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## A review of the Neotropical genus *Amazobenna* Penny, 1980 with description of a new species and description of the male of *Amazobenna reticulata* Penny, 1980 (Hemiptera: Fulgoromorpha: Cixiidae)

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### Abstract

A second species of the genus *Amazobenna* Penny, 1980, *Amazobenna pennyi* sp. nov., is described from the Brazil. The new species can be distinguished from *Amazobenna reticulata* Penny, 1980, the type species of the genus, by the coloration of the body and wing and by the characters of the male genitalia. The description of male of *Amazobenna reticulata* is also provided and morphology of male and female genitalia of the genus is discussed for the first time.

**Key words:** Benarellini, new species, taxonomy

### Introduction

*Amazobenna* Penny, 1980 belongs to Bennarellini Emeljanov, 1989 together with *Bennarella* Muir, 1930, *Noabennarella* Holzinger et Kunz, 2006, and *Loisirella* Holzinger, Holzinger et Egger, 2013. These genera share autapomorphic abdominal pleural appendages, forming a clade within the planthopper family Cixiidae Spinola, 1839 (Emeljanov 1989; Holzinger et Kunz 2006), and they can be distinguished by the shape of the abdominal appendages, presence or absence of a carina on the frons and vertex, and the shape of the carina on the frons (Holzinger *et al.* 2013).

*Amazobenna* have already been classified in Bennini Metcalf, 1938 by Penny (1980) together with *Bennarella*, but these genera were transferred to Bennarellini by Emeljanov (1989), based primarily on the abdominal appendages in the form of a labiate expansion with large sockets bearing a furcate seta. In Fulgoromorpha, abdominal appendages are known to occur also in Bennini (Cixiidae) and Achiliidae Muir, 1923 (Holzinger et Kunz, 2006), but those two taxa show appendages with completely different morphology from that from Bennarellini. Holzinger *et al.* (2013) discuss the characteristics of the Bennarellini and provided a key for the genera.

Until now, *Amazobenna* had only a single included species, *Amazobenna reticulata* Penny, 1980, the type species of the genus, based on a female described from the Brazilian Amazon. In this paper, we describe the second species of the genus, also from the Amazon, and provide the re-description of *Amazobenna reticulata*, including the description of male and female genitalia.

### Material and methods

Material studied belongs to Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia, Amazonas (INPA), and Coleção Entomológica Padre Jesus Santiago Moure, Curitiba (DZUP), both from Brazil.

For analysis of the genital structures, abdomens were detached from the thorax, macerated into 85% hot lactic acid, and drawn immersed in glycerin jelly using a Leica M165C stereomicroscope. Afterwards, genitalia were kept in plastic microvial filled with glycerin and pinned together with the specimen. Fore wings of some specimens were detached, cleaned by a short xylol bath, and mounted between cover glasses with Euparal. After drying, cover slides were glued by the margin to a small piece of cardboard and pinned with the specimen. Digital photographs were taken with a Leica MC 170 HD camera attached to a stereomicroscope and combined in expanded focus images by Leica Application Suite software.

Terminology of the head characters mostly follows O'Brien et Wilson (1985), and terminology for wing venation follows Bourgoin *et al.* (2015). Other terms for thorax morphology are named according to Emeljanov (2002). Male and female genitalia terms mostly follow Bourgoin (1988) and Bourgoin (1993) respectively.

Maps of occurrence were created with SimpleMappr (Shorthouse 2010), using geographical coordinates from the specimen labels and bibliography. We used Google Earth® to locate approximated collecting sites for specimens without geographical coordinates. Square brackets were used to complement label information of the material examined.

## Taxonomy

**Hemiptera Linnaeus, 1758**

**Fulgoromorpha Evans, 1946**

**Cixiidae Spinola, 1839**

**Bennarellini Emeljanov, 1989**

***Amazobenna* Penny, 1980**

*Amazobenna* Penny, 1980: 210, Figs. 1, 8. Type species: *Amazobenna reticulata* Penny, 1980 (original designation); Holzinger et Kunz 2006: 57, Figs. 7, 8 (head); Holzinger *et al.* 2013: 152 (key).

**Diagnostic characters.** Medium sized cixiid: body length 4.5–7.2 mm in males, 4.0–7.5 mm in females. Body laterally compressed. Frons long, wider than vertex in middle, evenly rounded in lateral view, lacking transverse carina on dorsal border; median carina weakly marked; lateral carinae strongly produced and directed obliquely laterally (Figs. 3,4, 20, 22). Clypeus with median carina low, little evident, much lower than lateral carinae; lateral carinae strongly produced. Ocelli distinct. Scapus short, pedicellus cylindrical, as long as wide to slightly longer than wide (Figs. 5, 21). Pronotum with dorsal longitudinal carina distinct. Mesonotum with median and lateral longitudinal carinae present, but sometimes lateral carinae weakly marked (Figs. 4, 22). Fore wings long, widening distally, exceeding apex of abdomen for about half of the total length, apical margin round (Figs. 28,29). Cubital veins strongly curved toward anal margin of wing, reaching edge of wing at an almost straight angle. First cell of cubitus about ten times longer than wide. Metatibia with 6–7 apical spines; tarsus with 7+7–8 apical spines. Abdominal pleura of four and five segments with a process bearing 3 + 2 sensory pits, with one furcate seta each (Figs. 6, 23). Male terminalia: pygofer symmetrical, elongate and somewhat triangular in lateral view; anal segment rectangular in dorsal view; medioventral process conical in lateral view; genital styles elongate, symmetrical, curved upward; aedeagus robust with shaft and flagellum well developed, bearing long thorn-shaped processes. Female genitalia like in other Bennarellini: ovipositor elongate, orthopteroid, and curved upwards, 9th tergite without wax plate, gonapophysis IX medially fused and bearing spinules.

**Remarks.** This genus may be easily distinguished from the other genera of Bennarellini by the following features: abdominal appendages as labiate expansions with five large sockets bearing one furcate seta; transversal carina, separating the frons from the vertex, absent; frons with median carina weakly marked and lateral carinae strongly produced; forewing with cubital veins strongly curved to the anal margin of the wing, reaching the edge of the wing at an almost straight angle, and first cell of cubitus about ten times longer than wide.

