Three new species of Amblyrhythus (Orthoptera, Grylloidea, Gryllidae, Paroecanthini) from Brazil

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Abstract

Amblyrhythus Kirby, 1906 is a genus of arboreal, undergrowth, and shrub crickets comprising, at present, seven species: one from Panama, one from Peru, two from Colombia, two from Brazil, and one with an unprecise locality. These crickets are seldom found in regular active collecting at night, although males produce a rather loud calling song. Unfortunately, their songs have never been recorded, and there is no ecological information for this genus so far. Here, we describe three new species from the Brazilian Atlantic Forest.

Keywords

cricket, Neotropical, new taxa, South America, taxonomy

Introduction

Paroecanthini crickets are far from fully known (Campos and Desutter-Grandcolas 2020, Campos and Souza-Dias 2021). Taxonomic papers from the last ten years demonstrate that these insects are more diverse than expected, and there are probably several species awaiting to be described (Cadena-Castañeda and Noriega 2015, Gorochov 2017, Campos and Desutter-Grandcolas 2020, Campos et al. 2020, Campos and Souza-Dias 2021). These crickets are morphologically diverse, mainly concerning their forewings, with species apterous, brachypterous, or with completely developed forewings (winged), reflecting directly on their communication modalities (Campos and Desutter-Grandcolas 2020). Frequently found on vegetation during the night, from small bushes to tall canopies, they are mainly recognized by the dorsoventrally flattened ovipositor with rather blunt apical valves and the number of hind tibia subapical spurs (five internal and four external, with a few exceptions).

Amblyrhythus Kirby, 1906, initially named Amblyopus Saussure, 1878, was proposed as a synonymy since its original name was preoccupied (Kirby 1906). This South American taxon was initially described with three species: A. brevipes (Saussure, 1878) (type species from Colombia), A. capitatus (Saussure, 1878) (type locality unknown), and A. depressus (Saussure, 1878) (Colombia). Two Brazilian species were described a few years later: A. manni Rehn, 1917 (northeast Brazil) and A. natalensis Rehn, 1917 (northeast Brazil). Hebard (1928) described a species from a single female from Panama, Amblyrhythus ponderosus Herbard, 1928. The last described species is A. nodifer Chopard, 1956, from Peru.

Although this genus has more than a century since its description, no acoustic, behavioral, ecological, or distributional data are available except the type localities. Here, we describe three new species, more than 60 years after the last publication. All new species are from Brazil: A. lineatus sp. nov. (state of Espirito Santo), A. bahiensis sp. nov. (state of Bahia), and A. alagoensis sp. nov. (state of Alagoas). We also provide a map of the known distribution of Amblyrhythus species.

Material and methods

The specimens were individually stored in glass tubes of 80% ethanol. Individuals were analyzed, compared, and described with a Zeiss Stemi DV4 stereomicroscope. External morphology photographs were taken with a Canon SL2 coupled to a 100 mm macro lens. Male phallic complex and female copulatory papilla were immersed in 70% gel alcohol hand sanitizer (Su 2016) and photographed with a Canon SL2 attached to a Zeiss Stemi DV4 stereomicroscope. Males and females (when available) were dissected to remove the phallic complex and copulatory papilla, respectively. Male genitalia were treated with 10% potassium hydroxide for a few hours to remove muscular tissues and clarify the sclerites. Copulatory papilla was removed, but no chemical treatment was necessary. Male and female genital structures were stored in a 2 μl tube with 80% ethanol and kept with their respective specimens. Forewing’s venation nomenclature follows Desutter-Grandcolas et al. (2017), modified by Schubnel et al. (2019). Genital pieces nomenclature follows Desutter (1987), Desutter-Grandcolas (2003), and Campos and Desutter-Grandcolas (2020).
Type localities of *Amblyrhethus* new species were plotted and edited on a map using Quantum-gis 3.16.8 (QGIS Development Team 2022).

