

Research article

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The *Smicridea* (*Smicridea*) *fasciatella* species group (Trichoptera: Hydropsychidae) in Brazil: six new species and new distributional records

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Abstract. The *Smicridea* (*Smicridea*) *fasciatella* species group occurs from the southwestern USA, throughout Central America, the Greater Antilles islands, and most of South America, except for the Chilean subregion. It is characterized by the phallic apparatus being a simple tube with eversible internal sclerites at the apex. The *fasciatella* group is composed of 61 species, of which only 11 occur in Brazil, mainly in the Atlantic Forest biome in the southeastern region. In order to reduce the Linnean and Wallacean shortfalls for the *Smicridea* Brazilian fauna, we diagnose, describe, and illustrate males of six new species in the *fasciatella* group: *Smicridea* (*Smicridea*) *blahniki* Desiderio, Pes & Hamada sp. nov., *S. (Smicridea) brevitruncata* Desiderio, Pes & Hamada sp. nov., *S. (Smicridea) caaguara* Desiderio, Pes & Hamada sp. nov., *S. (Smicridea) ipiranga* Desiderio, Pes & Hamada sp. nov., *S. (Smicridea) jeaneae* Desiderio, Pes & Hamada sp. nov., and *S. (Smicridea) polyacantha* Desiderio, Pes & Hamada sp. nov. Additionally, we provide distributional data for *S. (Smicridea) albosignata* Ulmer, 1907, *S. (Smicridea) bivittata* (Hagen, 1861), *S. (Smicridea) erecta* Flint, 1974, *S. (Smicridea) obliqua* Flint, 1974, *S. (Smicridea) paranensis* Flint, 1983, and *S. (Smicridea) sattleri* Denning & Sykora, 1968. The number of *S. (Smicridea)* species in Brazil increases from 21 to 27 and *Smicridea* is recorded from the states of Acre, Amapá, and Sergipe for the first time.

Keywords. Aquatic insects, caddisfly, Smicrideinae, morphology, taxonomy.

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Introduction

Smicridea McLachlan, 1871 was established by McLachlan (1871) to include three species: *Smicridea fasciatella* McLachlan, 1871 from USA, *Smicridea saucia* McLachlan, 1871 from Peru, and *Smicridea murina* McLachlan, 1871 from Chile. It is the only genus of Smicrideinae Flint, 1974 (Hydropsychidae Curtis, 1835) occurring in the Western Hemisphere and the most diverse and abundant genus in this subfamily, with 245 species distributed from the southwestern USA to southern Argentina (Holzenthall & Calor 2017; Alves *et al.* 2018; Mey & Ospina-Torres 2018; Sganga & Gibon 2018; Gibon & Sganga 2019; Rázuri-Gonzales & Armitage 2019; Vilarino *et al.* 2019; Desiderio *et al.* 2020).

Currently, *Smicridea* is divided into two subgenera: *S. (Smicridea)* McLachlan, 1871 (139 species) and *S. (Rhyacophylax)* Müller, 1879 (106 species). The subgenera can be distinguished in the adult stage by the wing venation, the male tibial spur formula, and the presence/absence of two pairs of internal reticulate sacs in segments VI and VII (Flint 1974a, 1989). Larval characters to distinguish subgenera are fewer and/or imprecise (Flint 1974a; Wiggins 1996; Sganga & Fontanarrosa 2006).

According to Flint (1974a, 1989), the subgenus *Smicridea* is composed of five species groups: *Smicridea annulicornis* (7 species), *Smicridea frequens* (5 species), *Smicridea smilodon* (3 species), *Smicridea fasciatella* (61 species), and *Smicridea nigripennis* (60 species). The first three of these groups occur from southern Argentina to Chile (the Chilean subregion, as defined by Flint (1983)) and the remaining two groups occur from the southwestern USA, throughout Central America, the Antilles, and most of South America, except for the Chilean subregion (Flint 1974a, 1974b, 1983, 1989; Desiderio *et al.* 2020). Additionally, the endemic species *S. complicatissima* Flint, 1989 and *S. matancilla* Flint, 1989 from the Chilean region remain incertae sedis with respect to their assignment to species groups within the subgenus *Smicridea* (Flint 1989).