The distribution of the Bennarellini remains poorly known, and the tribe occurs so far only in the Neotropical

region, with the four included genera recorded in some countries: *Bennarella* in Guyana and Brazil, *Amazobenna* in Brazil, *Noabennarella* in Costa Rica and Ecuador, and *Loisirella* in Ecuador (Holzinger *et al.* 2013). Taxa not formally described were also mentioned for Peru (Holzinger *et al.* 2013). *Amazobenna* has been recorded exclusively for the Brazilian part of Amazonian Biome (Penny, 1980). The lack of more collecting efforts and specialists studying this group in the region certainly contribute to this scarce knowledge.

Nothing so far is known about the phylogenetic relationship between genera of Bennarellini, thus making difficult to recognize sister groups relationships. The included genera share the presence of unique abdominal appendages, considered an autapomorphy of this clade (Emeljanov 1989, Holzinger et Kunz 2006), as well as similarities in the venation of the wing, as the presence of pterostigma and the same number of branches of the vein R, and aspects of the aedeagus, as the presence of spines and genital style spoon-like (Penny, 1980; Holzinger *et al.* 2013). However, *Amazobenna* and *Bennarella* share some morphological characters, such as the weak median carina of frons, lateral carina of frons less produced and directed obliquely laterad, and lateral abdominal processes with five sensorial pits (Holzinger *et al.* 2013), indicating a possible close relationship between these genera.

There is no information on the biology of *Amazobenna* species to date, but specimens label data indicate that they can be found in shrubby plants of the lower strata of moist dryland primary forest in the Amazon. Approximately 75% of the *Amazobenna* specimens analyzed in this study were collected in November, January and May, during the rainy season in the region, while the other 25% were collected in June and July, less rainy season (Marques-Filho *et al.* 1981). Representatives of *Amazobenna* are somewhat rare in collections and the methods employed to collect them have been Malaise, CDC and Mixed Light – BLB traps, additionally to sweeping.

**Distribution.** Neotropical: Brazil (Penny, 1980).

#### Key to species of *Amazobenna* Penny (males)

1. Body and legs brown (Fig. 1); wing with brown spot in the costal cell, spots at the apex of the medial veins interconnected basally (Fig. 28); genital style narrow at the base and distally broadening with apex truncated, inner face convex in posterior view (Figs. 9–12); apex of the anal segment triangular in posterior view (Fig. 8); pygofer with posterolateral margin produced in the middle forming an obtuse angle (Figs. 9, 11), lateral lobe slightly tapered distally and diverging distally in ventral aspect (Fig. 12) . . . . . *A. reticulata* Penny
- Body and legs yellow (Fig. 19); wing lacking spot on costal cell, spots at the apex of the medial veins not interconnected basally (Fig. 29); genital style long, broad in basal 2/3, narrowing towards the apex with apex round, inner face almost straight and parallel, slightly sinuous near apex in posterior view (Figs. 24–27); apex of anal segment trapezoidal in posterior view; pygofer with posterolateral margin slightly sinuous, not forming an obtuse angle (Figs. 24, 26), lateral lobe not tapered distally, with parallel inner sides and not diverging distally in ventral aspect (Fig. 27) . . . . . *A. pennyi* sp. nov.

#### *Amazobenna reticulata* Penny, 1980

(Figs. 1–18, 28, 30)

*Amazobenna reticulata* Penny, 1980:211, Figs. 1, 8; Holzinger et Kunz 2006: 57, Figs. 7,8 (head); Holzinger *et al.* 2013: 152 (key).

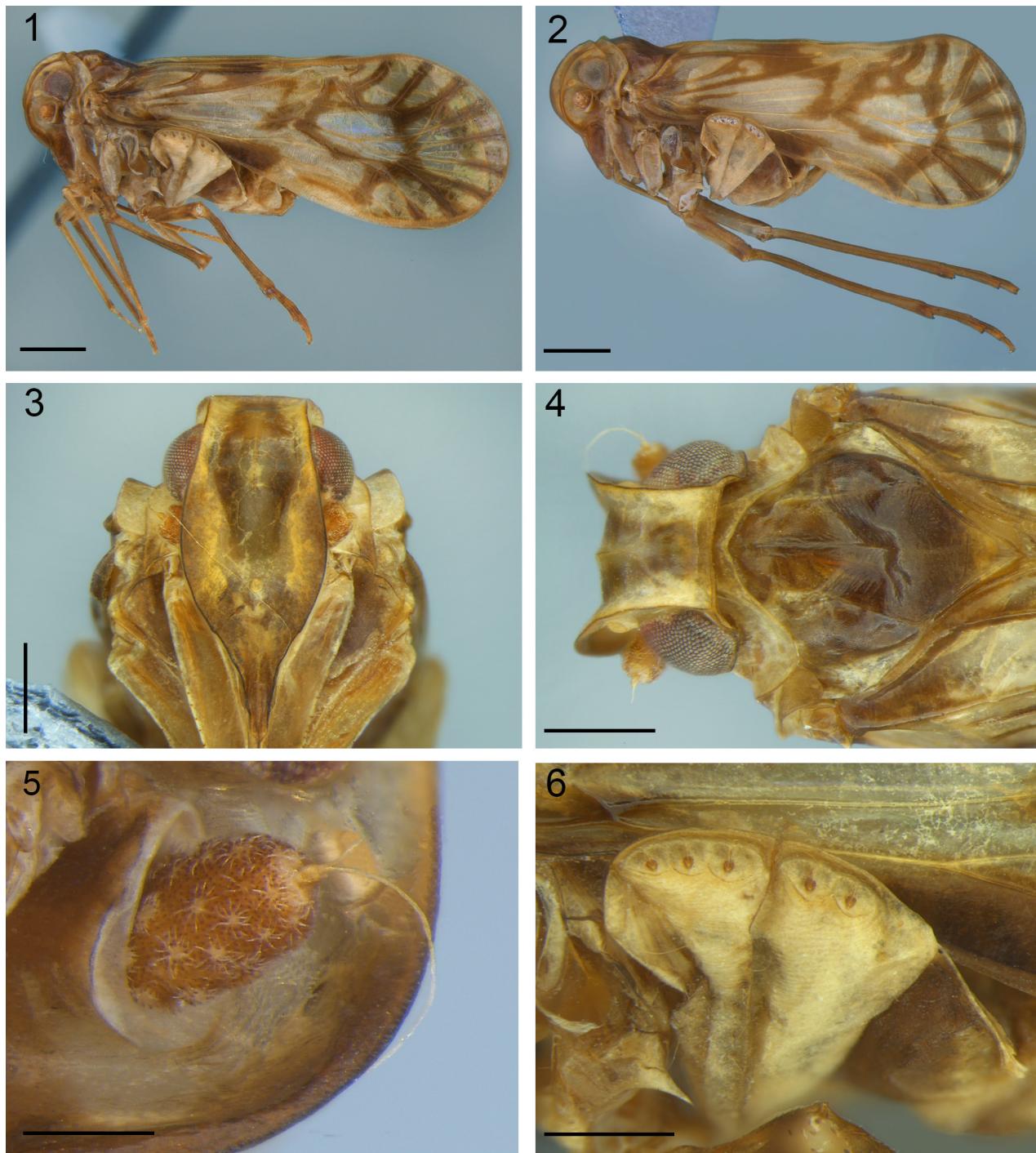
**Type material.** Holotype female (INPA): BRASIL: **Amazonas**, BR 319, Km 275, 17.v.1978, Norman D. Penny.