**Abbreviations.**

General morphology. 1st ter: first abdominal tergite; met: metanotum; I, II, III: anterior, median, posterior (leg, tarsomere); F: femur; T: tibia; iad, iam, iav: dorsal, median, ventral apical spurs of hind tibia on inner side; oad, oam, oav: dorsal, median, and ventral apical spurs of hind tibia on outer side; TIII: subapical and apical spurs formula indicated inner/outer respectively, counted from distal spurs upwards.

Forewings. A1: first anal vein; A2: second anal vein; CuA: anterior branch of cubital vein; CuP: posterior branch of cubital vein; CuPa: anterior branch of CuP; CuPb: posterior branch of CuP; hv: harp veins; M: medial vein; M+CuA: medial vein + anterior branch of cubital vein; PCu: postcubital vein (stridulatory vein); R: radial vein; Sc: subcostal vein.

Male genitalia. LLophi: lateral lophi of pseudoelephallus; m: membrane; PsP: pseudoelephallic paramere; EctAp: ectophallic apodeme; arc: ectophallic arc; End: endophallic sclerite; r: rami.

**Institutions.**

ANSP: Academy of Natural Sciences of Drexel University, Philadelphia, United States of America;

BOTU: Orthoptera Collection, Instituto de Biociências de Botucatu, Universidade Estadual Paulista “Julio de Mesquita Filho” (UNESP), Botucatu, Brazil;

MZSP: Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.

The holotypes, allotypes, and paratypes will be deposited in BOTU and MZSP. In label transcriptions, slashes (/) separate lines, bars (|) separate labels, parentheses () contain observations, and brackets [] contain interpretations. The described taxa were compared with *Amblyrhethus brevipes* (type material, Orthoptera Species File (OSF) pictures (Cigliano et al. 2022)), *A. manni* (type material, ANSP), and *A. natalensis* (type material, ANSP).

**Results**

**Taxonomy**

Order ORTHOPTERA Olivier, 1789

Superfamily GRYLLOIDEA Laicharting, 1781

Family GRYLLIDAE Laicharting, 1781

Subfamily OECANTHINAE Blanchard, 1845

Tribe Paroecanthini Gorochov, 1986

Subtribe Tafalischina Desutter, 1988

Genus *Amblyrhethus* Kirby, 1906

Type species.—*Amblyrhethus brevipes* (Saussure, 1878).

*Amblyrhethus lineatus* sp. nov.

https://zoobank.org/2D6DED73-00F2-4E92-B479-3BF063888BDC0

(Figs 1, 2, 7; Table 1)

**Material examined.**—Holotype: BRAZIL • 1♂; E[spírito]S[anto], Linhares, Reserva / Vale do Rio Doce. Mata; January 1996; 19°09’01”S, 40°03’53”W; F.A.G. Mello & S.S. Nihei leg.; BOTU.

Paratypes: BRAZIL • 1♂; same information as holotype; MZSP • 1♂; BA[íia], Mucuri, / Fazenda Farol – mata (forest); January 1996; 18°04’01”S, 39°40’23”W; F.A.G. Mello & S.S. Nihei leg.; BOTU.

**Type locality.**—Brazil, Espírito Santo, Linhares municipality.

**Etymology.**—From Latin, *linea*, meaning line or band. Allusive to the lateral bands of the species.

**Diagnosis.**—This species is distinguished from other species of *Amblyrhethus* by the following characters: body with two distinct whitish-to-yellowish bands going laterally from eyes’ margin, lateral lobes of pronotum and reaching the margin of forewing, excepting apical field; longitudinally crossed laterally by a whitish-to-yellow band on both sides, one on each wing field angulations; front, clypeus and ctenidium whitish to yellowish brown, clearly lighter than top of head and remaining medium brown coloration of body; antennomeres whitish with some isolated antennomeres light brown. Basitarsus dorsal spines 3/1. Male forewings: A1 connected to A2; harp crossed by three veins. Male metanotum with two rounded projections, first abdominal tergite with two lamellar projections.