The species groups in this subgenus are circumscribed mainly on the basis of the characters of the male genitalia. The *fasciatella* group is characterized by a tubular phallus with eversible internal sclerites at the apex. Within the *fasciatella* group, Blahnik (1995) proposed the *fasciatella* complex, characterized by highly similar genitalia and significant differences in the color of the wings and body, and Flint (1981) recognized the *albosignata* complex, which is distinguished by having paired apicodorsal sclerites on the phallus. The *fasciatella* complex includes six species, *S. astarte* Malicky, 1980, *S. catherinae* Blahnik, 1995, *S. fasciatella*, *S. hybrida* Blahnik, 1995, *S. lacanha* Bueno-Soria & Hamilton, 1986, and *S. varia* (Banks, 1913), and the *albosignata* complex has four species, *S. albosignata* Ulmer, 1907, *S. bulbosa* Flint, 1974, *S. riita* Flint, 1981, and *S. meridensis* Botosaneanu & Flint, 1982.

In Brazil, *Smicridea* is the most diverse caddisfly genus with 62 recorded species; 21 of them are assigned to the subgenus *Smicridea*, of which 11 belong to the *fasciatella* group: *S. aequalis* Banks, 1920, *S. albosignata* Ulmer, 1907, *S. bivittata* (Hagen, 1861), *S. capao* Vilarino, Dias & Calor, 2019, *S. erecta* Flint, 1974, *S. gemina* Blahnik, 1995, *S. obliqua* Flint, 1974, *S. paranensis* Flint, 1983, *S. sattleri* Denning & Sykora, 1968, *S. sepala* Rocha, Dumas & Nessimian, 2016, and *S. truncata* Flint, 1974 (Pes & Santos 2020). Most of these species are concentrated in the Atlantic Forest biome in southeastern Brazil.

The aims of this study are to advance knowledge of caddisfly diversity, reducing the Linnean (Brown & Lomolino 1998) and Wallacean (Lomolino 2004) shortfalls for *Smicridea*, and to describe and illustrate the males of six new species in the *S. fasciatella* group in Brazil. Additionally, we provide new distributional records for *S. albosignata*, *S. bivittata*, *S. erecta*, *S. obliqua*, *S. paranensis*, and *S. sattleri*.

Material and methods

Specimen collection, preparation, and observation

Adults were collected with Pennsylvania traps (Frost 1957), UV light pan traps (Calor & Mariano 2012), a white sheet with an LED light, and Malaise traps (Gressitt & Gressitt 1962), or manually with an entomological net. Most of the collected specimens were preserved in 80% or 96% ethanol, while the specimens collected on the white sheets were pinned and preserved dried.

To observe male genital structures, the abdomen of each specimen was removed and cleared using hot 10% KOH as detailed by Blahnik & Holzenthal (2004); sometimes 85% lactic acid was also used following procedures detailed by Blahnik *et al.* (2007) in order to evert the endothecal spines of the phallus. After clearing, the abdomen was mounted on a temporary slide using glycerin and examined under a Leica DM5500 B compound microscope. After examination, it was stored in a microvial filled with glycerin, together with the remains of the respective specimen in a plastic vial with 80% ethanol.

Illustrations and maps

Photographs of the habitus, head, and forewings were obtained with a Leica DMC4500 digital video camera attached to a Leica M205A stereo microscope or a Leica DFC420 digital video camera attached to a Leica M165C stereo microscope, both using an LED illumination dome (Kawada & Buffington 2016). Stacks of images of each structure were produced at different focal distances; these were then automatically combined into a single image with a greater depth of field using the Helicon Focus® stacking software (ver. 7.6.4 Pro).

Male genitalia were photographed using a Leica DFC295 video camera attached to a Leica DM5500 B compound microscope, and the stacked images were used as templates to create vector graphic illustrations in Adobe Illustrator®. Photographs were assembled into plates using Adobe Photoshop®.

The distribution maps were prepared using QGIS Las Palmas ver. 2.18.10 software (QGIS Development Team 2016). Vector and raster maps used IBGE (2019) and Natural Earth (2020) data. Distribution data for species of *Smicridea* were compiled from the literature, analyzed specimens, and collection datasets included in the Global Biodiversity Information Facility (GBIF 2020).

