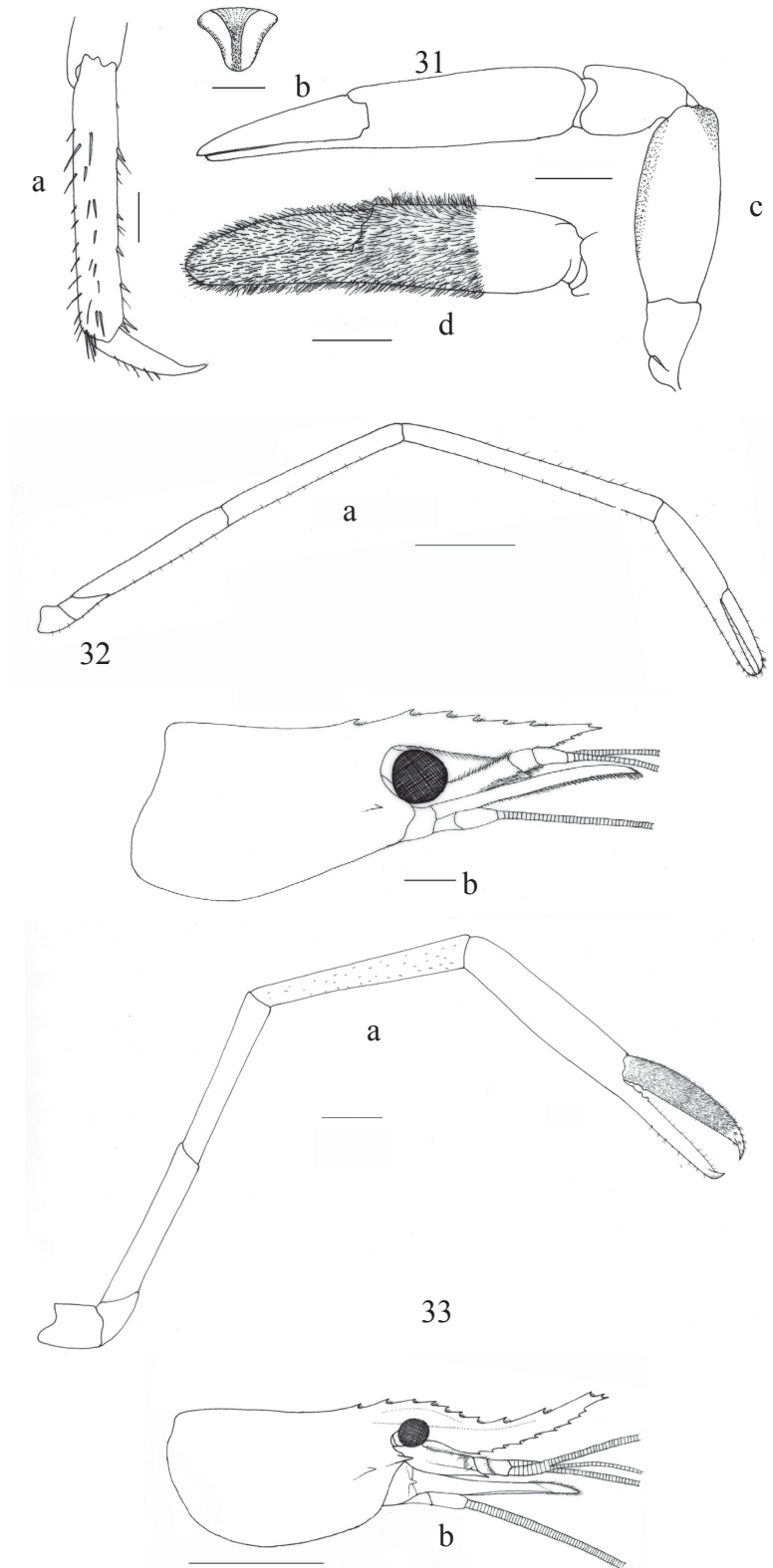


Fig. 31-33 31. Second pereopod (a), epistome (b), chela of second pereopod (c) and prododus and dactylus (d) of *M. hirsutimanus* (redrawn from Cai *et al.*, 2004, fig. 15B,G,H,K); 32. Second pereopod (a) and side view of cephalothorax (b) of *M. lanchesteri*; 33. Second pereopod (a) and side view of cephalothorax (b) of *M. rosenbergii*.
Scale: (31b,c) 5 mm; (31a, 31d, 32-33) 1 mm.