**Description.**—Head. Fastigium wide, smooth (Fig. 1C). Three ocelli present, aligned in frontal view (Fig. 1C); lateral ocelli rounded, median smaller than lateral ones; frons smooth (Fig. 1C). Antennal scape longer than wide, much narrower than fastigium in frontal view. Maxillary palpi articles 4 and 5 same-sized, article 3 slightly longer; article 5 almost straight (Fig. 1B). Thorax. Dorsal disk wider than long, with bristles on cephalic and caudal margins (Fig. 1A). Dorsal disk cephalic margin slightly concave, caudal margin convex (Fig. 1A). Lateral lobes ventro-cephalic and ventro-caudal angles rounded (Fig. 1B). Forewings longer than abdomen, hindwings as long as forewings (Fig. 1A, B). Legs. Ti with tympana on both faces; three apical spurs, two ventral, one dorso-internal. TII with three apical spurs, two ventral, one dorso-internal. TIII subapical spurs 5/4, with one (sometimes two) spine between each spur, six spines above subapical spurs on inner and outer sides. TIII longer than TIII (Fig. 1B). TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad. Basitarsus dorsal spines 3/1; inner apical spur slightly longer than outer apical spur. Male. Forewings as long as hindwings; anal vein area slightly bulged dorsally (Fig. 1B), A1 connected to A2. Stridulatory vein (PCu vein) present, portion close to CuPa sinuous. Harp crossed by three veins connected to CuPα; first harp vein short, second and third harp veins connected in the proximal region. Mirror as wide as long, divided in the middle by a curved vein. Apical field longer than mirror; lateral field with 14–15 diagonal veins (Fig. 1D). Metanotum with two rounded projections, first abdominal tergite with two lamellar projections (Fig. 1E). Supra-anel plate posterior margin rounded (Fig. 1F); subgenital plate longer than wide, posterior margin convex (Fig. 1G).

**Male genitalia.** (Fig. 2) Pseudoelephallus: pseudoelephallic sclerite trapezoidal in dorsal and ventral views; almost straight in lateral view; anterior margin somewhat rounded on median region

**Table 1. Measurements in mm of *Amblyrhethus lineatus* sp. nov.**

Abbreviations: IOD, inter ocular distance; HW, head width; PL, pronotum length; PW, pronotum width (at midline); FWL, forewing length; LFHII, length of hind femur; LTIII, length of hind tibia.

<table>
<thead>
<tr>
<th>Males (n=2)</th>
<th>IOD</th>
<th>HW</th>
<th>PL</th>
<th>PW</th>
<th>FWL</th>
<th>LFHII</th>
<th>LTIII</th>
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<tr>
<td>3</td>
<td>4.9-5</td>
<td>4-4.4</td>
<td>6.5-6.7</td>
<td>18-19</td>
<td>10.1-11</td>
<td>7.7-8.1</td>
<td></td>
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</tbody>
</table>
Fig. 1. *Amblyrhetus lineatus* sp. nov., male: A. Habitus, dorsal; B. Habitus, lateral; C. Head, frontal; D. Right forewing; E. Metanotum and first abdominal tergite; F. Supra-anal plate; G. Subgenital plate. Scale bars: 5 mm (A, B); 1 mm (C–G). Abbreviations: see materials and methods.
Fig. 2. *Amblyrhetus lineatus* sp. nov., male genitalia: A. Dorsal; B. Ventral; C. Lateral; D. Posterior. Scale bar: 1 mm. Abbreviations: see material and methods.

(Fig. 2A). LLophi curved upwards, posterior margin rounded in dorsal and ventral views; ventral face somewhat translucent (Fig. 2A, B). PsP longer than LLophi, inner margin divided into two lobes, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views (Fig. 2A, B); posterior half wider than anterior half in ventral view (Fig. 2B). Rami straight, two times or more longer than pseudepiphallic sclerite (Fig. 2A–C). Ectopha-
llic invagination: EctF strongly sclerotized, cordiform, on the edge of posterior margin of pseudepiphallic sclerite (Fig. 2A–D). EctAp longer than pseudepiphallic sclerite, slightly curved inwards in dorsal and ventral views (Fig. 2A, B); arc not complete, curved posteriorly; ventral projections of ectophallic invagination as long as arc. Endophallus: End short, u-shaped, in the middle of pseudepiphallic sclerite (Fig. 2B).