**Condition of the holotype:** left femur, tibia and tarsus of foreleg lost; left midtarsus lost; right femur, tibia and tarsus of midleg lost. Right forewing with torn apex. Genitalia dissected, abdomen lost.

**Additional material examined.** BRASIL, **Amazonas**, Manaus, Rod[ovia] 010, Km 54, BL-02, 10°21'–30.x e 6°10'–20.xi.1997, Arm[adilha] Malaise, J. F. Vidal col. (1♂, INPA); *idem*, Parque das Laranjeiras, 28.i.1981, J. A. Arias. (1♀, 1♂, INPA); *idem*, ZF2, Km 14, 02°35'21" S–60°06'55" W, 16–19.vii.2004, Lençol: luz mista—BLB, torre, J.A. Rafael; F.F. Xavier; C.S. Mota; J.M.F. Ribeiro & S. Trovisco cols. (1♀, INPA); *idem*, Rio Nhamundá, Cuipiranga, 01°53'58" S–57°02'59" W, 22–23.v.2008, Coleta manual, J.A. Rafael e equipe cols. (1♀, INPA); *idem*, Ig[arapé] Areias, 01°35'11"S–57°37'32"W, 17–20.v.2008. Arm[adilha] Luz no barco, 25 m, J.A. Rafael e equipe cols. (1♀, INPA).

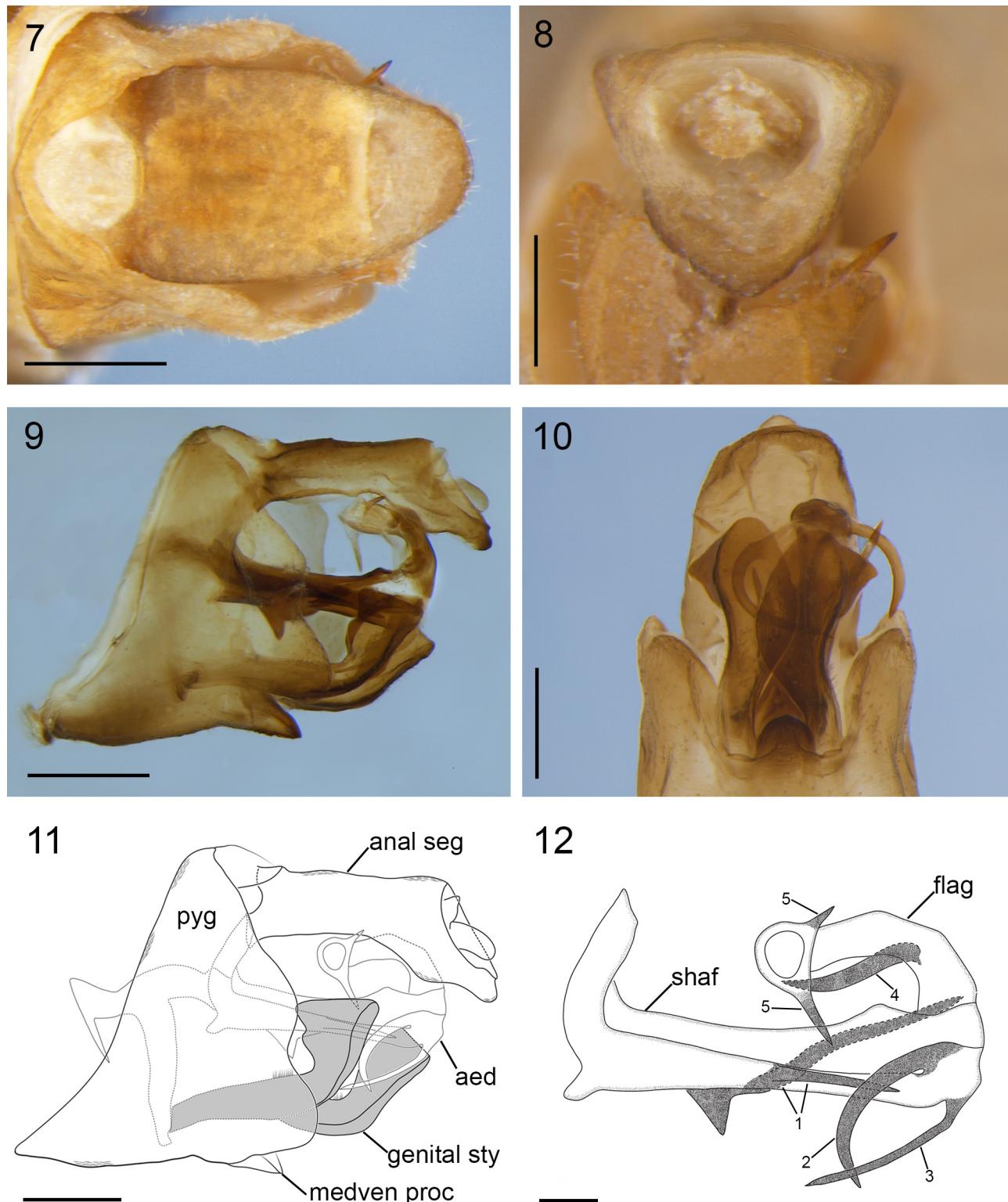
**Measurements:** Body length: female 4.0–4.6 mm (7–7.8 mm including wings) (N=3); male 4.0–4.5 mm (7.0–7.5 mm including wings) (N=2). Forewing length: female 6.6–7.0 mm (N=3); male. 6.45–6.8 mm (N=2).

