



<http://dx.doi.org/10.11646/zootaxa.3956.2.9>

<http://zoobank.org/urn:lsid:zoobank.org:pub:A57870FB-9CAA-4C51-A1E6-98CCAD5612DF>

A new species of *Amanahyphes* Salles & Molineri, 2006 (Ephemeroptera: Leptoxyphidae) from Bahia, Brazil

CARLOS MOLINERI¹, LUCAS R. C. LIMA², WILLIAM D. KNAPP³ & LOYANA DOCIO³

¹Instituto de Biodiversidad Neotropical, CONICET (National Council of Scientific Research)-Universidad Nacional de Tucumán, Tucumán, Argentina, UNASUR. E-mail: carlosmolineri@gmail.com

²Universidade Estadual do Piauí, Campus Heróis do Jenipapo, Laboratório de Diversidade Animal e Vegetal, CEP 64280-000, Campo Maior-PI, Brazil. E-mail: lucaslima_86@hotmail.com

³Universidade do Estado da Bahia, Campus IX, Departamento de Ciências Humanas, Laboratório de Biologia Geral, rod. Br 242, km 4. CEP 47806-972, Barreiras, BA, Brazil

Abstract

A new species of the previously monotypic genus *Amanahyphes* Salles & Molineri, 2006 is described based on the male imago, egg and nymph from the state of Bahia, Brazil. Characters and illustrations to distinguish *Amanahyphes bahiensis* sp. nov. from *A. saguassu* and all other species in Leptoxyphidae are provided. *Amanahyphes bahiensis* sp. nov. is diagnosed as follows: in the male imago, forewing shaded slightly with brownish at basal third and penes basally fused, distally with diverging lobes, and with a short spine-like projection at midlength on lateral margin; in the nymph, femoral spines long, slender and acuminate, tarsal claws with 10–11 marginal denticles and 2+3 subapical submarginal denticles, gill formula 3/2/2/2. Geographic records of both species are amended and indicated on a map.

Key words: Pannota, Neotropical Region, *Amanahyphes saguassu*, *Leptoxyphodes inanis*

Introduction

Amanahyphes Salles & Molineri, 2006 was described from all stages (male and female adults, egg and nymph) based on material collected from Amazonas state, Brazil. Until now, the only species in the genus has been the type species, *A. saguassu* Salles & Molineri, 2006, which has been recorded not only from Amazonas, but also from the Brazilian states of Pará (Gonçalves & Da-Silva 2010) and Maranhão (Cruz *et al.* 2011), and from the Venezuelan state of Bolívar (Molineri *et al.* 2011).

Amanahyphes shares many characters with *Leptoxyphodes* Ulmer, 1920: male eyes enlarged and divided in two portions, elongate wings, two-segmented forceps arising from posterolateral projections of the styliger plate; nymphal legs long and slender with claws showing two sets of denticles (a marginal row basally and a double submarginal row subdistally) and operculate gills subtrapezoidal in shape, narrowest proximally, and with inner margin nearly reaching midline of the body distally (Molineri 2005, Salles & Molineri 2006). Nevertheless, the penes, the eggs, and the structure of the gills seem different enough to justify the validity of both genera (Salles & Molineri 2006, Dias *et al.* 2007). The penes of *Amanahyphes* show small spines subdistally on the lateral margin (no such spines found on *Leptoxyphodes*); the eggs present a blunt polar cap formed by coiled threads and on the other pole a large conic structure composed of triangular plates (only one polar cap in *Leptoxyphodes*); finally, the gills do not have small, flap-like lamellae on the ventral side (present in *Leptoxyphodes*) (Salles & Molineri 2006). The nymphs can be found in streams and rivers, mainly on submerged roots and marginal vegetation, but also on inorganic substrate such as sand, gravel and stones (Belmont *et al.* 2012). Adults are attracted to lights, but the nuptial flight is unknown (Salles & Molineri 2006).

