

Plecoptera genera of two streams in Central Amazonia, Brazil

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Abstract

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Plecoptera were collected in the streams in the Ducke Reserve, AM. One stream exhibits natural condition, while the other stream is presenting sedimentation in suspension due to deforestation along its headwaters. The following Perlidae genera were collected: *Anacroneuria* (63.3%), *Macrogynoplax* (36.3%) and *Enderleina* (0.4%). Average number of specimens of *Macrogynoplax* was significantly lower (T-test, $P < 0.05$) in the stream with sedimentation.

Additional key words: *Anacroneuria*, aquatic insects, *Enderleina*, *Macrogynoplax*, stoneflies.

Resumo

BOBOT T, HAMADA N. 2002. Gêneros de Plecoptera de dois igarapés na Amazônia Central, Brasil. *Entomotropica* 17(3):299-301.

Plecoptera foram coletados em dois igarapés da Reserva Ducke, AM. Um dos igarapés se encontra em seu estado natural e o outro apresenta sedimentação em suspensão, pelo fato de apresentar desmatamento em sua cabeceira. Os seguintes gêneros de Perlidae foram coletados: *Anacroneuria* (63,3%), *Macrogynoplax* (36,3%) e *Enderleina* (0,4%). O número médio de espécimes de *Macrogynoplax* foi significativamente menor (teste-t, $P < 0,05$) no igarapé sedimentado.

Palavras chave adicionais: *Anacroneuria*, *Enderleina*, insetos aquáticos, *Macrogynoplax*.

Aquatic insect studies in the Brazilian Amazon region have been neglected; few papers have been published on this subject, despite the fact that the largest hydrographic basin in the world, in terms of water volume, is present in this region. Some bionomic and taxonomic studies have been done with Plecoptera in Central Amazonia (Alencar et al. 1999, Ribeiro-Ferreira 1995, 1996; Ribeiro-Ferreira & Froehlich 1999, 2001).

The present study was done in two unnamed streams (denominated here as "disturbed" and undisturbed") in the Adolpho Ducke Reserve, which is located in Manaus County, Amazonas State and belongs to the National Institute for Research in the Amazon (INPA). The reserve has four entrances; the two streams studied are located near the entrance named "Sabiá-I" (lat 03°00'S; 59°56'W). Both are lowland streams (0.50-1.0 m wide) located approximately at 60 m at the sea level and belong to the same drainage basin, also, they flow under the cover of a primary forest. However, they differ from each other because one has its headwaters running through a deforested area, carrying sediments resulting from soil erosion. Some workers

have shown that physical-chemical parameters such as water pH, conductivity, temperature and nutrient content are similar in small streams that flow under the forest canopy in some areas of Central Amazonia (e.g. Hamada 1993). The objective of the present study was to verify the faunal composition of Plecoptera in two streams in Central Amazonia. Plecoptera larvae were collected in basket traps (5'15'20 cm) made of galvanized wire enclosed in nylon bags (2-cm mesh) with four leaves of pomarac or mamei apple (*Eugenia malaccensis* L., Myrtaceae). A total of 14 samples were collected over the April 1992 - October 1993 period. In each sampling period, six baskets per stream were introduced in riffle areas, remaining submersed for 30 days. The organisms that colonized these basket traps were collected and preserved in a plastic container with 70% ethanol and identified in the laboratory. The Plecoptera genera were identified based on the key provided by Ribeiro-Ferreira (1996).

Both sampled sites in the streams were covered by forest canopy. The disturbed stream carries sediments because of deforestation in its headwaters while the undisturbed stream has characteristically black water.

Water physical chemical data from rainy and dry seasons, and from the beginning of the dry season indicate that pH, electrical conductivity and humic substances vary little between both streams, but total suspended solids is higher in the disturbed stream (Alencar & Hamada, unpublished data). The disturbed stream had a mean pH of 4.6 (n=3, range 4.5-4.7), mean electrical conductivity of 8.4 $\mu\text{S}/\text{cm}$ (n=3, range 7.5-9.0 $\mu\text{S}/\text{cm}$), mean humic substances of 17.7 ppm (n=3, range 9.0-27.7 ppm) and mean total suspended solid of 9.7 mg/l (n=3, range 4.3-20 mg/l). Natural stream presented mean pH of 4.2 (n=3, range 4.0-4.3), mean electrical conductivity of 13 $\mu\text{S}/\text{cm}$ (n=3, range 10.5-15.6 $\mu\text{S}/\text{cm}$), mean humic substances of 24.3 ppm (n=3, range 8.1-48.9 ppm) and mean total suspended solids of 1.5 mg/l (n=3, range 1.3-1.6 mg/l).