**Redescription (male and female).** Coloration. General body color brown with yellowish few areas (Figs. 1, 2). Lateral margins of frons with irregular yellowish band; pronotum with lateral margins wide area of yellow margins; tegula with lighter anterior and darker anterior posterior portion; brown mesonotum with pale yellow area in posterior lateral margin, posterior to tegula. Pronotum margin with large yellow area; tegula with lighter anterior portion and darker posterior portion. Forewing (length: 6.82 mm) semihyaline, yellowish with brown spot on clavus, in costal cell, distally in radial and median cells and narrow brown bands covering in radial, median and cubital veins in wing apex (Fig. 28). Pterostigma whitish-yellow. Hindwing semihyaline, yellowish. Posterior margin of abdominal segments yellowish; lateral process of the abdomen pale yellow. Legs brown, fore tibia light brown (Figs. 1, 2).



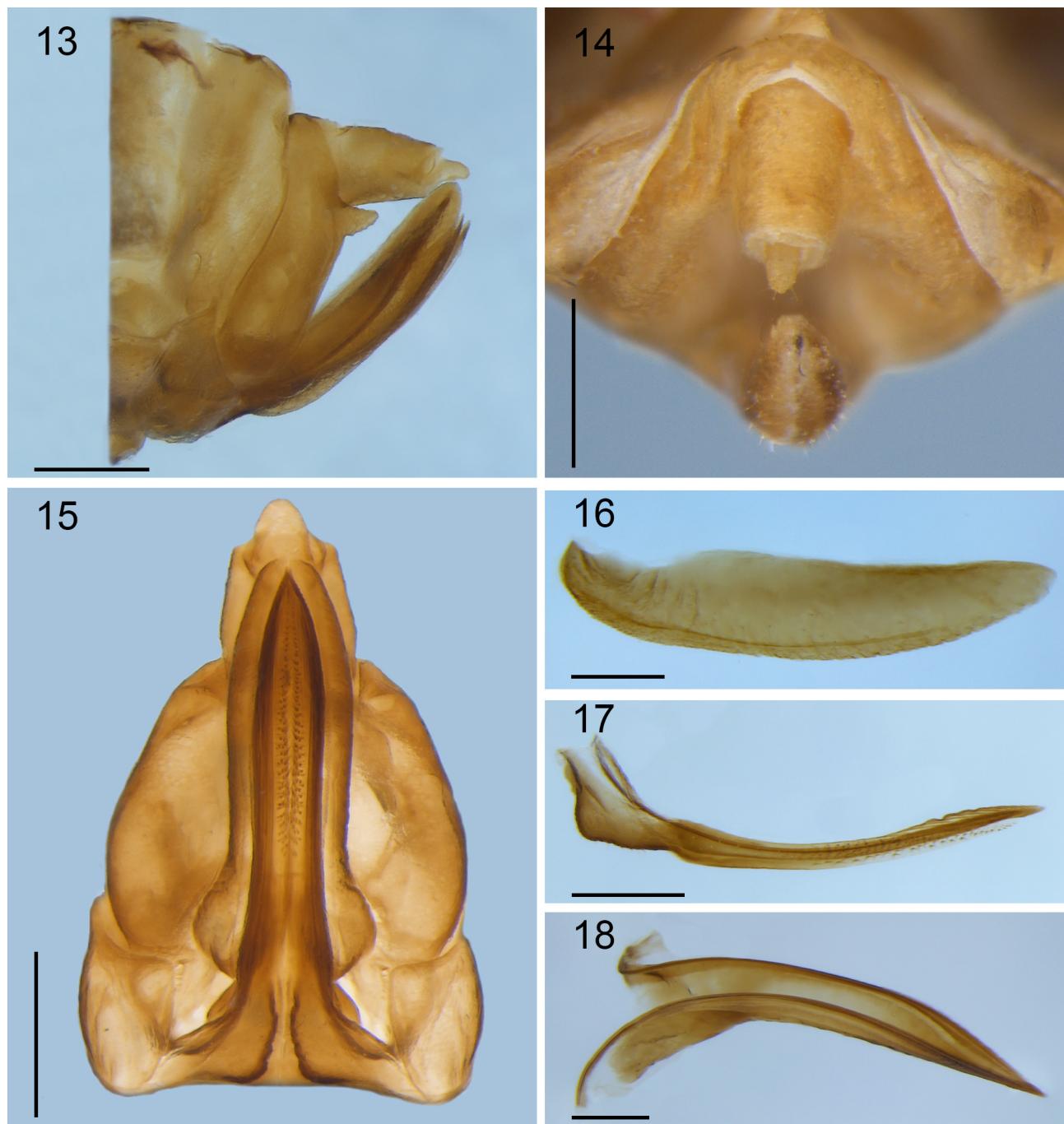
**FIGURES 1–6.** *Amazobenna reticulata* Penny: 1. Male habitus, lateral view; 2. Female, habitus, lateral view; 3. Male head, anterior view; 4. Male head and thorax, dorsal view; 5. Male antenna, lateral view; 6. Male abdominal process, lateral view. Scale bars: 1= 1mm; 2,4 = 0.5mm; 3 = 0.3 mm; 5 = 0.4 mm. Specimen from Amazonas, Manaus, highway AM 010, Km 54.