In the present paper we describe a new species of *Amanahyphes* based on male imago, egg and nymph from the state of Bahia, Brazil. Additionally, we provide characters and illustrations to separate this new species from *A. saguassu* and all other species in Leptoxyphidae. A map is included indicating the geographical records of both *Amanahyphes* species (Fig. 26).

Material and methods

The material on which this study is based is housed in the following institutions: CZNC (Coleção Zoológica Norte Capixaba, São Mateus, Brazil) and IBN (Instituto de Biodiversidad Neotropical, Tucumán, Argentina).

Eggs were studied under a light microscope, as were the wings, genitalia, legs and nymphal mouthparts. Permanent slides were made using Canada Balsam. Photographs were taken with a NIKON D5000 camera (Japan); drawings were made using a camera lucida attached to the stereomicroscope (Nikon SMZ10, Japan) or to the light microscope (OLYMPUS BX51). The gills were dissected and placed in alcohol with some drops of alcohol gel to prevent movements in the fluid while they were viewed with a stereomicroscope and drawn. Some difficult structures such as denticles on tarsal claws were studied using phase contrast microscopy (OLYMPUS BX51).

Results

Amanahyphes bahiensis sp. nov.

(Figs. 1–25)

Material examined. HOLOTYPE: male imago, Brazil, Bahia, Barreiras, Vau da Boa Esperança, first order stream, S 12° 12' 18.3" - W45° 13' 30", elevation 548 m, 16.iii.2014, W. Knapp & L. Lima colls. PARATYPES: four male imagos (parts of two individuals on slides IBN677CM and IBN691CM) and one nymph, same data; one mature female nymph, same data except 25.i.2014 (parts on slide IBN678CM). Holotype and paratypes deposited in CZNC; except the aforementioned slides and associated specimens (2 male imagos and one female nymph) in IBN.

Diagnoses. Male imago: forewing shaded slightly with brownish in basal third (Fig. 1); penes basally fused, distally with diverging lobes, and with a short spine-like projection at midlength on the lateral margin (Fig. 2). Nymph: femoral spines long, slender and acuminate; tarsal claws with 10–11 marginal denticles and 2+3 subapical submarginal denticles (Fig. 12); gill formula (number of lamellae per gill) 3/2/2/2 (Figs. 22–25).

