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Description of immatures and association with adults of three species of *Anacroneuria* Klapálek (Plecoptera: Perlidae) of the Brazilian Amazon

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Abstract

Nymphs of three species of the genus *Anacroneuria* Klapálek, 1909, *A. marlieri* Froehlich, 2001; *A. minuta* Klapálek, 1922, and *A. manauensis* Ribeiro-Ferreira, 2001 are described. The associations of nymphs with adults were made by rearing. The known geographical distribution in Brazil of these three species was expanded.

Key words: Stonefly, nymphs, rearing, aquatic insects, South America

Introduction

The genus *Anacroneuria* Klapálek is distributed from the southern Nearctic and Neotropics to northeastern Argentina (Stark *et al.*, 2009; DeWalt *et al.* 2014). This is the largest genus in the Perlidae with at least 300 described species (Froehlich 2010, DeWalt *et al.* 2013, 2014). The genus includes approximately 150 known species from Brazil including fifteen known from the Brazilian Amazon (Froehlich 2010, Ribeiro & Rafael 2009). Most species descriptions of *Anacroneuria* are based on adults, usually males without associations of the immature stages. Only a few publications of new species have also included nymphal descriptions despite the importance of this stage in understanding the ecology of tropical streams and in water quality assessments. The absence of species level keys to *Anacroneuria* nymphs hampers the study of the taxonomy, life history, and ecology of this genus in South America. Existing keys are available only to the generic level or for a few selected species (Froehlich 1984b, Hamada & Couceiro 2003, Olifiers *et al.* 2004).

Currently, the nymphs of only 23 species of *Anacroneuria* are known. In Brazil, only nine of 150 species are known as nymphs (Righi-Cavallaro & Lecci 2010, Silva *et al.* 2011; Novaes *et al.* 2012). In the present study nymphs of three species of the genus *Anacroneuria* from the Brazilian Amazon are associated with adults for the first time and compared. This study increases the number of *Anacroneuria* species known from nymphs from the Brazilian Amazon to six.

Papers describing nymphs of Brazilian Perlidae include Froehlich (1984b, c) who provided descriptions of nymphs from southeastern Brazil; Dorvill & Froehlich (1999, 2001) added characters for the distinguishing the perlid nymph of *Kempnyia tijucana*. Other nymphs have been described: *A. debilis* (Pictet 1841); *A. otafroehlichii* Righi-Carvalho & Lecci (2010); *K. gracilentata* (Enderlein, 1909); *K. neotropica* (Bispo *et al.* 2013); *K. reticulata* (Klapálek 1916); *K. colossica* (Návas 1934); *Macrogynoplax veneranda* Froehlich (1984b) and *A. ofaye* Novaes *et al.* (2012).

For other Neotropical species, Hynes (1948) provided descriptions for Trinidad species (*A. aroucana* Kimmins, 1948); Maldonado *et al.* (2002) and Stark (1995) described nymphs from Venezuela (*A. blanca* Stark, 1995; *A. caraca* Stark, 1995; *A. cruza* Stark, 1995; *A. muesca* Stark, 1995; *A. paleta* Stark, 1995; *A. segnini*, Stark & Maldonado, 2002 and *A. shamatari* Stark, 1995); Stark (1998) described nymphs from Costa Rica and Panama (*A. maritza* and *A. uatsi*); Stark & Kondratieff (2004) described nymphs from Mexico and Guatemala (*A. baumanni* Stark & Kondratieff, 2004; *A. quadriloba* Jewett, 1958); Zúñiga & Stark (1999) described a nymph from Ecuador

seems to be more tolerate of anthropogenic impacts to water quality. This species was collected in impacted and degraded habitats.

TABLE 4. Collection localities in Brazilian Amazon as mentioned in the text.

State	Municipality	Locality	Latitude	Longitude
Amapá	Macapá	Floresta Nacional do Amapá	0.9717	-51.6139
Amazonas	Manaus	BR174, ZF3	-2.353056	-59.984722
Amazonas	Manaus	BR174, ZF3	-2.3986	-59.8783
Amazonas	Presidente Figueiredo	RPPN Cachoeira da Onça, BR174, km 108	-2.0344	-60.0250
Amazonas	Manaus	Reserva de Desenvolvimento Sustentável do Tupé	-3.0342	-60.2763
Amazonas	Manaus	Reserva Florestal Adolpho Ducke	-2.921689	-59.955203
Maranhão		Imperatriz, Ribeirãozinho	-5.760842	-47.474386
Mato Grosso		Chapada dos Guimarães	-15.373103	-55.826253
Pará	Castanhal	Apeú River,	-1.258136	-48.008678
Pará	Peixe-Boi	Peixe Boi River Urubuquara	-1.169458	-47.315575
Pará	Peixe-Boi	Peixe-Boi River Abaeté	-1.139181	-47.323633
Pará	Capanema	Capanema River Toca do Índio	-1.210008	-47.136672
Roraima	Amajari	Serra do Tepequém	3.6522	-61.3706

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