Head: median carina of frons weakly marked (Fig. 3); pedicellus approximately 1.5 times longer than wide (Fig. 5). Thorax: pronotum deeply emarginated and very narrow medially; median and lateral carinae of mesonotum strongly marked, median carina not reaching the posterior margin of mesonotum, lateral carinae not reaching anterior margin of mesonotum (Fig. 4). Legs: metatibia with 6 apical spines; hind tarsus with 7+7 apical spines.



**FIGURES 7–12.** *Amazobenna reticulata* Penny, male: 7. Anal segment, dorsal view; 8. Apex of the anal segment, posterior view; 9. Terminalia, lateral view; 10. Genitalia, ventral view; 11. Anal segment, pygofer, medioventral process, genital style and aedeagus, lateral view; 12. Aedeagus, lateral view. Abbreviations: anal seg, anal segment; pyg, pygofer; medven proc, medioventral process; genital sty, genital style; aed, aedeagus, shaf, shaft; flag, flagellum. Scale bars: 16, 19 = 0.3 mm; 17 = 0.2 mm; 18, 20 = 0.3 mm; 21 = 0.1 mm.

Male terminalia (Figs. 7–12). Anal segment elongated and slender, rectangular, about 1.7 times longer than broad in dorsal view, dorsal margin almost straight, ventral margin abruptly produced ventrally at apex in lateral view, apex triangular in posterior view. Pygofer with lateral lobe well produced, apex round in lateral view, slightly tapered and diverging distally in ventral aspect. Medioventral process of pygofer conical in lateral view, with posterior margin round in ventral view. Genital style narrow at base, widening distally with truncated apex; inner face convex, outer face concave in posterior view. Aedeagus with straight shaft bearing four spines (Fig. 12): two slender, elongate, rather straight spines inserted near base (1), one elongate comma-like spine (2), one very slender rather straight spine near apex (3); flagellum with three spines: one long, slightly sinuate spine inserted near base (4), and two shorter and slender, almost straight apical spines (5).



**FIGURES 13–18.** *Amazobenna reticulata* Penny, female: 13. Terminalia, lateral view; 14. Anal segment, dorsal view; 15. Genitalia, ventral view; 16. Gonapophysis VIII, lateral view (first valvula); 17. Gonapophysis IX (second valvula), lateral view; 18. Gonoplac (third valvula), lateral view. Scale bars: 22, 24 = 0.4 mm; 23 = 0.3 mm; 25, 27 = 0.2 mm; 26 = 0.3 mm.

Female terminalia (Figs. 13–18). Anal tube slightly narrowed towards the apex in lateral view, about 1.5–1.7 times longer than wider in dorsal view. Pygofer about 4 times higher than long in lateral view, with a triangular process below base of anal tube, width slightly greater than length in ventral view. Gonapophysis VIII (first valvula) long, very slender, slightly curved upwards, inner margin corrugate in apical 1/3, inner face with spinules along apical 1/2, apex sharp. Gonapophysis IX (second valvula) strongly sclerotized, with denticles in distal 3/4. Gonoplac (third valvula) broader and slightly longer than first pair, 4.5 times longer than wide.

**Distribution.** Brazil (Amazonas). (Fig. 30)

***Amazobenna pennyi* sp. nov**

(Figs. 19–27, 29, 30)

**Type material.** Holotype male (DZUP). BRASIL, Amazonas, Santa Isabel do Rio Negro, Rio Padauari, igarape do Maia, 00.194410N–064.01083W, CDC, 08–10.vi.2010, R. & R.S. Hutchings cols.

**Condition of the holotype:** Glued on paper triangle; right and left flagellum lost. Right foreleg broken and stored in a microtube; foretibia and foretarsus lost; right midtarsus lost; third tarsal segment of the right hindleg lost. Right forewing mounted between coverslips. Genitalia not dissected.

**Measurements.** Holotype male: Body length: 4.2 mm (7.4 mm including wings); forewing length: 6.15 mm.

**Diagnosis.** *Amazobenna pennyi* sp. nov. can be promptly distinguished from *A. reticulata* by the general color of the wing and body. In addition, the genitalia are quite distinct, having the characteristic slender anal segment with triangular apex in posterior view, and genital style widening distally with truncated apex, whereas in *A. pennyi* sp. nov. the anal segment is broad with a trapezoidal apex in posterior view, and the genital style is narrow distally, widened in the basal 2/3, with round apex.

**Description.** Coloration. General body color yellow (Figs. 19–23). Forewing yellowish, semihyaline with brown oval spot in apical portion of clavus extending to first cubital cell (Fig. 29); long, narrow, brown, transverse band extending from the vein M5 to apex of pterostigma; narrow brown stripes covering base of medial, cubital and anal veins; narrow brown stripes covering radial and median veins at apex of wing; anterior cubital vein covered by brown stripe and small pale-brown spot at apex of CuA2. Pterostigma whitish-yellow. Hindwing yellowish, semihyaline. Genital style pale-brown (Figs. 24–25).

Head: median carina of frons weakly marked (Fig. 20); pedicellus as long as wide (Fig. 21). Thorax: pronotum somewhat emarginated; median and lateral longitudinal carinae of mesonotum weakly marked, median carina not reaching posterior margin of mesonotum, lateral carinae not reaching anterior margin of mesonotum (Fig. 22). Legs: hindtibia with 7 apical spines; hindtarsus with 8+8 apical spines.