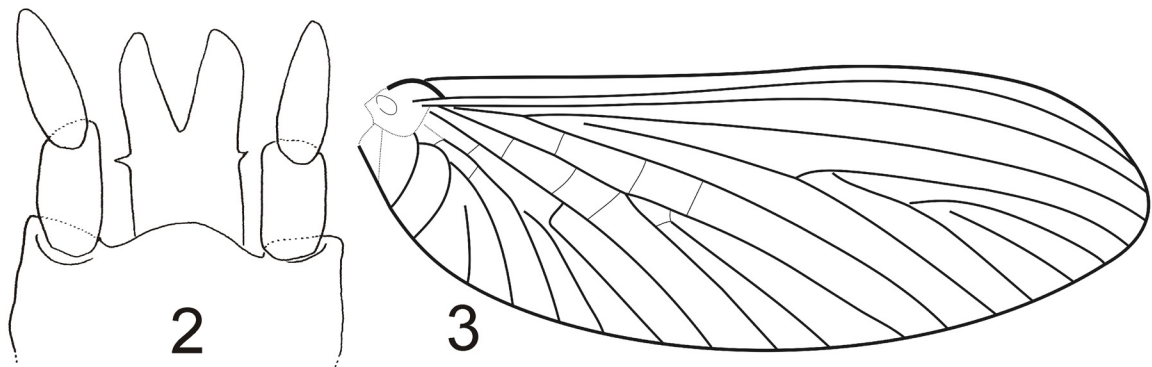
Descriptions. Male imago. Length (mm): body, 3.8–4.3; forewing, 4.1–4.5; foreleg, 3.0–3.5; terminal filament, 3.3–3.5; cerci, 3.0. Length ratios: body/forewing = 0.9–1.0; body/foreleg = 1.1–1.3; body/terminal filament = 1.2; body/cercus = 1.3–1.4. General coloration yellowish white with blackish spots on legs and abdomen (Fig. 1). Head: Color whitish, shaded with brown ventrally. Eyes large and almost touching dorsally, with large dorsal portion and small ventral portion, both blackish (Fig. 1). Antennae pale. Thorax: Pronotum yellowish translucent, shaded black on anterolateral corners, sternum yellowish white. Meso- and metanotum yellowish white shaded light brown on mesoscutum, carinae darker; meso- and metapleura yellowish white, shaded blackish at base of wing and around coxa; meso- and metasterna with light brown sclerites and yellowish translucent membranes. Legs (Table 1): coxae and trochanters light brown; femora whitish and shaded with grayish brown, darker on basal and apical bands; tibiae and tarsi whitish, with subproximal blackish mark on each tibia; foreclaws blunt, middle and hind tarsi each with dissimilar claws, blunt and acute. Foreleg ratio of segments, femur (0.6–0.7 mm = 1): tibia (1.4–1.8): 1st tarsomere (0.8–1.2): 2nd tarsomere (0.1–0.2): 3rd tarsomere (0.6–0.8): 4th tarsomere (0.7–0.9): 5th tarsomere (0.9). Other leg measures and ratios in Table 1. Wings (Figs. 1, 3): Membrane hyaline except basal third tinged with brownish; longitudinal and cross veins brownish on tinged area but becoming whitish translucent distally. Abdomen (Fig. 1): Translucent with whitish intersegmental membranes, except segments IX–X completely whitish; terga II and VI each with posteromedian blackish spot, darker and larger on tergum VI; tergum IX with transverse diffuse blackish mark; segments II–VIII with blackish spiracular marks. Abdominal sterna translucent with diffuse brownish sublateral marks on sterna IV–VIII. Genitalia (Fig. 2) whitish, shaded light brown on sternum IX; penes and forceps whitish translucent; styliger with rounded median margin, projected at base of each forcep; forceps bisegmented; penes fused in basal half, lobes diverging distally; spine-like projection present at midlength on lateral margin (Fig. 2). Caudal filaments whitish translucent.

Female adult. Unknown.

