

## Description of the immature stages of *Anastomoneura guahybae* Huamantincó & Nessimian, 2004 (Trichoptera: Odontoceridae), with a new record for the genus and keys to larvae and pupae of Neotropical genera

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### Abstract

The larva and pupa of *Anastomoneura guahybae* Huamantincó & Nessimian from tributaries of the Rio Aiuruoca, Minas Gerais, Brazil, are described, illustrated and compared with other Odontoceridae. The larva is characterized by a reduced lateral carina on the head, a membranous metanotum, a distinctive pattern of ventral setae on abdominal segment I and by the presence of a conspicuous dorsal spine on the anal claw. The larva of *Anastomoneura* is similar to those of the nearctic genera *Nerophilus* and *Namamyia* principally by the undivided mesonotal plates, and by the position and form of setal areas on the metanotum. The pupa is very similar to other odontocerids. The specimens were collected from sandy substrates in small order streams. Animal parts, plant fragments and detritus were observed in the larval gut contents. The genus *Anastomoneura* is for the first time recorded from the State of São Paulo, Brazil. Keys to larvae and pupae of known Neotropical genera of Odontoceridae are presented.

**Key words:** *Anastomoneura guahybae*, Odontoceridae, larva, pupa, Brazil, taxonomy, new record, keys to Neotropical genera

### Resumo

A larva e a pupa de *Anastomoneura guahybae* Huamantincó & Nessimian, de tributários do Rio Aiuruoca, Itamonte, Minas Gerais, Brasil, são descritas, figuradas e comparadas com outros Odontoceridae. A larva é caracterizada por ter a carena lateral da cabeça reduzida, o metanoto membranoso, um padrão distintivo de cerdas na região ventral do segmento abdominal I e a presença de um espinho dorsal conspícuo na garra anal. A larva de *Anastomoneura* é muito similar àquelas dos gêneros neárticos *Nerophilus* e *Namamyia* principalmente por possuir as placas mesonotais não divididas, e pelo posicionamento e forma das áreas setais no metanoto. A pupa é

muito parecida com a de outros odontocerídeos. Os espécimes foram coletados em riachos de pequena ordem, em substrato arenoso. Partes animais, fragmentos vegetais e detritos foram observados nos conteúdos digestivos das larvas. O gênero *Anastomoneura* é registrado pela primeira vez para o Estado de São Paulo, Brasil. Chaves para identificação de larvas e pupas dos gêneros conhecidos de Odontoceridae da Região Neotropical são fornecidas.

**Palavras-chave:** *Anastomoneura guahybae*, Odontoceridae, larva, pupa, Brasil, taxonomia, novo registro, chaves para gêneros neotropicais

## Introduction

The knowledge of the taxonomy and biology of aquatic immature stages of Trichoptera is important for limnological studies as these insects are a diverse and abundant component of the aquatic fauna. In addition to their ecological diversity, Trichoptera larvae display a wide range of tolerance to different levels and types of pollution and are very useful organisms in water quality monitoring programs (Resh 1995; Paprocki *et al.* 2004). However, there is a lack of knowledge on immature stages of Neotropical Trichoptera. Of the 2230 species of Trichoptera known from the Neotropical Region (Flint *et al.* 1999, Prather 2003), only a very few have been described in the immature stages (Holzenthall 2004).

Odontoceridae is a small family, with 14 genera and 115 species (Prather 2005). They occur in all faunal regions except the Afrotropical, and do not show a great species diversity in the tropics (Flint *et al.* 1999). Two subfamilies are recognized: Pseudogoerinae, with only the genus *Pseudogoeroa* Carpenter 1933, and Odontocerinae, which includes all other genera (Wiggins 1996a). The family Odontoceridae has 3 Neotropical genera: *Barypenthus* Burmeister 1939, with 1 species, *Marilia* Müller 1880 with approximately 54 species, and the recently described *Anastomoneura* Huamantínco & Nessimian 2004 with 1 species (Paprocki & Holzenthall 2002; Huamantínco & Nessimian 2004; Prather 2005). Immature stages of *Marilia* and *Barypenthus* have been described by Wiggins (1996a) and Flint (1969), respectively. Here we describe and illustrate for the first time the larva and pupa of *Anastomoneura guahybae* from small order streams in the Serra da Mantiqueira, Minas Gerais state, southeastern Brazil. Keys to larvae and pupae of the known Neotropical odontocerid genera are also presented.

