Chapter 18 Order Plecoptera

The Plecoptera, or stoneflies, is one of the more ancient insect orders. It is more diverse in lotic habitats of temperate zones. Species richness decreases rapidly at the family level going from cool and temperate climates to warm and tropical ones (Zwick, 1986). Perlidae is the only diverse tropical family (Covich, 1988), and it is widespread from the north to Bali of Indonesia (Dudgeon, 1999).

Adults lay eggs attached to underwater rock surfaces in clean and cool stoney-bottomed streams. Nymphs either cling beneath rocks or in leaf packs, depending on their feeding habits. Nymphs of Peltoperlidae are shredders and restricted to headwater streams (Sangpradub, *et al.*, 1999). Most perlid nymphs are predators. Nymphs of *Etrocorema nigrogeniculatum* (Enderlein) eat aquatic insects—mainly chironomid and blackfly larvae (Chaisamsaeng, 2003). Adults and the exuvia of mature nymphs of Perlidae are often found on rock surfaces, but those of *Amphinemura* usually are found on debris accumulations or leaf packs near stream margins. Early instars may be found in the hyporheic zone (Klaythong, 1997).

Most of the literature on Asian Plecoptera involves the adult stage: Kawai (1969), Zwick (1982), Stark (1983), Sivec (1984), Zwick & Sivec (1985), Zwick (1986), Stark (1987), Sivec *et al.* (1988), Stark (1989), Stark & Sivec (1991), and Sivec & Zwick (1989). Among these, Sivec (1984) provides a key to adult *Neoperla* (Perlidae) of the Phillippines and Sivec *et al.* (1988) provides a key to the world genera of Perlinae adult and nymphs. A key to the families and genera of Indochina stonefly nymphs is provided here.

Key to Families and Genera of Mature Stonefly Nymphs (Plecoptera) of Indochina

1 Body cockroach-like; thorax much wider than head and abdomen (Fig. 1)..... .....Peltoperlidae…2

1′ Body not cockroach-like; thorax only slightly wider than rest of body 3

2(1) Posterior infracoxal gill absent .....*Cryptoperla*

2′ Posterior infracoxal gill on thoracic segments I-II single (Fig. 2)..... *Peltoperlopsis*

3(1′) Glossae of labium much shorter than paraglossae (Fig. 5b); mandibles elongate and slender; thorax with branched lateral gills..... Perlidae…4

3′ Glossae of labium as long as paraglossae; mandibles short and stout (Fig. 13); no lateral gill on side of thorax segment I 11

4(3) Biocellate (2 ocelli) (Fig. 5a)..... 5

4′ Triocellate (3 ocelli) (Fig. 9) 8

5(4) One pair of posterior supracoxal gills on thoracic segment III; posterior margin of mesosternum with setal fringe (Fig. 3) ..... *Phanoperla*
5′ Two pairs of posterior supracoxal gills on thoracic segment III; posterior margin of mesosternum without setal fringe 6

6(5′) Occipital ridge with close-set complete row of short, thick setae (Fig. 4); body densely covered with black clothing setae ..... *Tetropina*
6′ Occipital ridge at most a few short, thick setae laterally; clothing setae sparse, typically brown 7

7(6′) Lateral margin of pronotum completely fringed with thick setae (Fig. 5a); anal gills absent (Fig. 5c) ..... *Etrocorema*
7′ Lateral margin of pronotum with fringe incomplete (Fig. 6a); anal gills typically present (Fig. 6b) ..... *Neoperla*

8(4′) Anal gills present (Fig. 6b) 9
8′ Anal gills absent 10

9(8) Posterior setae fringe of sternum segment VII incomplete (Fig. 7) ..... *Paragnetina*
9′ Posterior setae fringe of sternum segment VII complete (Fig. 8) ..... *Agnetina*

10(8′) Thorax and abdomen without a median row of long silky setae ..... *Togoperla*
10′ Thorax and abdomen with a median row of long silky setae (Fig. 9) .... *Kamimuria* or *Tyloperla*