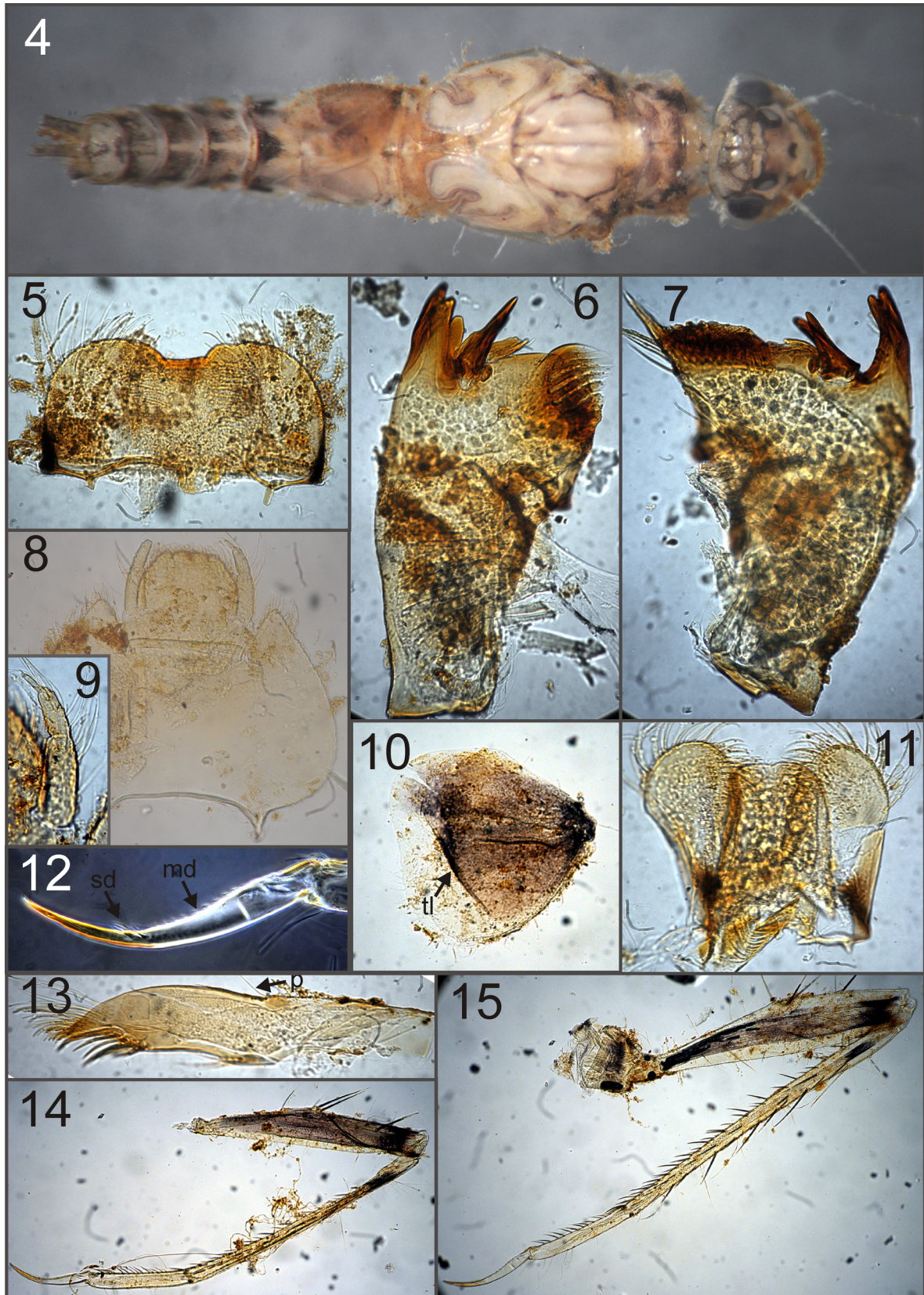
Eggs (extracted from mature nymph, Fig. 20). Length (including polar caps), 205–225µm; maximum width, 103–113µm. Ovate in shape, with two polar caps, one blunt and short, formed by coiled threads; other polar cap longer and conic, composed of 4–5 triangular plates. General color yellowish white.

TABLE 1. *Amanahyphes bahiensis* sp. nov., male imago (n=2), leg segments length (mm) and ratios between hind and forelegs. Abbreviations: ♂1=male 1; ♂2=male 2; FL=foreleg; ML=middle leg; HL=hind leg.