Male genitalia (Figs. 24–27): anal segment elongate and wide, only slightly longer than wide in dorsal view, dorsal margin almost straight, ventral margin abruptly produced ventrally at apex in lateral view, apex trapezoidal in posterior view. Pygofer with lateral lobe well produced, apex round in lateral view, parallel in ventral view. Medioventral process of pygofer conical in lateral view, with posterior margin triangular in ventral view. Genital style narrowed distally, widening in the basal 2/3 on outer margin, inner margin almost straight, parallel in ventral aspect, with apex round, divergent in posterior view. Aedeagus with straight shaft bearing long spines.

**Etymology.** The species is named to honor Dr. Norman D. Penny, who created this genus, for his immense contribution to the knowledge of invertebrate fauna in the Amazon.

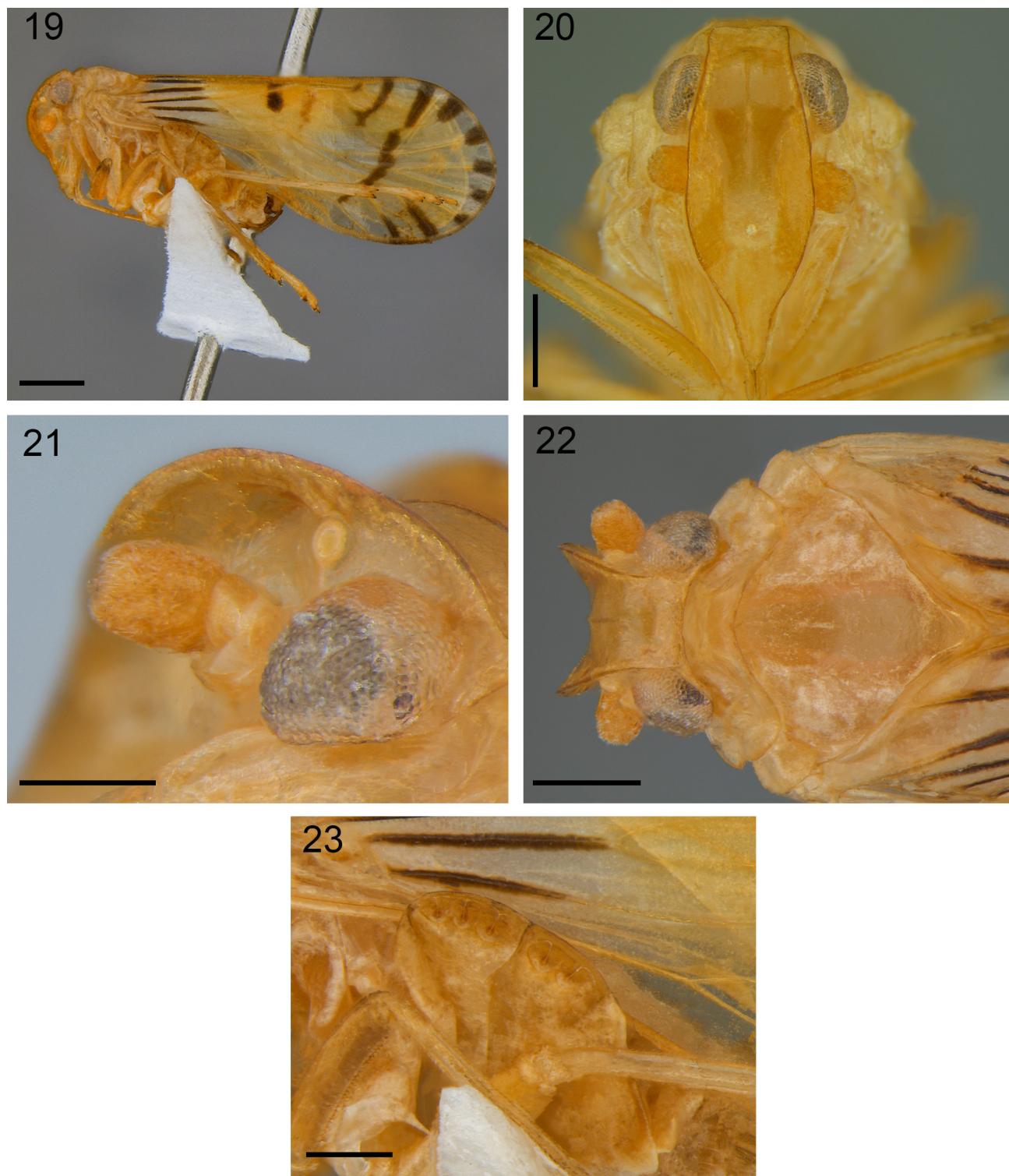
**Distribution.** Brazil (Amazonas) (Fig. 30).

**Discussion.** Previously, the type species *A. reticulata* was the only known species included into the genus. Since *A. pennyi* sp. nov. fits very well to the generic description, we consider both species congeneric. The discovery of a further species for this genus allowed us to verify that the diagnostic characters used by Penny (1980) to describe it remain valid.

