

SCIENTIFIC COMMUNICATION

An illustrated key to nymphs of Perlidae (Insecta, Plecoptera) genera in Central Amazonia, Brazil

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ABSTRACT. An illustrated key to nymphs of Perlidae collected in streams of Central Amazonia, Brazil is provided. Three genera are reported for this region: *Macrogynoplax* Enderlein, *Anacroneuria* Klapálek and *Enderleina* Jewett. Additional diagnostic characters are provided for *Enderleina* nymphs.

KEYWORDS. Aquatic insects; *Anacroneuria*; *Enderleina*; *Macrogynoplax*; Plecoptera.

Plecoptera has aquatic nymphs that frequently have gills in the thorax and at the base of the legs. The Order is divided into four groups: Euholognatha, Systellognatha, Eusthenioidea and Gripopterygoidea (STEWART & STARK 1993). In Brazil, only the families Perlidae, which belongs to the second group, and Grypopterygidae, belonging to the fourth group, occur (FROELICH 1981).

Perlidae is the only family that has been reported in Central Amazonia. According to STARK (2001), in the Neotropical region this family is composed by 280 species distributed among 10 genera. Up to now, only three genera are known in the Amazon region: *Macrogynoplax* Enderlein, 1909, *Anacroneuria* Klapálek, 1909 and *Enderleina* Jewett, 1960 (RIBEIRO-FERREIRA 1995, 1996; RIBEIRO-FERREIRA & FROELICH 1999, 2001). *Anacroneuria* is the most dominant and abundant genus in the Neotropical region, while *Macrogynoplax* and *Enderleina* are more restricted (STARK 2001). BOBOT & HAMADA (2002) reported that in two small streams, in a forested area in Manaus county, Amazonas State, the relative abundances of Plecoptera genera were: 63.3% *Anacroneuria*, 36.3% *Macrogynoplax* and 0.4% *Enderleina*.

Very little is known about aquatic insects taxonomy in the Amazon region, especially with regard to the immature stages. Identification to genus or species level is important for environmental impact studies in aquatic ecosystems. Since most taxonomic studies involving aquatic insects are based on

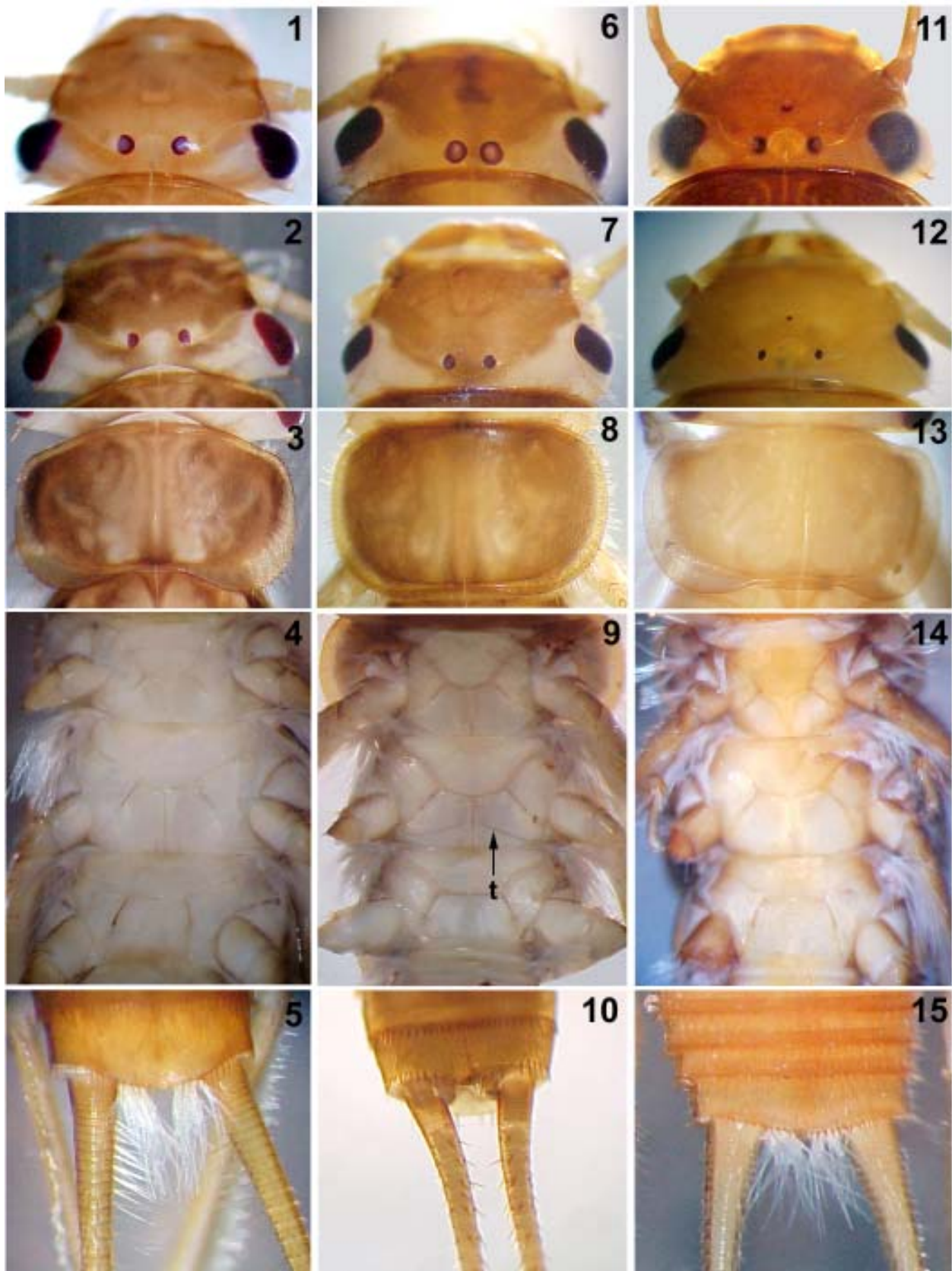
the adult stage, in general males, it is necessary to rear nymphs in order to associate them with the adults and increase our knowledge of the taxonomy of the immatures.