## Material and methods

Larva and pupa were collected by hand and with sieves from small order tributaries of the Rio Aiuruoca, Itamonte, Minas Gerais State, Brazil (between 22°19.643'S 44°40.631'W and 22°19.689'S 44°40.325'W). The specimens were collected from sandy substrate in moderately flowing water. The larval and pupal morphological terminology follows Wiggins (1996a, b). Association and identification were made by rearing pupae in an

aquarium to the adult stage. Non-permanent microscope slides of larval guts were prepared to identify ingested food items. The illustrations were made using a Zeiss SV6 stereomicroscope equipped with a camera lucida. Voucher specimens are located in the following institutions: DZRJ- Coleção Entomológica do Departamento de Zoologia (Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil); MNRJ- Museu Nacional do Rio de Janeiro (Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil); MZUSP- Museu de Zoologia da Universidade de São Paulo (São Paulo, SP, Brazil).

## Description

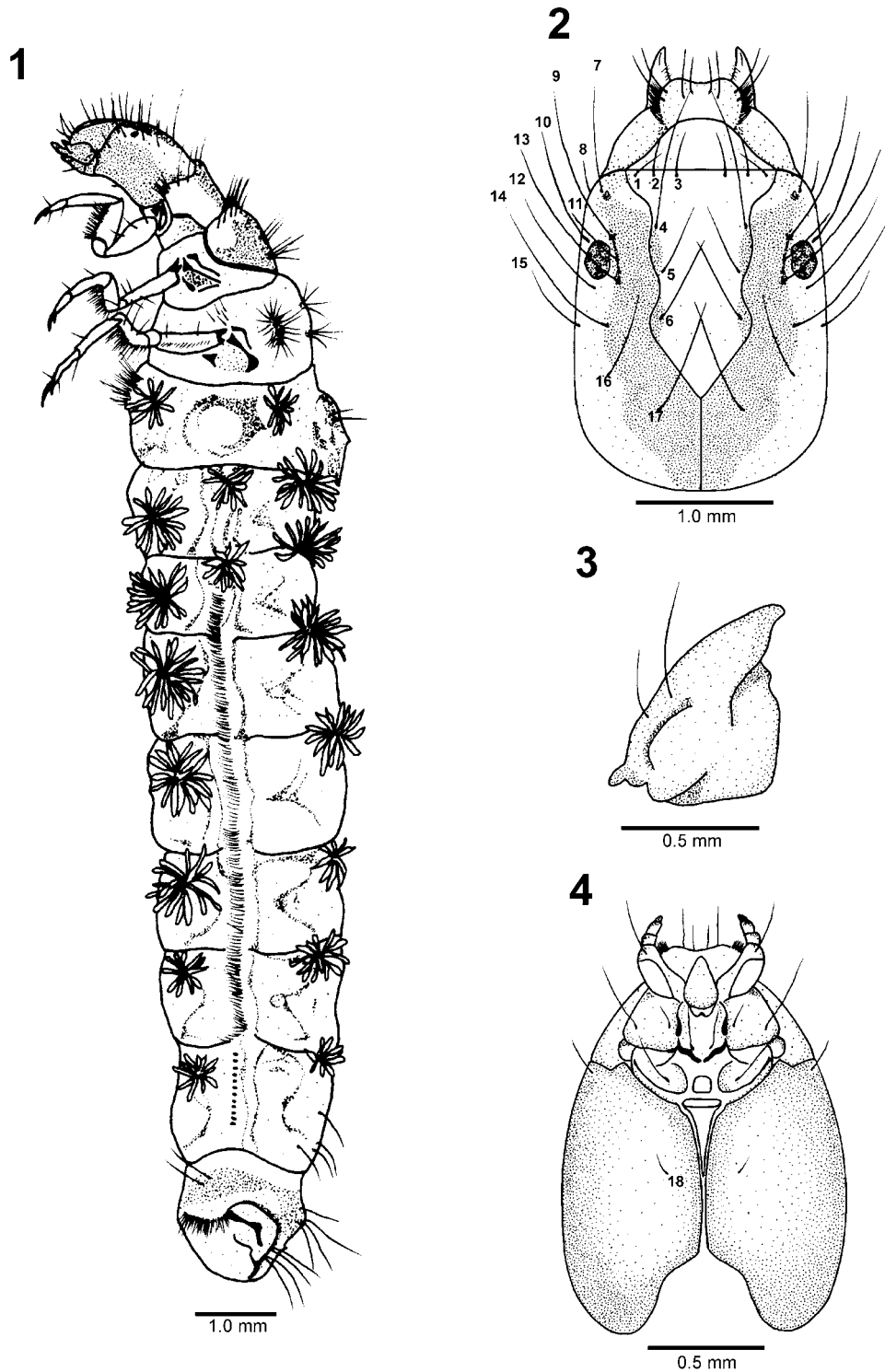
### *Anastomoneura guahybae* Huamantínco & Nessimian, 2004