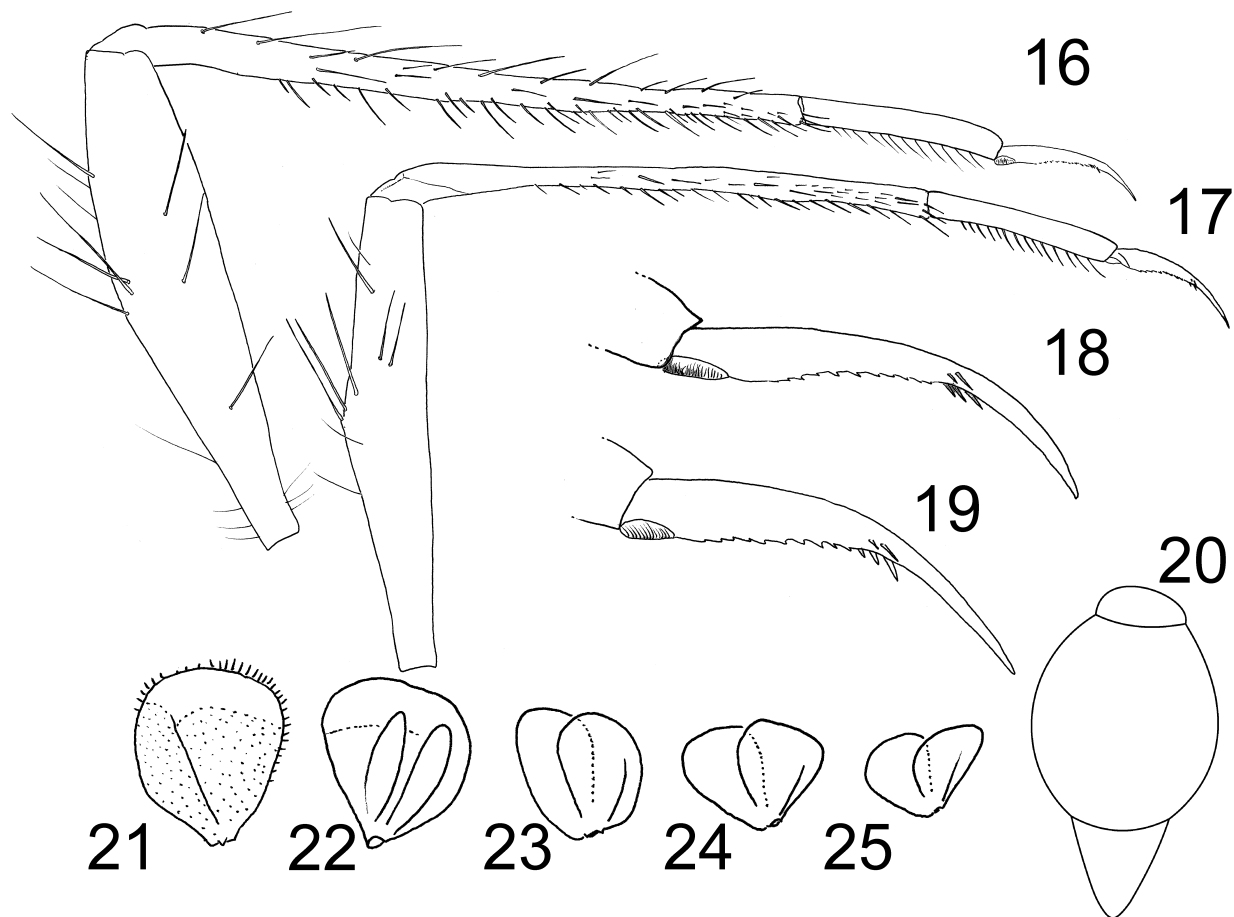
	♂ 1	♂ 1	♂ 1	♂ 1	♂ 2	♂ 2	♂ 2	♂ 2
	FL	ML	HL	HL/FL	FL	ML	HL	HL/FL
femur	0.63	0.58	0.7	1.11	0.71	0.85	0.88	1.23
tibia	1.14	0.66	0.91	0.80	1.00	0.93	1.08	1.08
tarsomere 1	0.91	0.03	0.03	0.03	1.20	0.05	0.05	0.04
tarsomere 2	0.12	0.04	0.04	0.33	0.20	0.05	0.05	0.25
tarsomere 3	0.10	0.04	0.04	0.40	0.12	0.05	0.05	0.42
tarsomere 4	0.07	0.09	0.07	1.00	0.11	0.10	0.10	0.91
tarsomere 5	0.06	0.13	0.1	1.67	0.10	0.10	0.10	1.00
claws	0.02	0.02	0.02	1.00	0.05	0.05	0.05	1.00
total	3.05	1.59	1.91	0.63	3.49	2.18	2.35	0.67



FIGURES 1–3. *Amanahyphes bahiensis* sp. nov., male imago: 1, general view, lateral; 2, genitalia, ventral view; 3, fore wing.



FIGURES 4–15. *Amanahyphes bahiensis* sp. nov., female mature nymph (dorsal view except when indicated): 4, general view; 5, labrum; 6, left mandible; 7, right mandible; 8, labium, ventral view; 9, detail of labial palp, v.v.; 10, abdominal gill II (tl=transverse line); 11, hypopharynx, v.v.; 12, hind tarsal claw (sd= subapical submarginal denticles, md= marginal denticles); 13, maxilla (p= palp); 14, foreleg; 15, hind leg.