Morphological terminology, descriptions, and material examined

Morphological terminology follows mostly Blahnik (1995) for the male genitalia and Wells & Neboiss (2018) for the head setal warts.

Species descriptions were made using the DELTA (Description Language for Taxonomy) software (Dallwitz *et al.* 1999) to promote consistency and standardization in descriptive taxonomy. The style of descriptions follows Desiderio *et al.* (2020).

Lists of material examined were prepared using the AUTOMATEX macro in Microsoft Excel (Brown 2013).

Abbreviations of genital structures

- al. wt. = anterolateral wart
- am. wt. = anteromesal wart
- apm. lb. = apicomesal lobe
- as. ia. = apical segment of the inferior appendage
- bs. ia. = basal segment of the inferior appendage
- dl. pl. = dorsolateral plates on the phallic apparatus

- ej. dt. = ejaculatory duct of endophallus
 et. sp. = endothecal spines
 in. resc. = internal reticulate sacs
 lb. pp. = labial palp
 ml. pp. = maxillary palp
 ph. sc. = phallotremal sclerite
 pl. wt. = posterolateral wart
 pr. cp. = periphalic cap on the phallic apparatus
 se. = segment
 te. = tergum

Repositories

Types and other material examined are deposited in the following collections:

- CZMA = Coleção Zoológica do Maranhão, Centro de Estudos Superiores de Caxias, Universidade Estadual do Maranhão, Caxias, Brazil
 DZRJ = Coleção Entomológica Prof. José Alfredo Pinheiro Dutra, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
 DZUP = Coleção Entomológica Padre Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil
 INPA = Coleção de Invertebrados, Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil
 MZUSP = Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil
 UFBA = Museu de Zoologia da Universidade Federal da Bahia, Salvador, Brazil

Results

Class Insecta Linnaeus, 1758
 Order Trichoptera Kirby, 1813
 Suborder Annulipalpia Martynov, 1924
 Superfamily Hydropsychoidea Curtis, 1835
 Family Hydropsychidae Curtis, 1835
 Subfamily Smicrideinae Flint, 1974

Genus *Smicridea* McLachlan, 1871

Smicridea (Smicridea) blahniki Desiderio, Pes & Hamada sp. nov.
 urn:lsid:zoobank.org:act:FD50773D-473C-4AC6-979F-D3F9E3B410E0

Figs 1–3, 4A

Diagnosis

Smicridea blahniki sp. nov. is similar to *S. erecta* and *S. jeaneae* Desiderio, Pes & Hamada sp. nov. based on the strong, pointed apicomesal lobes on tergum X. Of these species, the new species is most similar to *S. erecta*, because the apicomesal lobes in both species touch distally and each lobe bears one pair of short, thin apical setae in dorsal view, while in *S. jeaneae* sp. nov., the apicomesal lobes do not touch distally and each has three medium-sized, thin apical setae. *Smicridea blahniki* sp. nov. has one pair of long, stout subapical setae on the apicomesal lobe of tergum X, whereas *S. erecta* has one pair of medium-sized, thin setae (absent in *S. jeaneae* sp. nov.). The basal segment of the inferior appendage in the new species has five stout apical spine-like setae, one long seta on the dorsal surface and four medium-sized on the mesal margin, whereas *S. erecta* and *S. jeaneae* sp. nov. have three stout apical spine-like setae (one dorsal and two on the internal margin). Additionally, the apical segment of the inferior appendage

in *S. blahniki* sp. nov. is thick, slightly curved medially, and has a rounded apex, while in *S. erecta* and *S. jeaneae* sp. nov., this segment is slender, strongly curved medially, and has a slightly acute apex. Furthermore, *S. blahniki* sp. nov. can be recognized by the stethoscope-shaped phallotremal sclerite of the phallic apparatus in dorsal view, while in *S. erecta* this sclerite is ribbon-shaped and in *S. jeaneae* sp. nov. it is U-shaped in the proximal region and hastate in the distal region.