This study has the objective of providing an illustrated key for identification of Perlidae nymphs from Central Amazonia at the generic level. This key will provide support for ecological and biological studies on aquatic environments in the region.

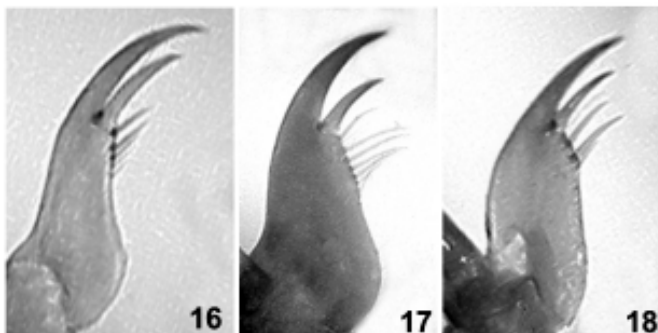
The specimens used to illustrate this study were collected in streams in the Reserva Florestal Adolpho Ducke, Manaus county and Presidente Figueiredo county, Amazonas State. The nomenclature for morphological characters used is that of STEWART & STARK (1993). Voucher specimens are deposited in the Coleção de Invertebrados of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil. Most of the specimens were preserved in 80% ethanol and two specimens were mounted between slide and coverslip, using Euparal® as the mounting media.

STARK (2001) presented an identification key for the 10 genera of Perlidae that occur in the Neotropical region. The diagnostic characters used to characterize the genus *Enderleina* were based on a nymph that was probably *Enderleina flinti* Stark, 1989 (the nymph was not reared to allow association with adults). This is the only known nymph of this genus until now. This author described the nymph as having three small and widely spaced ocelli. However, larvae of this genus examined by us have three ocelli of variable size and not widely spaced,

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Figs. 1-5. Nymphs of *Macrogynoplax*: 1-2, head, dorsal view; 3, pronotum; 4, thoracic segments, ventral view; 5, subanal lobe gills and cerci. **Figs. 6-10.** Nymphs of *Anacroneuria*: 6-7, head, dorsal view; 8, pronotum; 9, thoracic segments, ventral view; 10, subanal lobe gills and cerci. **Figs. 11-15.** Nymphs of *Enderleina*: 11-12, head, dorsal view; 13, pronotum; 14, thoracic segments, ventral view; 15, subanal lobe gills and cerci. t = tracheal tube forming a transverse line.



Figs. 16-18. Maxillae of Perlidae nymphs: 16, *Macrogynoplax*; 17, *Anacroneuria*; 18, *Enderleina*.

the distance between the paired ocelli being 0.5 to 0.8 times the distance between the ocellus and the nearest compound eye (Figs. 11, 12).