A total of 474 specimens of the family Perlidae (Plecoptera) were collected, of which 300 were *Anacroneuria*, 172 *Macrogynoplax* and 2 *Enderleina*. In the undisturbed stream, 259 specimens were collected, distributed among three genera, and in the disturbed stream, 215 specimens were collected, distributed between two genera (*Anacroneuria* and *Macrogynoplax*). Although the most abundant genera, *Anacroneuria* and *Macrogynoplax*, occurred in similar proportions in both streams, the mean number of the latter in the disturbed stream was significantly smaller (t-test, $P < 0.05$, insect numbers were \log_{x+1} transformed) than in the undisturbed stream (Figure 1). Ribeiro-Ferreira (1996) also worked at the Adolpho Ducke Reserve and collected *Macrogynoplax* in higher abundance in the Barro Branco stream than in the Bons Amigos stream. The Bons Amigos stream is located at the edge of this reserve and is partially deforested along its margin while the Barro Branco stream is practically undisturbed in the area studied by Ribeiro-Ferreira (1996). This author attributed the lower abundance of *Macrogynoplax* species in the Bons Amigos stream to the human in this stream. Studies in the temperate region also indicate that disturbance is related to the distribution and abundance of insects in streams at local and regional scales (Stone & Wallace 1998; Karr 1999; Lake 2000).

Even though the lack of additional comparable streams prevented replication in the present study, the results suggest that the number of specimens in the genus *Macrogynoplax* is negatively correlated with the presence of suspended sediment or deforestation in the headwaters. More studies need to be done on species in this genus to verify if they have potential to be used as indicators of water quality. Information on aquatic fauna and bio-indicator organisms is urgently needed in the Amazonian region because human impact on

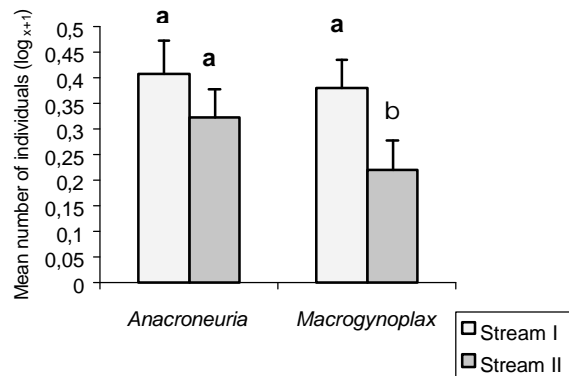


FIGURE 1. Mean number of individuals (\log_{x+1}) of *Anacroneuria* and *Macrogynoplax* (Plecoptera: Perlidae) in two streams in the Adolpho Ducke Reserve, Central Amazonia, Brazil. Within each genus, bars labeled with the same letter are not significantly different from each other at the 5% level. Stream I and II are undisturbed and disturbed, respectively.

water resources is increasing with the growth of population and development.

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References

- ALENCAR YB, HAMADA N, MAGNI-DARWICH, S. 1999. Stomach content analysis of potential predators of Simuliidae (Diptera: Nematocera) in two lowland forest streams, Central Amazonia, Brazil. *An Soc Entomol Brasil* 28(2):327-332.
- HAMADA N. 1993. Abundância de larvas de *Simulium goeldii* (Diptera: Simuliidae) e caracterização do seu habitat, em uma floresta de terra firme, na Amazônia Central. *Bol Mus Para Emilio Goeldi, sér. Zool* 9(2):203-218.
- KARR JR. 1999. Defining and measuring river health. *Freshwater Biol* 41:221-234.
- LAKE PS. 2000. Disturbance, patchiness, and diversity on streams. *J N Am Benthol Soc* 19:573-592.
- RIBEIRO-FERREIRA AC. 1995. Nova espécie de *Enderleina* Jewett do Norte do Brasil (Plecoptera-Perlidae). *Acta Amazon* 25:138-140.
- RIBEIRO-FERREIRA AC. 1996. Estudo da fauna de Perlidae (Plecoptera) em dois igarapés da Amazônia Central. [M.Sc. thesis]. Manaus (AM, Brasil): INPA/FUA. 76p.
- RIBEIRO-FERREIRA AC, FROELICH CG. 1999. New species of *Macrogynoplax* Enderlein, 1909 from North Brazil (Plecoptera: Perlidae, Acroneuriinae). *Aquat Insects* 21:133-140.

- RIBEIRO-FERREIRA AC, FROELICH CG. 2001. *Anacroneuria* Klapálek, 1909 from Amazonas State, North Brazil (Plecoptera, Perlidae, Acroneuriinae). *Aquat Insects* 23:187-192.
- STONE MK, WALLACE BJ. 1998. Long-term recovery of a mountain stream from a clear-cut logging: the effects of forest succession on benthic invertebrate community structure. *Freshwat Biol* 39:151-169.