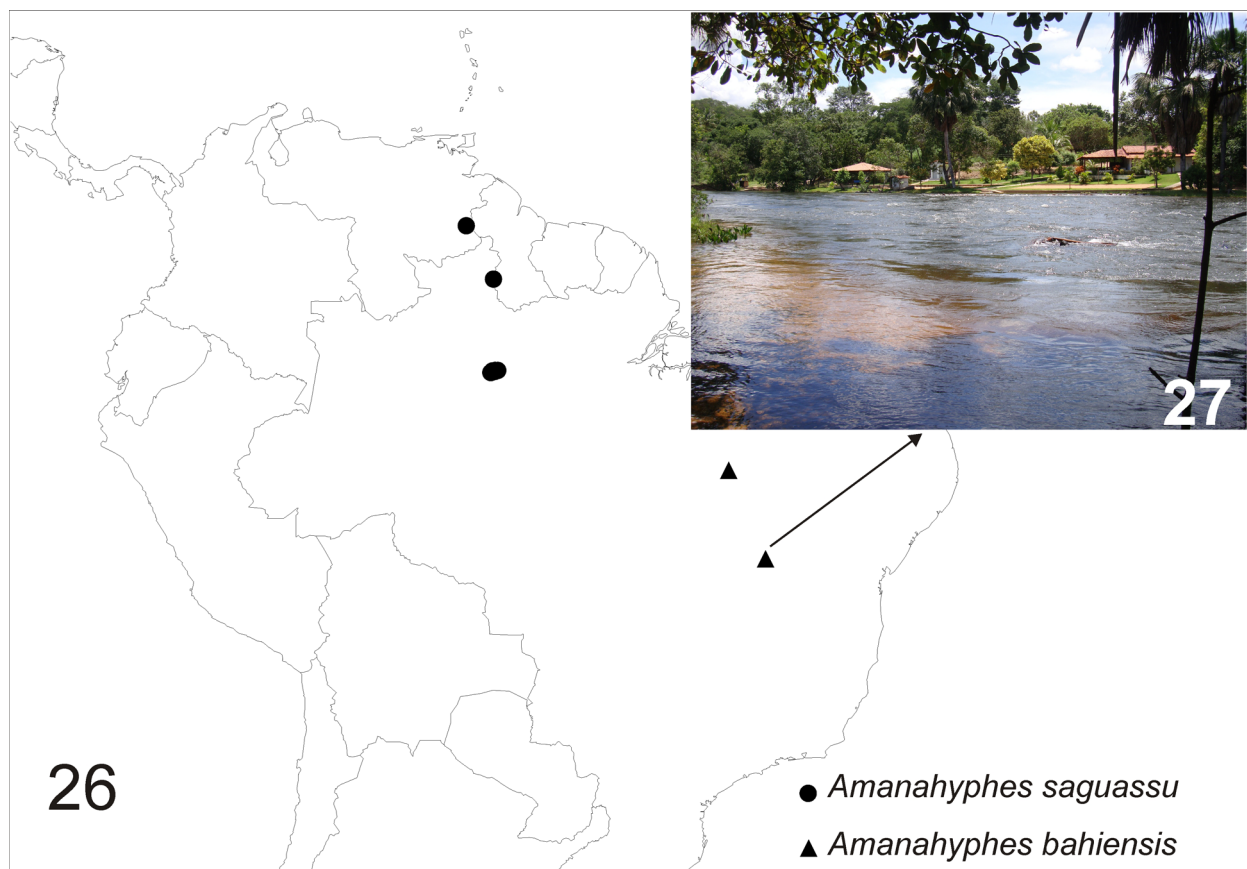
FIGURES 16–25. *Amanahyphes bahiensis* sp. nov., female mature nymph (dorsal view except when indicated): 16, hind leg; 17, fore leg; 18, hind tarsal claw; 19, fore tarsal claw; 20, egg; 21, gill II; 22, same, v.v.; 23, gill III; 24, gill IV; 25, gill V.