RIBEIRO-FERREIRA (1996) provided descriptions of last-instar *Macrogynoplax* and *Anacroneuria* nymphs and presented an identification key to distinguish these genera and *Enderleina* based on the number of ocelli, distance between the paired ocelli, shape of foreleg and presence of subanal lobe gills. But, she did not provide a description for the *Enderleina* nymph, nor did she provide an illustration as she did for the other two genera presented in her work. Also, she did not provide information on the examined *Enderleina* specimens she examined to elaborate the key.

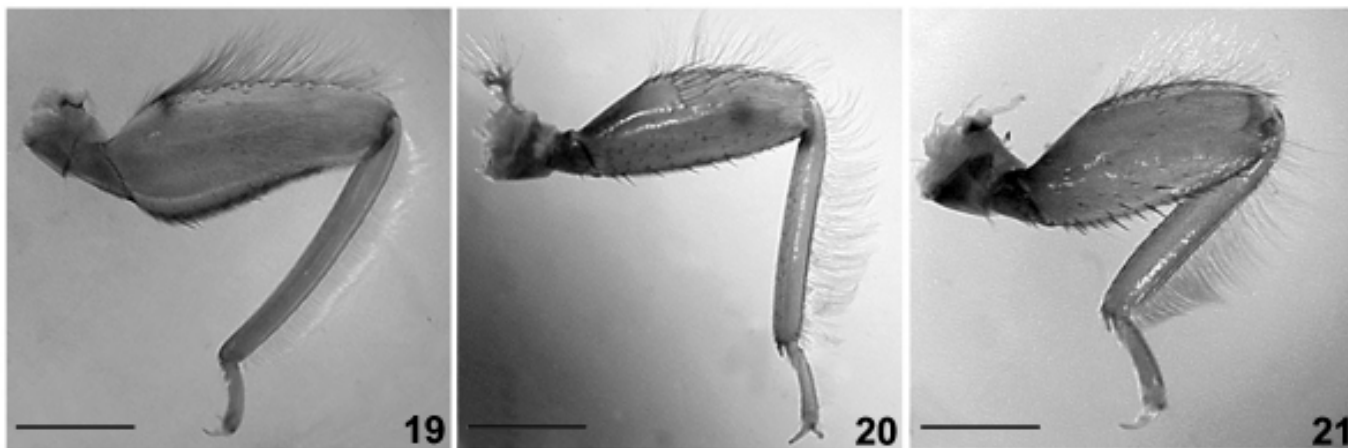
In identification keys for Perlidae genera from the southeast region of Brazil, FROEHLICH (1984) and DORVILLÉ & FROEHLICH (1999) described the distance between the paired ocelli in *Macrogynoplax* as being the same as the distance between the ocellus and the nearest compound eye. However, in the specimens we examined from Central Amazonia, the distance between the paired ocelli was 0.5 to 0.6 times the distance between the ocellus and the nearest compound eye (Figs. 1, 2). Comparing *Enderleina* with the other three genera studied by

DORVILLÉ & FROEHLICH (1999) we can say that *Enderleina*, as well as *Macrogynoplax* and *Kempnyia* Klapálek, 1916, does not have bristles dorsally on the maxilla, in contrast to *Anacroneuria* (Figs. 16-18). Also, the inner margin of the maxilla in *Enderleina* is not concave as in *Macrogynoplax* and the bristles on the distal region of the inner margin of the maxilla are stronger than in the other two genera present in the study area (Figs. 16-18). *Enderleina* has the posterior lateral border of the pronotum expanded (Fig. 13), subanal lobe gills (Fig. 15), ecdysial line in a "W" shape (Figs. 11, 12) and supracoxal gills SC1, SC2 and SC3 as in *Macrogynoplax* (FROEHLICH 1984; DORVILLÉ & FROEHLICH 1999) (Figs. 1-3, 5). However, in *Enderleina*, the middle point of the "W" described by the ecdysial line extends anteriorly beyond the paired ocelli (Figs. 11, 12). In *Enderleina*, as in *Anacroneuria*, the forelegs are not modified to hold prey as in *Macrogynoplax* (Figs. 19-21), and the tibiae of the forelegs are short, not reaching the trochanter of the same leg (Fig. 21).

In *Anacroneuria* nymphs, tracheal tubes can be seen by transparency in the posterior region of the mesosternum. These tubes form a typical pattern (Fig. 9) that was not observed in the *Macrogynoplax* and *Enderleina* nymphs examined (Figs. 4, 14).