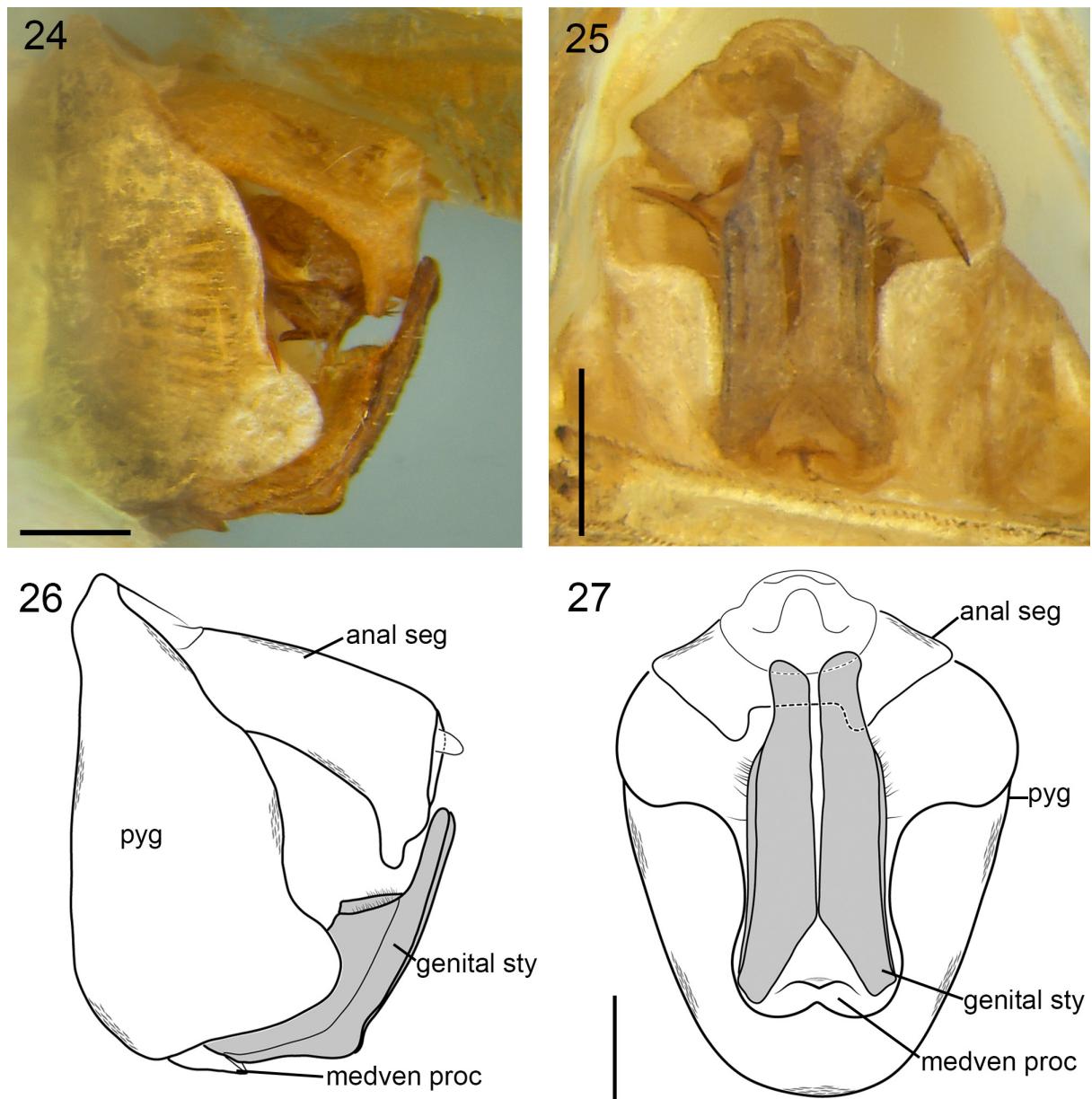
## Acknowledgements

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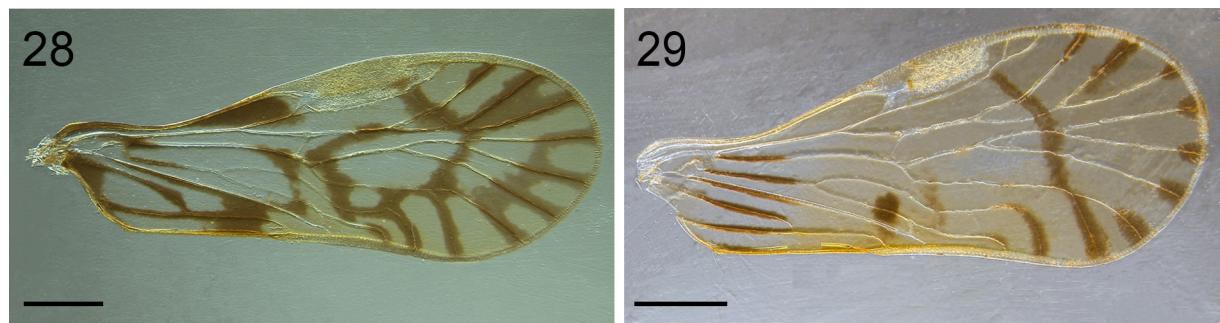
Matheus Mickael Mota Soares, who assisted the preparation of the maps and photographs and Rafael Augusto Pinheiro de Freitas Silva for suggestions on and discussions of previous versions of the manuscript. Still, we thank to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for providing the master studies scholarship for the first author and for the support to the second author through the PQ Fellowship.