**Female.** Unknown.

**Coloration.**—Occiput, vertex, and pronotum general coloration reddish brown to dark brown (Fig. 1A, B). Body crossed laterally by a whitish to yellowish band along the fore wings dorsolateral angulation (head, lateral lobes, forewings) (Fig. 1A, B). Occiput reddish brown to dark brown, whitish laterally (Fig. 1A, C); face whitish to yellowish brown (Fig. 1C); antennal scape
whitish; antennomeres whitish with some isolated antennomeres medium brown (Fig. 1B). Forewings slightly translucent, medium brown; region between M+Cua and Sc veins, white. Metanotum and abdominal tergites yellowish-brown (Fig. 1E). Supra-anal plate medium to dark brown, posterior margin darker (Fig. 1F). Abdominal sternites and subgenital plate light brown (Fig. 1G). Fl, FIII, TII, and TIII medium brown to yellowish brown. FIII reddish brown to dark brown, slightly striped, distal margin darker; TIII yellowish brown to medium brown; spurs yellow with apex medium to dark brown; tarsomeres light brown (Fig. 1B).

**Amblyrhetus bahiensis** sp. nov.
https://zoobank.org/82ED62CF-5218-48DB-BB88-ECBC55168978
(Figs 3, 4; Table 2)

**Material examined.**—Holotype: BRAZIL • ♂; BA[lia], Lençóis / Parque Nacional da Chapada Diamantina; 12°35'16"S, 41°24'35"W; 600–950 m; 13–19 February 2013; de Mello leg.; CNPq-SISBIOTA | 4453663 | LDC_SIS_001; BOTU.

**Type locality.**—Brazil, Bahia, Lençóis municipality.

**Etymology.**—Toponymic, referring to the state of Bahia, Brazil.

**Diagnosis.**—This species is distinguished from the other species of *Amblyrhetus* by the following characters: male metanotum without outprojections, first abdominal tergite with two lamellar humps close to anterior margin; supra-anal plate lateral margins fingerprinted. Male genitalia: PSp posterior margin truncated; rami slightly curved inwards; EctAp anterior margin slightly curved outwards in dorsal and ventral views.

**Description.**—Head. Fastigium wider than long, smooth (Fig. 3C). Three ocelli present, aligned in frontal view (Fig. 3C); lateral ocelli rounded, median ocellus elliptical, smaller than lateral ones; frons smooth (Fig. 3C). Antennal scape longer than wide, thinner than fastigium in frontal view. Maxillary palpi articles 3, 4, and 5 almost same-sized; article 5 sub-straight (Fig. 3B). Thorax. Dorsal disk wider than long, covered by bristles (Fig. 3A). Dorsal disk cephalic margin slightly concave, caudal margin convex (Fig. 3A). Lateral lobes ventro-cephalic and ventro-caudal angles rounded (Fig. 3B). Forewings slightly translucent, medium brown. Metanotum whitish brown (Fig. 3E), abdominal tergites medium brown, darker on last segments. Supra-anal plate medium to dark brown, lateral margins darker (Fig. 3F). Abdominal sternites yellowish brown; subgenital plate medium brown (Fig. 3G). Fl, FIII, TII, and TIII medium brown to yellowish brown. FIII yellowish-brown, slightly striped, distal margin darker; TIII yellowish-brown; spurs yellow with apex medium to dark brown; tarsomeres yellowish-brown (Fig. 3B).