Mature female nymph. Length (mm): body, 4.2; terminal filament and cerci broken off and lost. General color yellowish white, shaded with brownish gray (Fig. 4). Head yellowish and shaded gray at base of antennae and near ocelli, occiput with grayish net-shaped pattern (Fig. 4). Antennae yellowish translucent. Eyes not appreciably enlarged. Mouthparts: Labrum (Fig. 5) with rounded anterolateral lobes separated by broad and shallow anteromedian emargination. Mandibles as in Figs. 6–7. Maxilla long and slender with seta-like palp (Fig. 13). Hypopharynx as in Fig. 11. Labium slightly shaded gray; submentum with pointed anterolateral projections (Fig. 8); glossa and paraglossa partially fused; palp 3-segmented, apical segment thin (Fig. 9). Thorax (Fig. 4): Pronotum yellowish, shaded with complex black and gray patterning, rectangular in shape, transverse to main body axis; without anterolateral projections. Mesonotum whitish, shaded blackish on carinae and costal margin of wingbud; oblong in shape and without projections, but widening abruptly at base of wingpads; meso- and metapleura with blackish marks; meso- and metasterna shaded gray. Legs (Figs. 14–17): long and slender, covered by tiny curved and thin setae and with many long hair-like and very thin setae; legs yellowish, extensively shaded with gray on femora, with darker marks proximally and distally (Figs. 14–15). Forefemur with five long, spine-like setae on dorsum forming incomplete transverse band near midlength, and one additional spine-like seta subdistally; tibia covered by many spine-like setae; tarsus with marginal row of spine-like setae; claw with row of 10 marginal denticles, and double row of 2+3 subapical submarginal denticles (Fig. 19). Middle legs broken off and lost. Hind leg similar to foreleg but larger, setation similar except transverse row of spine-like setae absent; three setae present along middle longitudinal line (Fig. 16); tibia with relatively longer, spine-like setae; claw with 11 marginal denticles and 2+3 subapical denticles (Fig. 18). Leg ratios: hind femur $1.1 \times$ length of forefemur; hind tibia $1.3 \times$ length of foretibia; tarsi and claws similar in length in both legs. Foreleg: forefemur length/width = 5.4; foretibia $1.2 \times$ length of forefemur; foretarsus $0.4 \times$ length of foretibia; foreclaw $0.7 \times$ length of foretarsus. Hind leg: hind femur length/width = 4.6; hind tibia $1.4 \times$ length of hind femur; hind tarsus $0.3 \times$ length of hind tibia; hind claw $0.7 \times$

length of hind tarsus. Abdomen (Fig. 4): More or less cylindrical in shape, without lateral flanges nor posterolateral projections. Terga yellowish, shaded with gray and black; terga I–II widely shaded with gray; terga III–VI shaded gray around black median mark, this mark becoming larger toward posterior segments; spiracular areas black; terga VII–IX extensively shaded with gray except on pale median line; tergum X pale with only small gray markings. Abdominal sterna extensively shaded with gray except on pale intersegmental membranes; sternum IX apically blunt. Gills present on segments II–V (Figs. 21–25), those on segment II operculate and subtrapezoidal in shape, narrowest at base, and with pair of oblong ventral lamellae (Figs. 21–22); dorsal portion brownish in basal 2/3, translucent and thinner apically (Fig. 10), basal and apical portions separated by slightly marked transverse line, also with oblique-longitudinal ridge; gills III–V smaller (Figs. 23–25), translucent shaded with light gray, each one with two subtriangular lamellae; most dorsal lamellae with thin longitudinal ridge present. Caudal filaments broken off and lost, but basal segments yellowish and shaded with gray.

Etymology. The name "*bahiensis*" refers to the type locality in the State of Bahia.

Distribution (Figs. 26–27). Brazil: northeastern region, states of Bahia and Maranhão.



FIGURES 26–27. 26, Map with the points of occurrence of *A. saguassu* (circles) and *A. bahiensis* **sp. nov.** (triangles). 27, type locality of the new species in the State of Bahia, Rio das Ondas.