Etymology

The specific epithet is in honor of Dr Roger J. Blahník (University of Minnesota, USA) in recognition of his contributions to the taxonomy and systematics of Neotropical caddisflies.

Material examined

Holotype

BRAZIL • ♂; Amazonas, Barcelos, Parque Estadual Serra do Aracá, 1st order stream; 00°54'13.68" N, 63°26'01.18" W; 1112 m a.s.l.; 2 Aug. 2009; A.M.P. Santos, N. Ferreira Jr and F.F. Salles leg.; Malaise trap; INPA-TRI 000106.

Paratype

BRAZIL • 1 ♂; same collection data as for holotype; INPA-TRI 000107.

Description

Adult male (Figs 1–2)

FOREWING LENGTH. 4.15, 4.67 mm (n = 2).

COLOR. General color brown (in alcohol) (Fig. 1A). Antennae yellowish brown (Fig. 1A). Head brown, denuded (Fig. 1B–C); dorsally with weakly-pronounced median suture; with five setal warts; anteromesal wart small, rounded; anterolateral pair undivided, weakly delimited; posterolateral pair large, ovoid (Fig. 1C). Maxillary palp with segments 1–4 increasing gradually about 0.8× in size toward more apical segments, segment 5 long, about 1.2× as long as all previous segments combined (Fig. 1B). Thorax pale brown, without setae (old specimens); legs brown, with mid leg tarsi yellowish (Fig. 1A). Wing venation typical for subgenus (Fig. 1D–E). Forewings, in alcohol, uniformly brown, with small white spot on apex of Cu2 (Fig. 1D). Sternum V with anterolateral glandular processes as long as sternum. Abdominal segments VI and VII with 2 pairs of internal glands, both pairs longer than their containing segments (Fig. 1F).

MALE GENITALIA (Fig. 2). Segment IX in lateral view with anterolateral margin nearly straight, strongly sclerotized (Fig. 2A); posterodorsal margin bearing small spicules, distributed in a subtriangular band (Fig. 2B). Tergum X elongate; in lateral view, ventrolateral margin strongly sclerotized, with four medium-sized, thin setae on apical third; apex with sharp notch, ending in slender, straight lobe (Fig. 2A); in dorsal view, lateral margin rounded; dorsomesal setose area bearing three medium-sized, thin setae; divided apicomeresally by V-shaped incision about ¼ its length; apex of tergite rounded, with strong, pointed apicomeresal lobe, touching distally, each bearing one pair of long, stout subapical setae and one pair of short, thin apical setae (Fig. 2B). Inferior appendages 2-segmented; basal segment long, slightly inflated distally, covered with long, thin setae, with a group of stout apical spine-like setae, one long seta dorsally and four medium-sized setae on mesal margin; apical segment short, about ⅓ as long as basal segment, thick, slightly curved medially, apex rounded with numerous short, thin setae on mesal margin (Fig. 2B). Phallic apparatus long and tubular; basal section, in lateral view, enlarged, 4× diameter of phallosome at its narrowest point, forming an angle of about 93° with apical section; median section of phallosome straight, with dorsal periphallal cap sclerotized, slender, and upturned (Fig. 2C); apex enlarged, without processes or plates; endothecal membranes without spines; phallotremal sclerite, in dorsal view, distinct, strongly sclerotized, stethoscope-shaped, proximal region slightly bifid and distal region with acute arms