**Table 2.** Measurements in mm of *Amblyrhetus bahiensis* sp. nov.

| Abbreviations: IOD, inter ocular distance; HW, head width; PL, pronotum length; PW, pronotum width (at midline); FWL, forewing length; LFIII, length of hind femur; LTIII, length of hind tibia. |
| IOD | HW | PL | PW | FWL | LFIII | LTIII |
| 4.9–5 | 4–4.4 | 6.5–6.7 | 18–19 | 10.1–11 | 7.7–8.1 |

**Male.** Forewings slightly shorter than hindwings: anal area slightly bulged dorsally (Fig. 3B), A1 connected to A2. Stridulatory vein (PCu vein) present, portion close to CuPa strongly sinuous. Harp crossed by four veins connected to CuPa; first and second harps shorter than third and fourth; third and fourth harp veins connected in the proximal region. Mirror as wide as long, divided in the middle by a curved vein on its right half. Apical field as long as mirror; lateral field with 12 diagonal veins (Fig. 3D). Metanotum without projections, first abdominal tergite with two lamellar projections close to anterior margin (Fig. 3E). Supra-anal plate posterior margin rounded (Fig. 3F), lateral margins fingerprinted on the middle; subgenital plate as long as wide, posterior margin convex (Fig. 3G).

**Male genitalia.**—(Fig. 4) Pseudophiphalus: pseudophiphalic sclerite trapezoidal in dorsal and ventral views; slightly curved upwards in lateral view; anterior margin somewhat rounded on median region (Fig. 4A). Llophi curved upwards, posterior margin rounded in dorsal and ventral views; ventral face translucent (Fig. 4A, B). PsP longer than Llophi, inner margin not divided, posterior margin truncated, not surpassing posterior margin of pseudophiphalic sclerite in dorsal and ventral views (Fig. 4A, B); posterior half wider than anterior half in ventral view (Fig. 4B). Rami slightly curved inwards in dorsal and ventral views, two or more times longer than pseudophiphalic sclerite (Fig. 4A–C). Ectophallic invagination: EctF strongly sclerotized, triangular, on the edge of posterior margin of pseudophiphalic sclerite (Fig. 4A–D). EctAp longer than pseudophiphalic sclerite, anterior margin slightly curved outwards in dorsal and ventral views (Fig. 4A, B); arc not complete, curved posteriorly; ventral projections of ectophallic invagination shorter than arc. Endophallicus: End short, u-shaped in the middle of pseudophiphalic sclerite (Fig. 4B).

**Female.** Unknown.

**Coloration.**—Occiput, vertex, and pronotum general coloration reddish brown to medium brown (Fig. 3A, B). Face reddish-brown (Fig. 3C); antennal scape reddish-brown to dark brown; antennomeres yellowish with some isolated antennomeres medium brown (Fig. 3B). Forewings slightly translucent, medium brown. Metanotum whitish brown (Fig. 3E), abdominal tergites medium brown, darker on last segments. Supra-anal plate medium to dark brown, lateral margins darker (Fig. 3F). Abdominal sternites yellowish brown; subgenital plate medium brown (Fig. 3G). Fl, FIII, TII, and TIII medium brown to yellowish brown. FIII yellowish-brown, slightly striped, distal margin darker; TIII yellowish-brown; spurs yellow with apex medium to dark brown; tarsomeres yellowish-brown (Fig. 3B).

**Amblyrhetus alagoensis** sp. nov.
https://zoobank.org/4FDF095B-58E9-42F2-9486-55B7F8708715
(Figs 5, 6, 7; Table 3)

**Material examined.**—Holotype: BRAZIL • ♂; AL[agoas] Quebrangulo / Res[erva] Biológica Pedra Talhada / Arm[adilha]; Malaise - 1° Bosque; 08–11 September 2002; Refugos; Penteado-Dias & eq[iup] leg; MZSP. Allotype: BRAZIL • ♀; Satuba, Alagoas, Brasil / Área de Proteção Ambiental do Catolé; 25 July 2012; Dias, P.G.B.S, Costa, C.S., Alcântara, D.M.C.; Nihei S.S. leg.; LDC_014; MZSP.