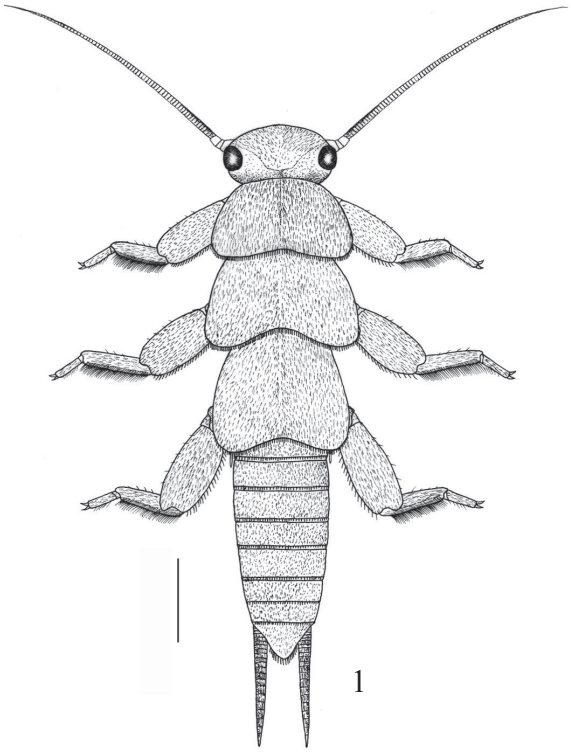
11(3′) Body short; midline of metathoracic wing pads strongly divergent (Fig. 12a); cervical gills present or absent ..... Nemouridae…12
11′ Body elongate; midline of metathoracic wing pads parallel (Fig. 10); abdominal segments I-VII with membranous pleural fold ..... Leuctridae, *Rhopalopsole*

12(11) No cervical gills on the neck ..... *Nemoura*
12′ Cervical gills present on the neck (Fig. 11,12,13,14) 13

13(12′) Cervical gills reduced to stubbly or triangular projections (Fig. 11) .... *Indonemoura*
13′ Cervical gills branched (Fig. 13,14) 14

14(13′) Cervical gills highly branched (Fig. 12b) ..... *Amphinemura*
14′ Cervical gills consisting of four or six branches only 15

15(14′) Four cervical gills on the neck (Fig. 13) ..... *Sphaeronemoura*
15′ Six cervical gills on the neck (Fig. 14) ..... *Protonemura*



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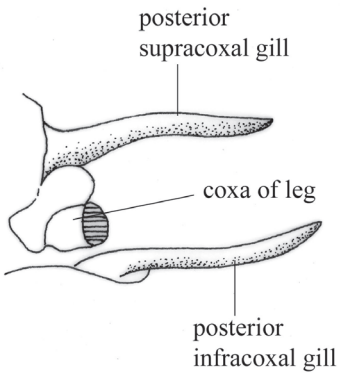

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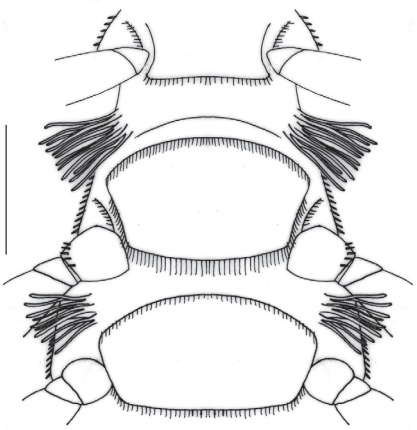