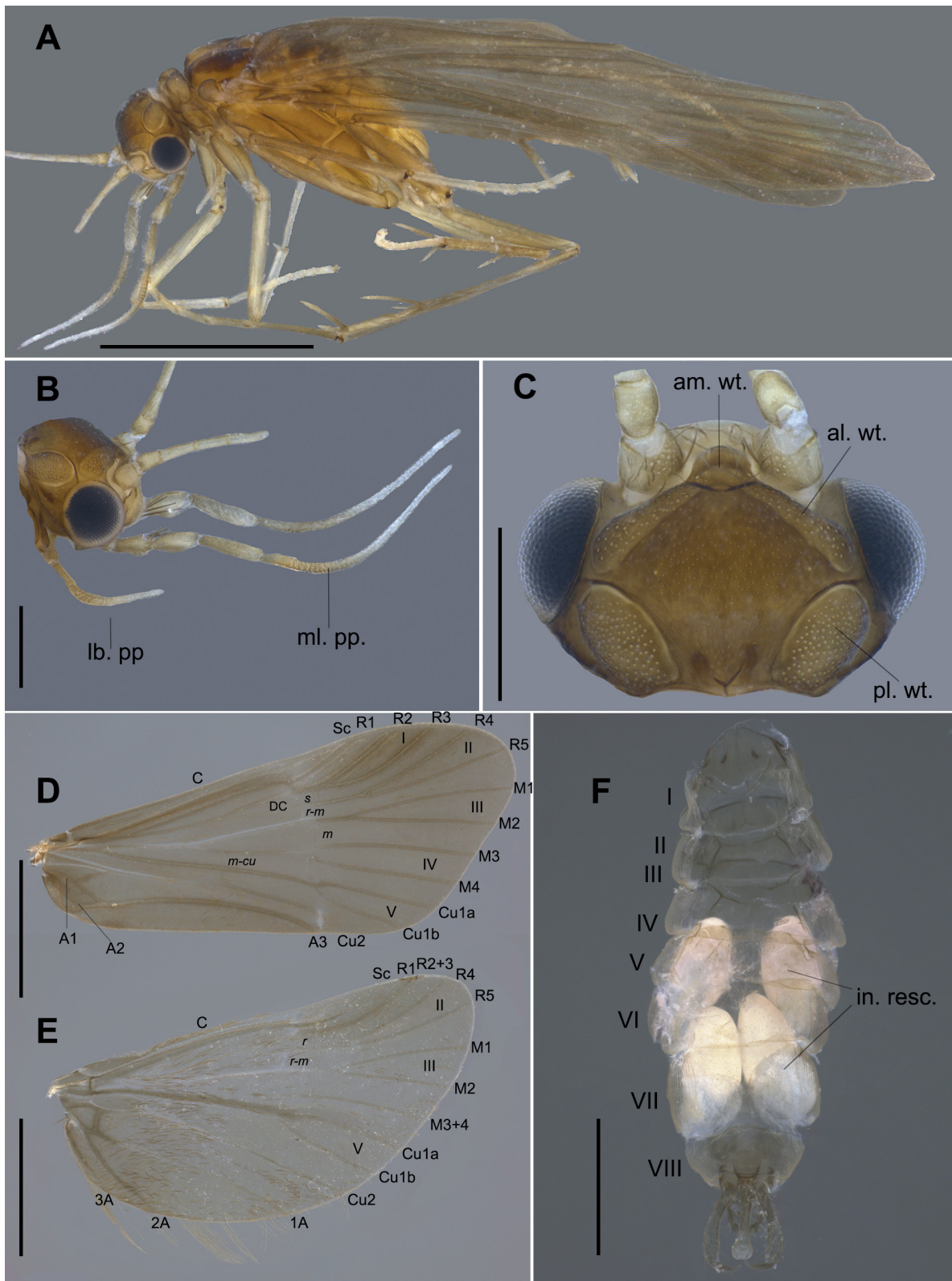


Fig. 1. *Smicridea (Smicridea) blahniki* Desiderio, Pes & Hamada sp. nov., holotype, ♂ (INPA-TRI 000106). **A.** Lateral habitus (in alcohol). **B.** Head, right lateral view. **C.** Head, dorsal view. **D.** Forewing, right dorsal view. **E.** Hind wing, right dorsal view. **F.** Abdomen, ventral view. Scale bars in mm: A = 2; B–C = 0.5; D–F = 1.

(Fig. 2D–E); in lateral view, slender, with dark brown comma-like median depression, distally arched, directed posterad (Fig. 2C). Ejaculatory duct of endophallus, in lateral view, distinct, sclerotized (Fig. 2C).