**Larva** (Figs. 1-10): Total length: 18-34 mm (n=8); general color brown (Fig. 1).

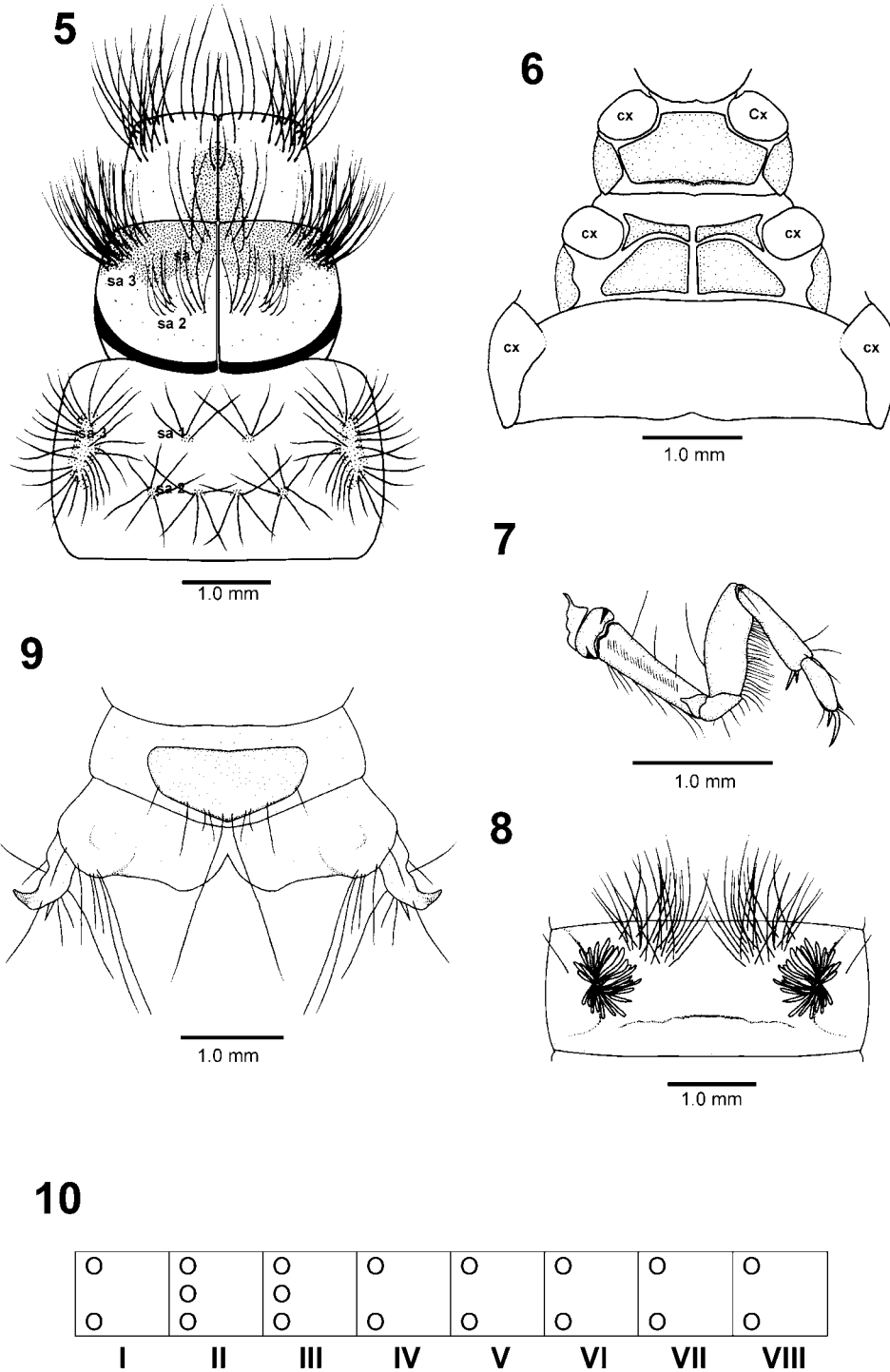
*Head* (Figs. 2-4): Two times longer than wide, 2 times longer than pronotum, slightly depressed dorsoventrally, with 1 dark band at each side, both bands converging backwards and meeting near vertex, resembling an inverted “V” (Fig. 2); eyes placed anterolaterally on superior third of head; lateral carina barely marked, extending a little beyond the eye; all primary setae present, setae 1 curved inward, setae 4, 6, 9, 13, 16 and 17 long; labrum narrow, with row of about 30 pale setae on lateral margin, 4 pairs of primary setae present (setae 1 and 2 absent) (Fig. 2); mandibles broad, conical, with blade-like outer margin and rhomboidal apical tooth, 2 setae on dorsal region (Fig. 3); labium and maxilla well developed; ventral apotome triangular, not reaching posterior head end (Fig. 4).

*Thorax* (Figs. 5-7): Pronotum yellowish brown, with black posterolateral edges; anterior margin with 2 parallel rows of 10 pairs of long setae; 2 other small lateral setae and 1 pair of short setae posteriorly near median line. Mesonotum yellowish brown, posterolateral edges dark and rounded; *sa1* with 4 setae, *sa2* with 8–10 setae, *sa3* with 18–20 setae. Metanotum membranous, wider than pronotum and mesonotum, *sa1* small and ovoid, with 4–6 setae, *sa2* with two groups of setae, the innermost with 4–5 setae and the outermost with 5–7 setae, *sa3* large, bearing 28–32 setae (Fig. 5). Prosternum consisting of 1 large undivided plate. Mesosternal plate subdivided medially (Fig. 6). Legs robust, with several long dark setae mainly on coxae and femora; tibiae with pair of apical spurs; tarsi with long curved claws bearing long basal spine (Fig. 7).