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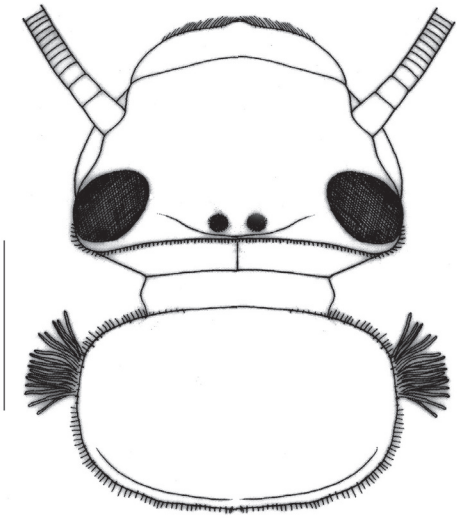

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Fig. 1-4 1. Dorsal view of nymph of *Crytoperla* sp.; 2. Posterior infracoxal gill on thoracic segments I-II of *Peltoperlopsis* sp.(redrawn from Harper, 1994, fig. 12.48); 3. Ventral view of mesosternum of *Phanoperla* sp.; 4. Dorsal view of head and thorax of *Tetropina* sp.
Scale = 1 mm.

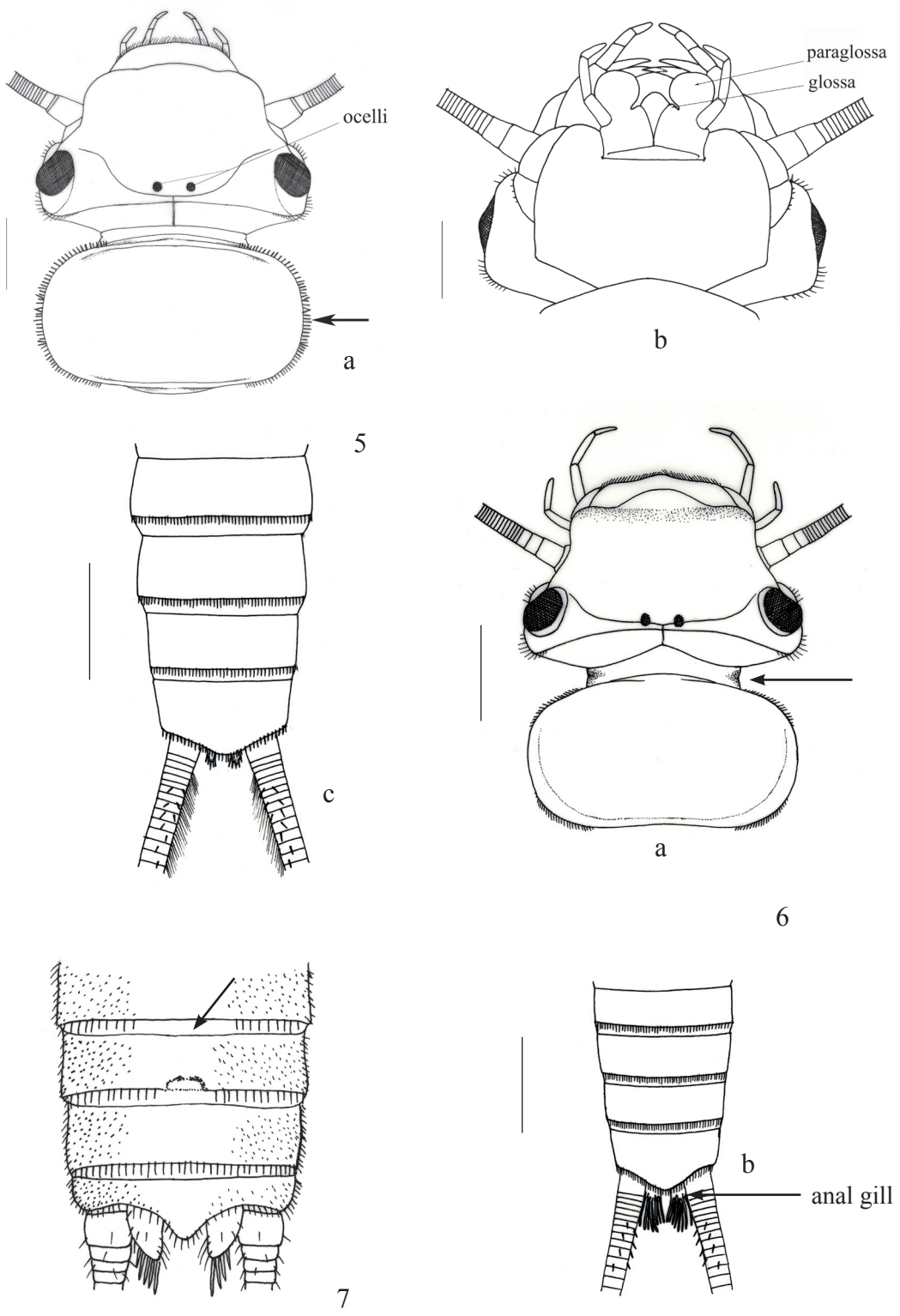
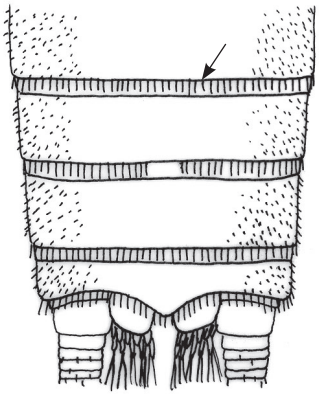