**Type locality.**—Brazil, Alagoas, Quebrângulo and Satuba municipalities.

**Etymology.**—Toponymic, referring to the State of Alagoas, Brazil.
Fig. 3. *Amblyrhethus bahiensis* sp. nov., male: A, habitus, dorsal; B, habitus, lateral; C, head, frontal; D, right forewing; E, metanotum and first abdominal tergite; F, supra-anal plate; G, subgenital plate. Scale bars: 5 mm (A, B); 1 mm (C–G). Abbreviations: see material and methods.
**Diagnosis.**—This species is distinguished from other species of *Amblyrhetus* by the following characters: male forewings vein A1 not connected to A2; metanotum with two clusters of bristles on the middle; first abdominal tergite with two rounded projections close to anterior margin. Male genitalia: pseudoprephalic sclerite somewhat enlarged on anterior half, especially at the middle level, rounded in dorsal and ventral views; PsP clavate, EctAp slightly curved inwards in the middle, both in dorsal and ventral views. Copulatory papilla tapered, with two anterior projections.

**Description.**—Head: Fastigium wide, with bristles laterally (Fig. 5E). Three ocelli present, aligned in frontal view (Fig. 5E); lateral ocelli rounded, median ocellus elliptical, smaller than lateral ones; frons smooth (Fig. 5E). Antennal scape longer than wide, narrower than fastigium in frontal view. Maxillary palpi article 3 the longest, 4 and 5 almost same-sized; article 5 straight (Fig. 5B, D). Thorax: Dorsal disk wider than long, covered by fine pubescence (Fig. 5A, C). Dorsal disk cephalic margin slightly concave, caudal margin convex (Fig. 5A, C). Lateral lobes ventro-cephalic and ventro-caudal angles rounded (Fig. 5B, D). Forewings covering abdomen, hindwings slightly longer than forewings (Fig. 5A–D). Legs: TI with tympana present on inner and outer faces; three apical spurs, two ventral, one dorsal. TII with four apical spurs, two ventral, two dorsal. TIII subapical spurs 5/4, with two spines between each spur, except proximal spurs with three spines; eight spines above subapical spurs on inner and outer sides. FIII longer than TIII (Fig. 5B, D). TIII inner apical spurs: iad>iam>iav; outer apical spurs: oam>oav>oad. Basitarsus dorsal spines 3/1; inner apical spur slightly longer than outer apical spur.

**Male.** Forewings slightly shorter than hindwings; anal area slightly bulged dorsally (Fig. 5B). A1 not connected to A2. Stridulatory vein (PCu vein) present, portion close to CuPa.
Fig. 5. *Amblyrhetus alagoensis* sp. nov. A. Male habitus, dorsal; B. Male habitus, lateral; C. Female habitus, dorsal; D. Female habitus, lateral; E. Head, frontal; F. Male right forewing; G. Male metanotum and first abdominal tergite; H. Male supra-anal plate; I. Male subgenital plate; J. Female subgenital plate and ovipositor. Scale bars 5 mm (A–D); 1 mm (E–J). Abbreviations: see material and methods.
Fig. 6. *Amblyrhethus alagoensis* sp. nov. Male genitalia: A. Dorsal; B. Ventral; C. Lateral; D. Posterior. Female copulatory papilla: E. Dorsal; F. Ventral; G. Lateral. Scales 1 mm. Abbreviations: see material and methods.
Measurements in mm of *Amblyrhethus alagoensis* sp. nov.
Abbreviations: IOD—inter ocular distance; HW—head width; PL, pronotum length; PW, pronotum width (at midline); FWL, forewing length; LFIII, length of hind femur; LTIII, length of hind tibia; OL, ovipositor length.

<table>
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<tr>
<th></th>
<th>IOD</th>
<th>HW</th>
<th>PL</th>
<th>PW</th>
<th>FWL</th>
<th>LFIII</th>
<th>LTIII</th>
<th>OL</th>
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<tr>
<td>Female</td>
<td>2.7</td>
<td>5.5</td>
<td>4.1</td>
<td>6</td>
<td>18.1</td>
<td>13.1</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Male</td>
<td>2.1</td>
<td>4.2</td>
<td>3.6</td>
<td>4.8</td>
<td>15.1</td>
<td>-</td>
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Fig. 7. Map of the known distribution of *Amblyrhethus* species.