Material examined. *Anacroneuria*. BRAZIL. Amazonas: Presidente Figueiredo: BR 174, km 137, Ramal do Castanhal (03°01'S/60°08'W), 9.IX.2002, A. M. O. Pes & C. A. Azevedo, 4 nymphs; Pedra Furada (01°59'S/59°33'W), 13.X.2002, A. M. O. Pes, C. A. Azevedo & T. E. Bobot, 1 nymph; Portal dos Anjos (02°03'S/60°06'W), 16.X.2002, A. M. O. Pes, C. A. Azevedo & T. E. Bobot, 3 nymphs; estrada da Morena (Lages), igarapé II (02°01'S/59°26'W), 14.IX.2002, A. M. O. Pes, C. A. Azevedo & T. E. Bobot, 4 nymphs. AM 240, km 20, Pousada Sossego da Pantera (01°59'S/60°01'W), 10.IX.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph. Manaus: AM 010, Km 26, Reserva Florestal Adolpho Ducke (02°55'S/59°58'W), igarapé Tinga 13.VI.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph, 11.V.2002, A. M. O. Pes & C. A. Azevedo, 2 nymphs, 07.VI.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph, 13.VI.2002, A. M. O. Pes & C. A. Azevedo, 3 nymphs; igarapé Ubere, 11.V.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph.

Macrogynoplax. BRAZIL. Amazonas: Presidente Figueiredo: BR 174, km 115, igarapé do Lajes (01°59'S/60°01'W), 9.IX.2000, A. M. O.



Figs. 19-21. Forelegs of Perlidae nymphs: 19, *Macrogynoplax*; 20, *Anacroneuria*; 21, *Enderleina*; scale bar=1 mm.

Pes, 1 nymph in slide mount; km 137, Ramal do Castanhal (03°01'S/60°08'W), 9.IX.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph; Cachoeira do Boto (02°07'S/59°18'W), 12.X.2002, A. M. O. Pes, C. A. Azevedo & T. E. Bobot, 4 nymphs; Vivenda Fênix, ramal do Urubuí, (02°03'S/60°06'W), 16.X.2002, A. M. O. Pes, C. A. Azevedo & T. E. Bobot, 1 nymph. Manaus: Reserva Florestal Adolpho Ducke (02°55'S/59°58'W), igarapé Tinga, 13.VI.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph; igarapé Bolívia, 16.IV.2002, A. M. O. Pes & C. A. Azevedo, 2 nymphs; igarapé Acará, 23.V.2002, A. M. O. Pes & C. A. Azevedo, 1 nymph; igarapé Barro Branco, 21.X.2002, A. M. O. Pes & C. A. Azevedo, 4 nymphs.

Enderleina. BRAZIL. Amazonas: Presidente Figueiredo: BR 174, km 115, igarapé do Lajes (01°59'S/60°01'W), 9.IX.2000, A. M. O. Pes, 1 nymph in slide mount. Manaus: Reserva Florestal Adolpho Ducke (02°55'S/59°58'W), igarapé Barro Branco, 06.VIII.2002, J. O. Silva, 1 nymph; igarapé Acará, 02.VI.2002, A. M. O. Pes, 1 nymph; CIGS, AM 010, km 54 (02°45'S/59°51'W), 21.V.2003, A. M. O. Pes, 1 nymph.

Identification key for last-instar nymphs of Perlidae genera from Central Amazonia, Brazil.

1. Subanal lobe gills present (Figs. 5, 15); posterior lateral border of pronotum expanded (Figs. 3, 13); ecdysial line of head capsule in a "W" shape, extending anteriorly between the paired ocelli (Figs. 1, 2, 11, 12); two or three ocelli present 2
 Subanal lobe gills absent (Fig. 10); posterior lateral border of pronotum not expanded (Fig. 8); ecdysial line of head not in a "W" shape, surpassing the ocelli and not extending between them (Figs. 6, 7); two ocelli present *Anacroneuria*
- 2(1). Ecdysial line extending anteriorly beyond the paired ocelli (Figs. 11, 12); inner margin of maxilla not concave (Fig. 18); three ocelli present *Enderleina*
 Ecdysial line extending anteriorly but not beyond the paired ocelli (Figs. 6, 7); inner margin of maxilla concave (Fig. 16); two ocelli present
 *Macrogynoplax*

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