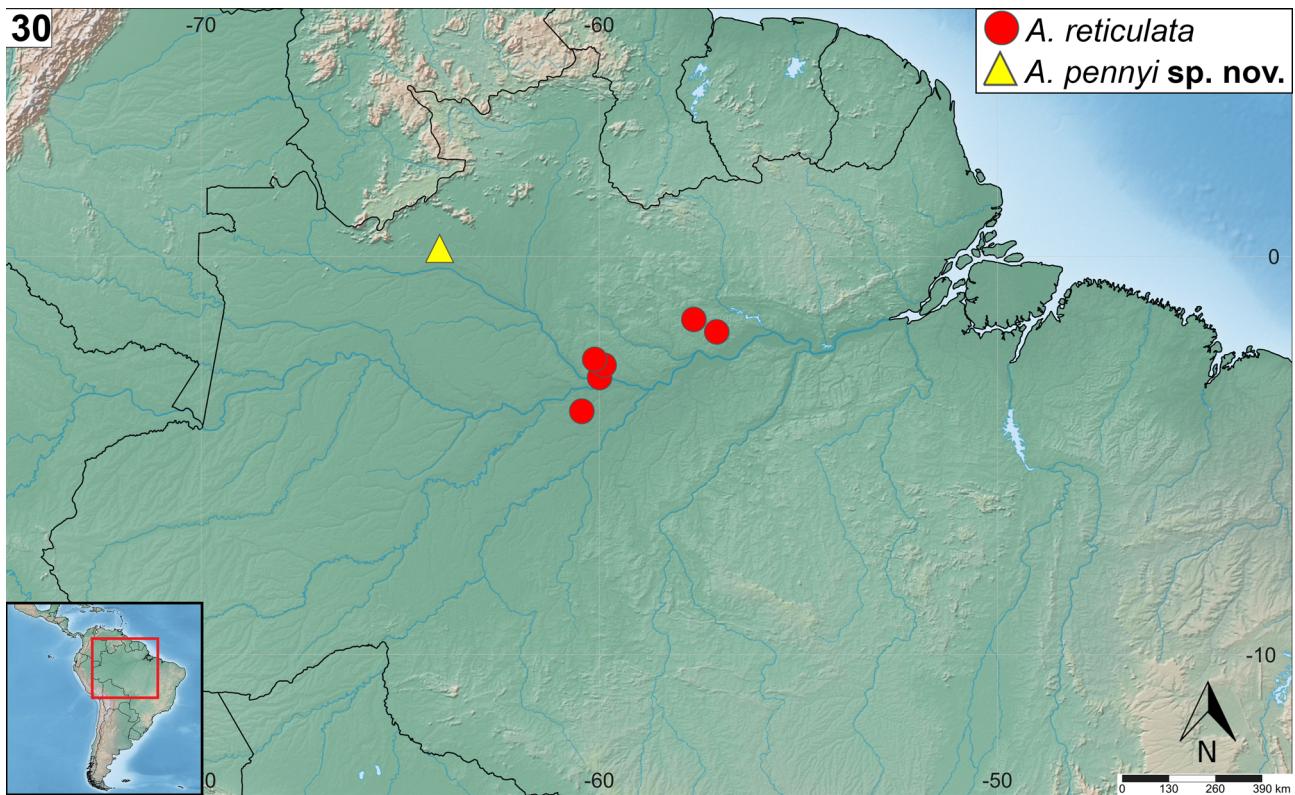
**FIGURES 19–23.** *Amazobenna pennyi* sp. nov., holotype: **19.** Habitus, lateral view; **20.** Head, anterior view; **21.** Antenna, lateral view; **22.** Head and thorax, dorsal view; **23.** Abdominal process, lateral view. Scale bars: 1 = 1mm; 2,4 = 0.5mm; 3 = 0.3 mm; 5 = 0.4 mm.



**FIGURES 24–27.** *Amazobenna pennyi* sp. nov., holotype: 24. Male terminalia, lateral view; 25. Male terminalia, posterior view; 26. Anal segment, pygofer, medioventral process and genital style, lateral view. 27. Anal segment, pygofer, medioventral process and genital style, posterior view. Abbreviations: anal seg, anal segment; pyg, pygofer; medven proc, medioventral process; genital sty, genital style. Scale bars: 6,8 = 0.2 mm; 7,9 = 0.3 mm.



**FIGURES 28–29.** Wings of *Amazobenna* Penny species. 28. *Amazobenna reticulata* Penny (male); 29. *A. pennyi* sp. nov. (male). Scale bars: 1 mm.



**FIGURE 30.** Geographical distribution of *Amazobenna* Penny species.

## References

- Bourgoin, T. (1988) A new interpretation of the homologies of the Hemiptera male genitalia, illustrated by the Tettigometridae (Hemiptera, Fulgoromorpha). In: Vidano, C. & Arzone, A. (Eds.), *Proceedings of the 6<sup>th</sup> Auchenorrhyncha Meeting*. 7–11 September 1987. Consiglio Nazionale delle Ricerche-Special Project IPRA, Turin, pp. 1–625.
- Bourgoin, T. (1993) Female genitalia in Hemiptera Fulgoromorpha, morphological and phylogenetic data. *Annales de la Société Entomologique de France*, New Series, 29, 225–244.
- Bourgoin, T., Wang, R.-R., Asche, M., Hoch, H., Soulier-Perkins, A., Stroinski, A., Yap, S. & Szewedo, J. (2015) From micropterism to hyperpterism: recognition strategy and standardized homology-driven terminology of the forewing venation patterns in planthoppers (Hemiptera: Fulgoromorpha). *Zoomorphology*, 134, 63–77. <https://doi.org/10.1007/s00435-014-0243-6>
- Emeljanov, A.F. (1989) To the problem of division of the family Cixiidae (Homoptera, Cicadina). *Entomologicheskoye Obozreniye*, 68 (1), 93–106. [in Russian. English translation: *Entomological Review*, 68 (4), 54–67.]
- Emeljanov, A.F. (2002) Contribution to classification and phylogeny of the family Cixiidae (Hemiptera, Fulgoromorpha). *Denisia*, 04, 103–111.
- Holzinger, W.E. & Kunz, G. (2006) A new genus and species of Bennarellini from Costa Rica (Hemiptera: Fulgoromorpha: Cixiidae). *Zootaxa*, 1353, 53–61.
- Holzinger, W.E., Holzinger, I. & Egger, J. (2013) A new genus, *Loisirella*, and two new species of Bennarellini from Ecuador (Hemiptera: Auchenorrhyncha: Fulgoromorpha: Cixiidae). *Acta Musei Moraviae, Scientiae biologicae, Brno*, 98 (2), 143–153.
- Marques-Filho, A.O., Ribeiro, M.N., Dos Santos, H.M. & Dos Santos, J.M. (1981) Estudos climatológicos da Reserva Florestal Ducke. IV. Precipitação. *Acta Amazonica*, 11, 759–768. <https://doi.org/10.1590/1809-43921981114759>
- O'Brien, L.B. & Wilson, S.W. (1985) Planthopper systematics and external morphology. In: Nault, L.R. & Rodriguez J.G. (Eds.), *The leafhoppers and planthoppers*. Wiley-Interscience, New York, pp. 61–102.
- Penny, N.D. (1980) A revision of American Bennini (Hemiptera: Fulgoroidea: Cixiidae). *Acta Amazonica*, 10 (1), 207–212. <https://doi.org/10.1590/1809-43921980101207>
- Shorthouse, D.P. (2010) SimpleMappr, an online tool to produce publication-quality point maps. Available from: <http://www.simplemappr.net> (accessed 20 October 2018)