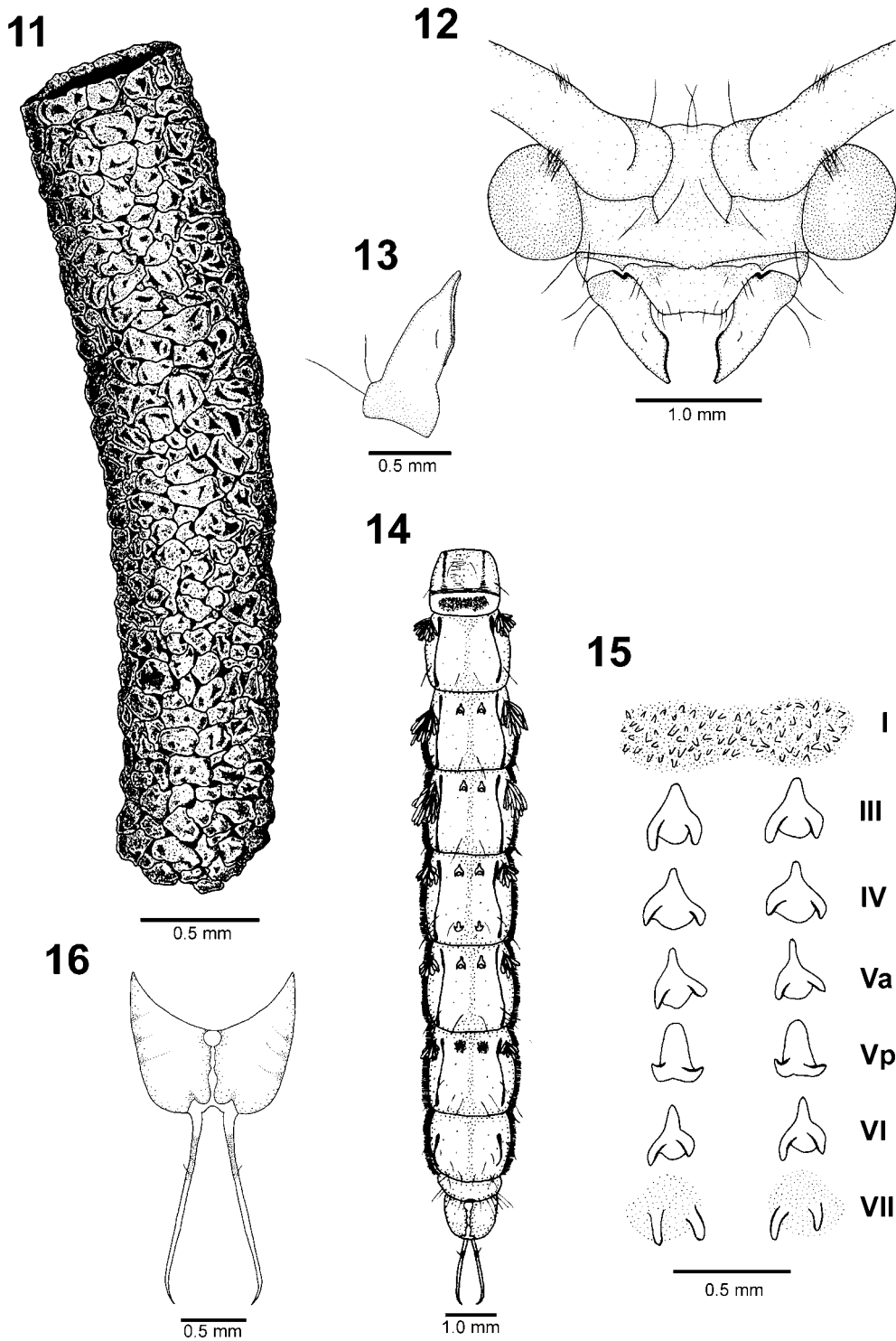
*Abdomen* (Figs. 8-10): Lateral fringe of pale setae on segments III–VII; segment I with well-developed dorsal and lateral humps, venter of segment bearing each side one group of 22–26 setae near midline and an isolated lateral seta (Fig. 8); all gills branched, with 3 main stems; dorsal and ventral gills on segments I–VIII, gills less developed on segment I and well developed on segments II–V (some smaller specimens lack ventral gills on segment VIII); segments II and III with lateral gills (Fig. 10); segment VIII with 12 forked lamellae; tergite IX with 5 pairs of setae, the innermost pair 2 times longer than others;



**FIGURES 1–4.** *Anastomoneura guahybae*, larva. 1. Larva, lateral view; 2. Head, dorsal view; 3. Left mandible, dorsal view; 4. Head, ventral view.