Male genitalia: (Fig. 6) Pseudepiphallus: pseudepiphallic sclerite trapezoidal in dorsal and ventral views, anterior half inflated; slightly curved upwards in lateral view; anterior margin rounded on median region (Fig. 6A). Llophi curved upwards, posterior margin sub-straight in dorsal and ventral views; ventral face translucent (Fig. 6A, B). PsP clavate, longer than Llophi, not surpassing posterior margin of pseudepiphallic sclerite in dorsal and ventral views, inner margin with anterior projection finger-shaped (Fig. 6A, B). Rami straight in dorsal and ventral views, two times longer than pseudepiphallic sclerite (Fig. 6A–C). Ectophallic invagination: EctF strongly sclerotized, shorter than PsP, trapezoidal on the edge of posterior margin of pseudepiphallic sclerite (Fig. 6A–D). EctAp longer than pseudepiphallic sclerite, slightly curved inwards in the middle in dorsal and ventral views (Fig. 6A, B); arc not complete, curved posteriorly; ventral projections of ectophallic invagination shorter than arc. Endophallus: End short, u-shaped, in the middle of pseudepiphallic sclerite (Fig. 6B).

Female. Larger than male, similar coloration (Fig. 5C, D). Forewings with longitudinal veins crossed by accessory veins. Subgenital plate wider than long, posterior margin concave (Fig. 5I). Ovipositor slightly inclined upwards; apex of ovipositor lateral margins serrulate, posterior margin truncate (Fig. 5C, J). Copulatory papilla bell-shaped, with two posterior thin projections directed ventrally (Fig. 6E–G).

Coloration.—Occiput, vertex, and pronotum general coloration reddish brown (Fig. 5A–D). Face reddish-brown to medium brown (Fig. 5E); antennal scape medium brown; antennomeres yellowish with some isolated antennomeres medium brown (Fig. 5A–D). Forewings slightly translucent, medium brown. Metanotum light brown (Fig. 5G), first three abdominal tergites medium brown, the other tergites dark brown. Supra-anal plate

Table 3. Measurements in mm of *Amblyrhethus alagoensis* sp. nov.
dark brown (Fig. 5H). Abdominal sternites yellowish brown; subgenital plate medium brown (Fig. 5I). FI, FII, TI, and TII medium brown to reddish brown. FIII reddish brown, slightly striped, distal margin darker; TIII medium brown; spurs yellow with apex dark brown; tarsomeres yellowish-brown (Fig. 5C).

Discussion

Now, with ten valid species, Ambyrrhethus is the fifth most speciose genus of Paroecanthini. It is right behind Neometrypus Desutter, 1988 (13 species), Angustistrella Gorochov, 2011 (14 species), Paroecanthus Saussure, 1859 (21 species), and Tafalisca Walker, 1869 (27 species) (Cigiano et al. 2022). However, knowledge about this genus is very incipient. There are no acoustic, distributional, or ecological data available about this taxon. The difficulty of collecting these crickets could be an important factor contributing to this lack of knowledge (Campos et al. 2020). Such crickets frequently hide on the leaves of bushes and trees, making it difficult to find them. Males are easier to find due to their sound production; however, they are far from being abundant in the field (LDC and FAGM pers. obs.). The difficulty of finding these crickets could also be related to where they hide. There are no records of refuges for Ambyrrhethus crickets. The relatively short legs related to the body (mainly posterior leg) indicate that the insect could find refuge inside hollow tree branches, a similar type of refuge for other Paroecanthini crickets, such as Tafalisca and Brazitrypa (Campos et al. 2020).

Four of the seven species of Ambyrrhethus described before now have an unknown type locality (A. capitatus) or an inaccurate type locality, such as A. brevipes and A. depressus from Colombia, a large country, and A. ponderosus from Panama. The low accuracy of the type locality of more than half of Ambyrrhethus species indicates the need for more data on these crickets, especially field information such as distribution, behavior, and acoustics. These characteristics are crucial to understanding cricket adaptation and diversification. We hope to obtain valuable field data over the next few years on these interesting but poorly known crickets that may have much to tell about evolution, particularly concerning acoustics and habitat adaptation.

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References