Fig. 5-7 5. Dorsal view of head and pronotum (a), ventral view of labium (b) and abdominal segments VII-X (c) of *Etrocorema* sp.; 6. Dorsal view of head and pronotum (a) and abdominal segments VII-X (b) of *Neoperla* sp.; 7. Sternum of abdominal segment VII of *Paragnetina* sp. (redrawn from Pescador et al., 2000, fig. 66).
Scale = 1 mm.



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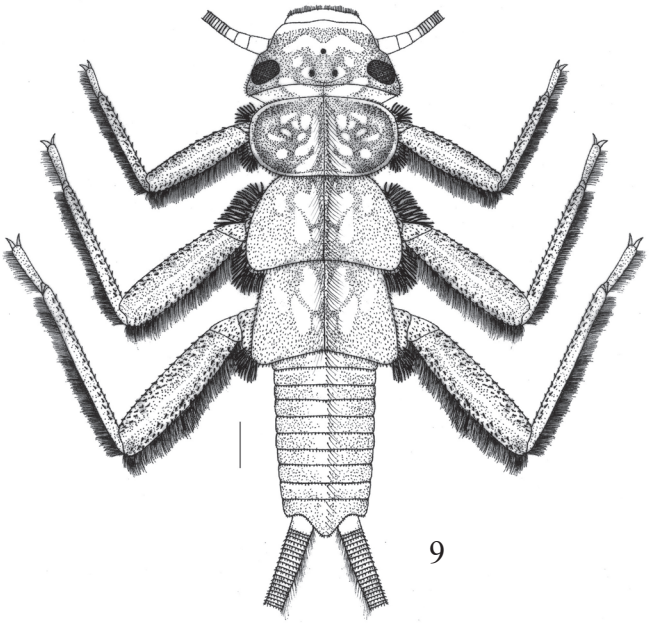

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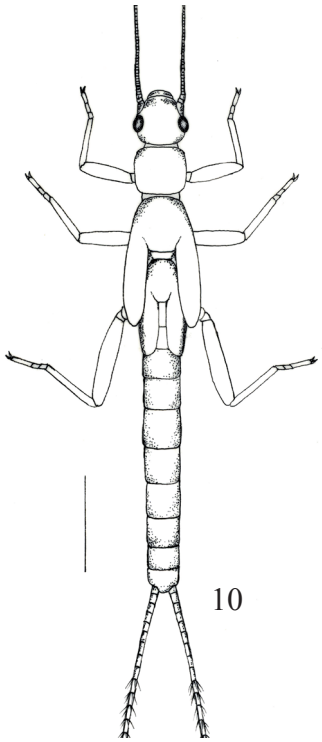