**FIGURES 5–10.** *Anastomoneura guahybae*, larva. 5. Thorax, dorsal view; 6. Thorax, ventral view (cx, coxae); 7. Abdominal segment I, ventral view; 8. Foreleg; 9. Abdominal segments IX–X and anal claw; 10. Gill diagram: position of filaments on abdominal segments I–VIII.



**FIGURES 11–16.** *Anastomoneura guahybae*, case and pupa. 11. Case; 12. Head, frontal view; 13. Left mandible, dorsal view; 14. Abdomen, dorsal view; 15. Abdominal hook plates; 16. Apex of abdomen, dorsal view.

venter of segment IX with 2 pairs of short setae; prolegs broad, with thin pale fringe of short setae on posterior margin of ventral region, 5 dorsolateral long thick setae on base and 1 lateral pair; anal claw long, right-angled, with 8 thick setae and a conspicuous dorsal spine (Fig. 9).

*Case* (Fig. 11): made with large sand grains, 21–30 mm long; anterior extremity 5–8 mm wide, cylindrical, slightly curved, smooth; anterior opening circular.

**Pupa** (Figs. 12-16): total length 18–22 mm, maximum width 7 mm (n=3).

*Head* (Figs. 12-13): about 1.5-2 times as long as wide; eyes well developed; frontoclypeus with rugose central area with 2 pairs of setae; 1 pair of setae beyond the eyes, 1 pair of setae on genal area near base of mandible; labrum trapezoidal, with 3 pairs of setae on base and 4 apical pairs; tentorial pits conspicuous; vertex with 2 pairs of setae; antennal scape with dorsal tuft of 6 setae and ventrolateral tuft of 10 setae (Fig. 12); flagellum with apical tuft of 3 short, brown thick setae on each segment; mandible long, triangular, flattened dorsoventrally, with 2 thick dark ventrolateral setae, inner margin serrate posteriorly (Fig. 13); maxillary palp 5-segmented, long, extending beyond base of forecoxa; labial palp 3-segmented, short, reaching base of forecoxa.

*Thorax*: Pronotum with 4 pairs of dorsal setae. Mesonotum with 1 anterior pair of setae near median line and 9 pairs of setae on central area. Metanotum with 6 pairs of setae on central area, 1 pair long and 2 pairs short. Legs long, with 2 rows of long, thin setae on tarsomeres I and II; trochanter of anterior leg with 4 setae and trochanter of median leg with 1 pair of setae on inner region; wing pads reaching abdominal segment V.

*Abdomen* (Figs. 14-16): lateral fringe extending from half of segment III to segment VIII; abdominal segment I with dorsal transverse striae, and 1 posterolateral and 1 median pair of setae; segment I with hook plates fused, forming single plate with several small short, truncated spines (more than 60); segments II-VII with 1 dorsal and 1 ventral pair of tufts of branched, filamentous gills; segments II-VIII with 1 pair of postero-median dorsal setae and 1 posterolateral pair of setae; segments V-VI with 1 posterolateral pair of setae; segments VII-VIII with 2 posterolateral pairs of setae; segment IX with 8 pairs of setae (Fig. 14); segments III-VII with 2 anterior, cordiform hook plates, each one bearing 2 hooks curved backward; plates of segment VII with larger hooks; posterior hook plates on segment V longer, with rounded base and 2 hooks curved forward (Fig. 15); segment IX slightly sclerotized with longitudinal median depression, posterior margin with a median obtuse lump, apical process long, thin, smoothed and curved at the apex (Fig. 16).