Discussion

Amanahyphes bahiensis **sp. nov.** is similar to *A. saguassu*, but can be readily distinguished from it by the following combination of characters: (1) male forewing shaded slightly with brownish in basal third (Fig. 1) (shading absent in *A. saguassu*); (2) penes basally fused, but distally with diverging lobes, and with a short spine-like projection at midlength on lateral margin (Fig. 2) (*A. saguassu* has only a small apical furrow, and many tiny spines are present on the apical third of the lateral margin); (3) nymph with long, thin and acuminate femoral spines (*A. saguassu* with long but apically spatulate spines); (4) tarsal claws of nymph with 10–11 marginal denticles (4–6 marginal denticles present on *A. saguassu*); gill formula 3/2/2/2 (vs. 5/4/3/2 on *A. saguassu*).

The generic definition of *Amanahyphes* requires slight modifications in light of the apically divided penes and the different gill formula, characters discovered in our new species.

A nymph reported from Maranhão State, Brazil (Mun. Carolina, Rio Itapecuru, S7° 24' 53.2" W 47° 12' 55") by Cruz *et al.* (2011) is not *A. saguassu*, as previously suspected. The coloration of the body and especially the operculate gills are more similar to *A. bahiensis*, and thus we consider that *A. saguassu* is not present in the locality cited by Cruz *et al.* 2011 (Fig. 26).

Acknowledgements

We are thankful to the members of Laboratório de Biologia Geral for assisting during field trips and to the community of Vau da Boa Esperança for logistic support, and to Paulo V. Cruz for comments about the material from Maranhão. The senior author thanks CONICET for permanent support and grants PIP 0330 and PICT 1067 (E. Domínguez).

References

- Belmont, E.L.L., Salles, F.F. & Hamada, N. (2012) LeptoHyphidae (Insecta, Ephemeroptera) do Estado do Amazonas, Brasil: novos registros, nova combinação, nova espécie e chave de identificação para estágios ninfais. *Revista Brasileira de Entomologia*, 56, 289–296.
<http://dx.doi.org/10.1590/S0085-56262012005000054>
- Cruz, P.V., Belmont, E.L., Boldrini, R. & Hamada, N. (2011) LeptoHyphidae (Insecta: Ephemeroptera) from Northeastern Brazil. *Neotropical Entomology*, 40, 682–688.
<http://dx.doi.org/10.1590/S1519-566X2011000600008>
- Dias, L.G., Molineri, C. & Ferreira, P.S.F. (2007) Ephemerelloidea (Insecta: Ephemeroptera) do Brazil. *Papéis Avulsos de Zoologia*, 47, 213–244.
- Gonçalves, I.C. & Da-Silva, E.R. (2010) Ephemeroptera, LeptoHyphidae, *Amanahyphes saguassu* Salles e Molineri, 2006: First record from State of Pará, Brazil. *Checklist*, 6, 170–171.
- Molineri, C. (2005) *LeptoHyphodes inanis* (Pictet) and *Tricorythodes ocellus* Allen & Roback (Ephemeroptera: LeptoHyphidae): New stages and descriptions. *Studies on Neotropical Fauna and Environment*, 40, 247–254.
<http://dx.doi.org/10.1080/0165052041233127>
- Molineri, C., Grillet, M.-E., Nieto, C., Domínguez, E. & Guerrero, E. (2011) New species and records for the mayfly families Caenidae, LeptoHyphidae and Coryphoridae (Ephemeroptera, Pannota) from Venezuelan Guayana's Uplands. *Zootaxa*, 2750, 39–50.
- Salles, F.F. & Molineri, C. (2006) *Amanahyphes saguassu*, a new genus and species of LeptoHyphidae Ephemeroptera: Ephemerelloidea) from northern Brazil. *Aquatic Insects*, 28, 1–12.
<http://dx.doi.org/10.1080/13682820500343180>
- Ulmer, G. (1920) Neue Ephemeropteren. *Archiv für Naturgeschichte*, 85 (A), 1–80.