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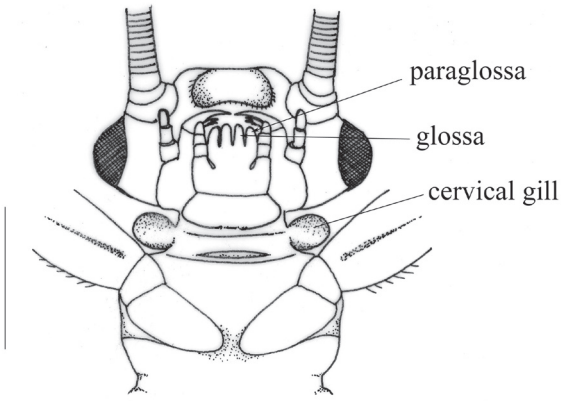

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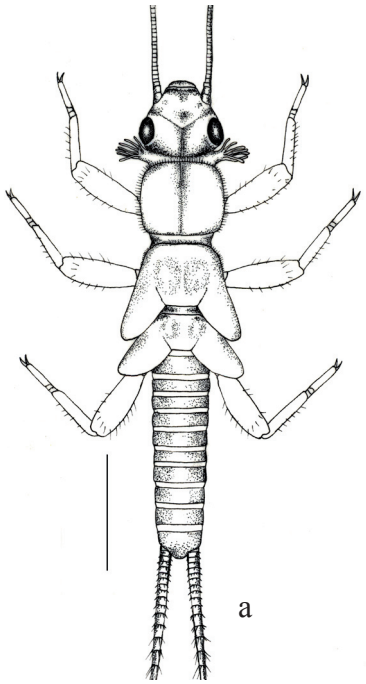
Fig. 8-10 8. Sternum of abdominal segment VII of *Agnetina* sp. (redrawn from Pescador et al., 2000, fig. 65); 9. Dorsal view of nymph of *Kamimuria* sp.; 10. Dorsal view of nymph of *Rhopalopsole* sp. 11. Ventral view of prothorax of *Indonemoura* sp.
Scale = 1 mm.



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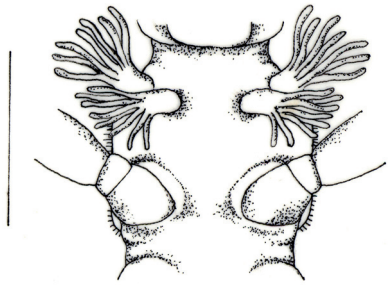

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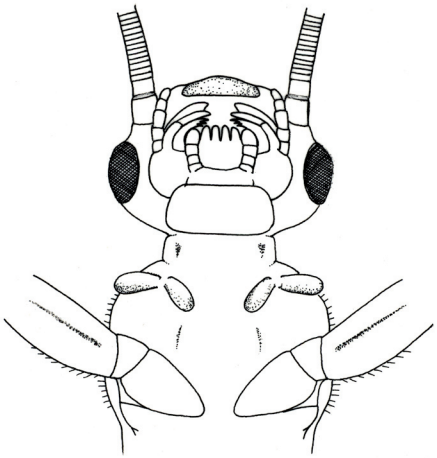

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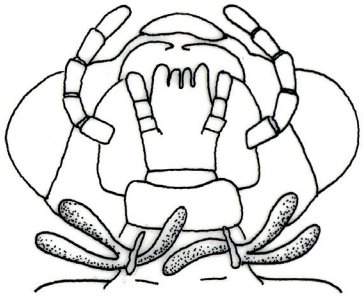

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Fig. 12-14 12. Dorsal view of nymph (a) and ventral view of cervical gills (b) of *Amphinemura* sp.; 13. Ventral view of head and prothorax of *Sphaeronemoura* sp.; 14. Ventral view of head and prothorax of *Protonemura* sp. (redrawn from Harper, 1994, fig. 12.41). Scale = 1 mm.