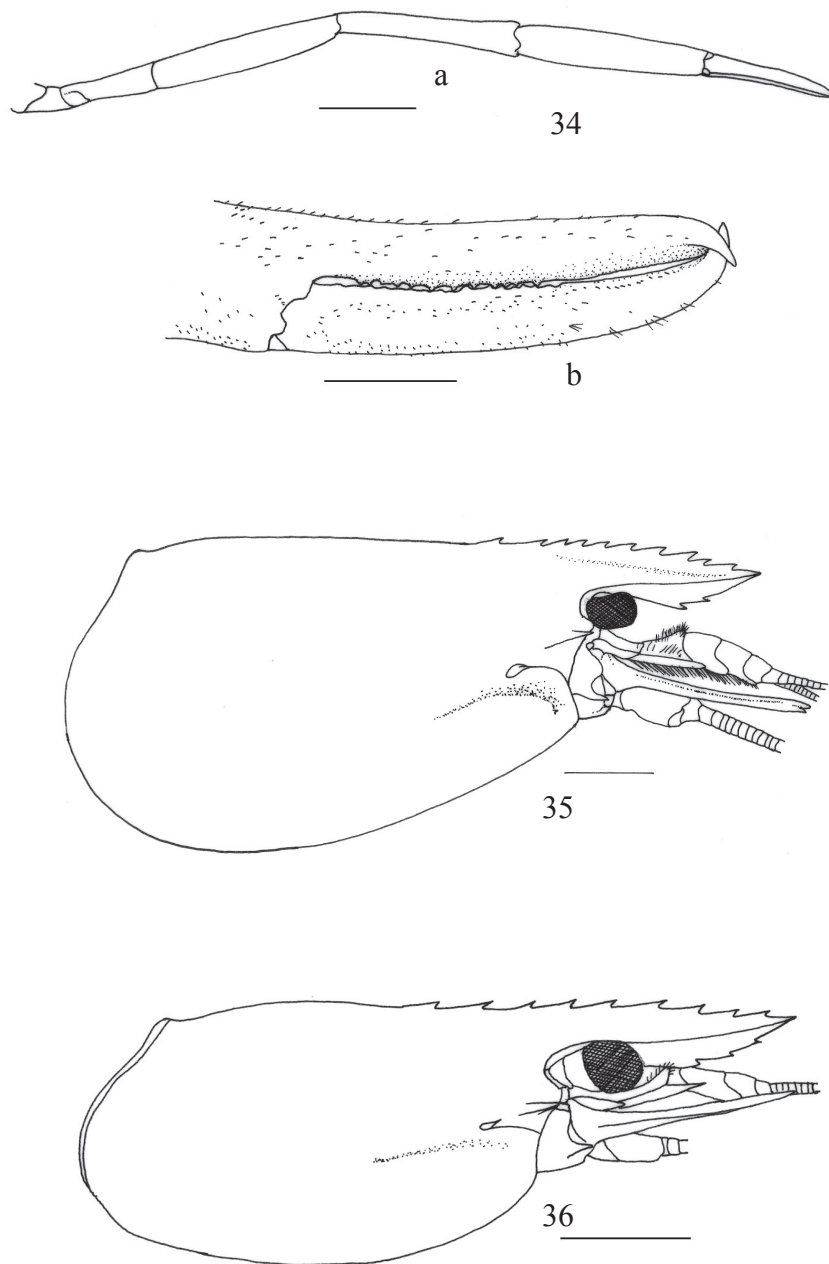


Fig. 34-36 34. Second pereopod (a) and finger of second pereopod (b) of *M. thai* (redrawn from Cai *et al.*, 2004, fig. 9H,I) 35. Side view of cephalothorax of *M. yui* (redrawn from Cai *et al.*, 2004, fig. 10A); 36. Side view of cephalothorax of *M. mieni* (redrawn from Cai *et al.*, 2004, fig. 11A).
Scale line: (34) 2 mm; (35-36) 5 mm