**Material examined.** Larvae: **BRAZIL: Minas Gerais:** Itamonte, 2nd order stream, 22°19'41.3"S 44°40'19.5"W, 2044 m, 20.iii.2004, J. L. Nessimian., 3 larvae (DZRJ 666, 669, 670), 3 empty cases (DZRJ 680); 09.iv.2005, A. P. Santos, A. L. Henriques, B. M. Miranda, J. L. Nessimian, L. L. Dumas & M. R. de Souza, 4 larvae (DZRJ 671, 672), 28 empty cases (DZRJ 679), A. P. Santos, B. M. Miranda, J. L. Nessimian & L. L. Dumas, 26 empty cases (DZRJ 675); 1st order stream, 22°19'37.2"S 44°40'12.4"W, 2060 m, 09.iv.2005, A. P. Santos, B. M. Miranda, J. L. Nessimian & L. L. Dumas, 7 larvae (DZRJ

667, 668, 674), A. P. Santos, B. M. Miranda, J. L. Nessimian & L. L. Dumas, 9 larvae (DZRJ 676) A. P. Santos, A. L. Henriques, B. M. Miranda, J. L. Nessimian, L. L. Dumas & M. R. de Souza, 1 larva (DZRJ 678); 10.xii.2005, A. P. Santos & L. L. Dumas, 2 larvae (DZRJ 673, 681), A. P. Santos, L. L. Dumas & M. R. de Souza, 5 empty cases (DZRJ 682); 3rd order stream, 22°19'56.7"S 44°40'58.9"W, 1865 m, 09.xii.2005, A. P. Santos, L. L. Dumas & M. R. de Souza, 2 larvae (DZRJ 683, 684); 1st order stream, 22°20'26.2"S 44°41'31.0"W, 1780 m, 09.xii.2005, A. P. Santos, J. L. Nessimian, L. L. Dumas & M. R. de Souza, 2 larvae (DZRJ 685); Rio Aiuruoca, 22°20'55.7"S 44°41'36.4"W, 1860 m, x.2003, J. L. Nessimian & A. A. Huamantincó (DZRJ 677).

Pupae: **BRAZIL: Minas Gerais:** Itamonte, 1st order stream, 22°20'26.2"S 44°41'31.0"W, 1834 m, 09.xii.2005, A. P. Santos, J. L. Nessimian, L. L. Dumas & M. R. de Souza, 2 pupae (DZRJ 686); 2nd order stream, 22°19'38.6"S 44°40'37.9"W, 1898 m, 22.xi.2004, J. L. Nessimian & L. L. Dumas, 1 pharate adult with pupal exuviae (DZRJ 687).

**Biology and habitat.** Larva and pupa were collected from 1st and 2nd order tributaries of the Rio Aiuruoca, Minas Gerais, at altitudes varying from 1780 to 2060 m above sea level. The streams have clean and cold water, widths ranging from 0.4 to 1.0 m wide, and a median outflow of 0.7 m<sup>3</sup>s<sup>-1</sup>. The specimens were found in less than 10 cm-deep sand substrate. Gut content analysis indicated that larvae are omnivorous. The predominant food items were animal parts (setae, pieces of cuticle, heads, legs, and claws of insects), plant fragments (plant fibers, algae – Desmidiaceae and Cyanophyceae) and detritus.

**Distribution.** Until now, *Anastomoneura* was only recorded from the Serra da Mantiqueira mountain range, in Minas Gerais state, Southeastern Brazil. Larvae of this genus, probably belonging to *A. guahybae*, were found in 3 streams at São José do Barreiro, Serra da Bocaina National Park, São Paulo state. These records extend the distribution of the genus to the Serra do Mar mountain range and to lower altitudes (1200 m): 3rd order tributary of Córrego da Floresta, 22°42'46.7"S, 44°38'14.2"W, 1575 m; Córrego das Posses, 2nd order stream, 22°46'06.6"S, 44°36'36.0"W, 1270 m; Ribeirão da Prata, 4th order stream, 22°46'48.9"S, 44°36'40.4"W, 1200 m.

**Comments.** The larva of *Anastomoneura guahybae* fits the subfamily Odontocerinae in having an unexpanded fore tibia and slender apical spurs. Although *Anastomoneura* does not present exclusive diagnostic features, the genus can be recognized by the following characters: head with reduced lateral carina; rounded and not produced pronotal anterolateral margins; mesonotal tergites undivided; metanotum membranous, metanotal setal areas small and ovate, metanotal *sa*2 subdivided; ventral gills on abdominal segments I–VIII; venter of abdominal segment I with 22 – 26 setae on each side near median line and 1 seta near lateral margin; anal claw with a conspicuous stout spine.

Concerning the New World genera, *Anastomoneura* larvae differ from those of *Barypenthus*, *Parthina* Denning, 1954, and *Psilotreta* Banks, 1899 in having rounded, not



pointed anterolateral pronotal margins and an unsclerotized metanotum (Flint 1969; Wiggins 1996a). *Anastomoneura* differs from *Marilia* in having each mesonotal plate undivided, a unsclerotized metanotum and small, ovate metanotal setal areas (Drecktrah 1990; Wiggins 1996a). This pattern approximates the genus to *Namamyia* Banks, 1905 and *Nerophilus* Banks, 1899 (Wiggins 1996a). Besides the above mentioned features, these 3 genera have metanotal *sa*<sub>2</sub> subdivided. *Anastomoneura* is especially similar to *Nerophilus* sharing several characteristics. These 2 genera differ from *Namamyia* by the presence of a vestigial lateral carina on the head, short ventral apotoma, cephalic dark band, head texture smooth (not pebbled), ventral gills on abdominal segment I, anal prolegs broad with a thin pale fringe of short setae on the posterior margin of the ventral region, and the stout dorsal spines on the anal claw. *Anastomoneura* can be distinguished from *Nerophilus* by the undivided prosternal plate, the ventral setal pattern of abdominal segment I (only 2 setae in *Nerophilus*) and a single dorsal, pre-apical spine on the anal claw (two spines in *Nerophilus*) (Wiggins 1996a). The proximity of *Anastomoneura* with *Nerophilus* was suggested by Huamantincó & Nessimian (2004) based on the adult morphology.

The pupa of *Anastomoneura* resembles those of other described Odontocerinae and can be recognized by the following characters: mandible dorsoventrally flattened with inner margin serrate posteriorly; abdominal gills on segments II–VII; lateral abdominal fringe on segments III–VIII; hook plates on abdominal segment I forming a single plate with several small spines; segments III–VII with anterior, cordiform hook plates bearing 2 hooks curved backward; posterior hook plates of segment V with 2 hooks curved forward. *Anastomoneura* pupa differs from *Barypenthus* and *Psilotreta* by the presence of hook plates on abdominal segment I. The number of hooks on the anterior hook plates distinguishes *Anastomoneura* from *Marilia* and also from *Psilotreta*, which has a single hook (Flint 1969; Drecktrah 1990, Parker & Wiggins 1987).

### Keys to the immature forms of the known Neotropical genera of Odontoceridae

#### Larvae

1. Anterolateral margins of pronotum produced and sharply pointed.....*Barypenthus*
- 1'. Anterolateral margins of pronotum rounded, not pointed..... 2
2. Lateral carina of head well developed; each mesonotal plate divided into 3 sclerites; metanotum with sclerotized plates ..... *Marilia*
- 2'. Lateral carina of head reduced; mesonotal plate undivided; metanotum membranous ..  
..... *Anastomoneura*

#### Pupae

1. Hook plates on abdominal segment I absent; posterior hook plates on segment V represented by a single band, bearing a series of small spines along entire margin of segment.....*Barypenthus*

- 1'. Hook plates on abdominal segment I present, consisting of a continuous strip with several small spines; posterior hook plates on segment V separated, bearing 2 hooks curved forward ..... 2
2. Outer margin of mandibles serrate, inner margin smooth; anterior hook plates on segments III – VII with a single hook ..... *Marilia*
- 2'. Outer margin of mandibles smooth, inner margin serrate; anterior hook plates on segments III – VII with 2 hooks ..... *Anastomoneura*

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