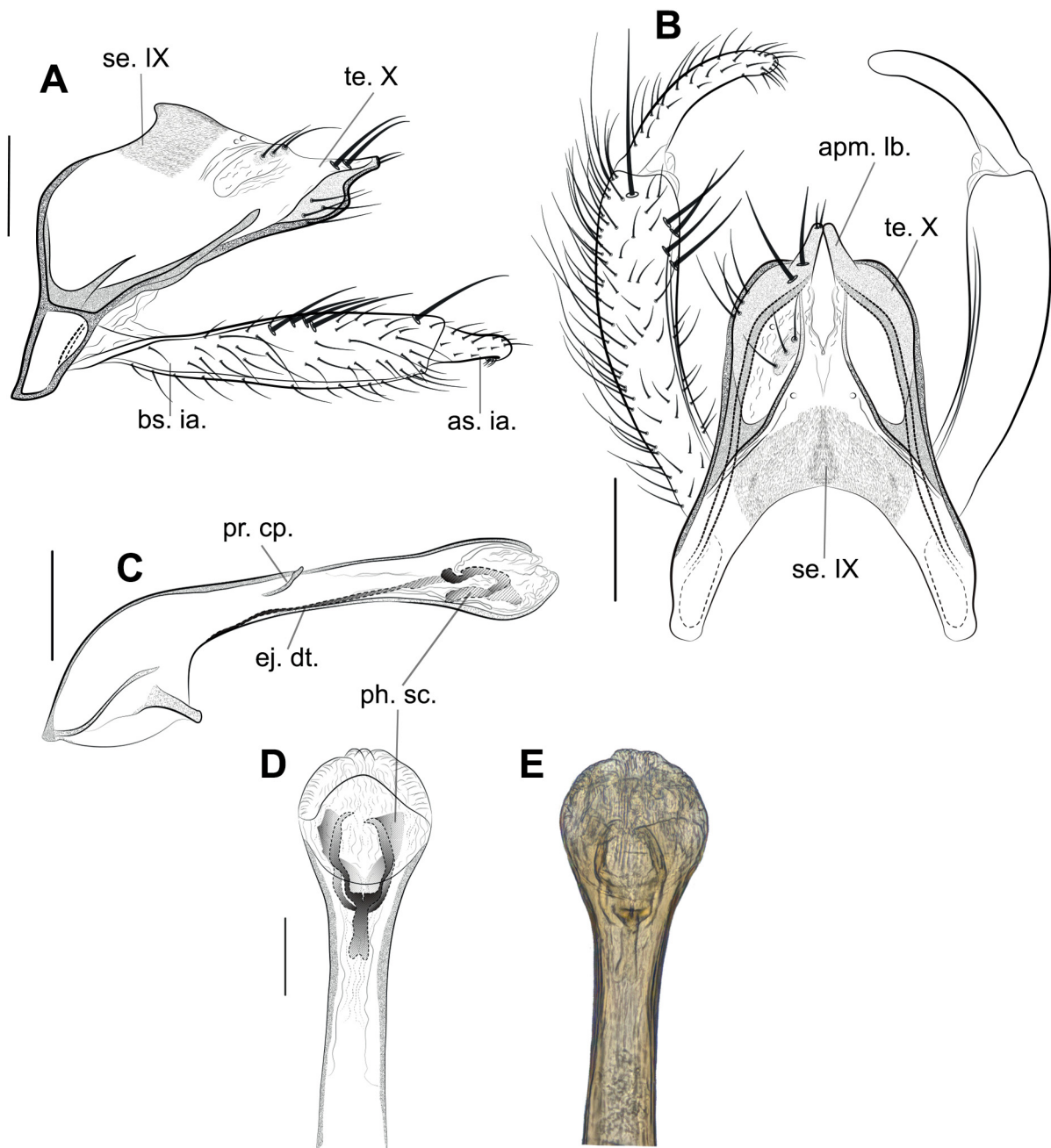


Fig. 2. *Smicridea (Smicridea) blahniki* Desiderio, Pes & Hamada sp. nov., male terminalia, holotype (INPA-TRI 000106). **A.** Terga IX, X and inferior appendages, lateral view. **B.** Same, dorsal view. **C.** Phallic apparatus, lateral view. **D.** Apex of phallic apparatus, dorsal view. **E.** Apex of phallic apparatus (photograph). Scale bars in mm: A–C = 0.1; D–E = 0.05.

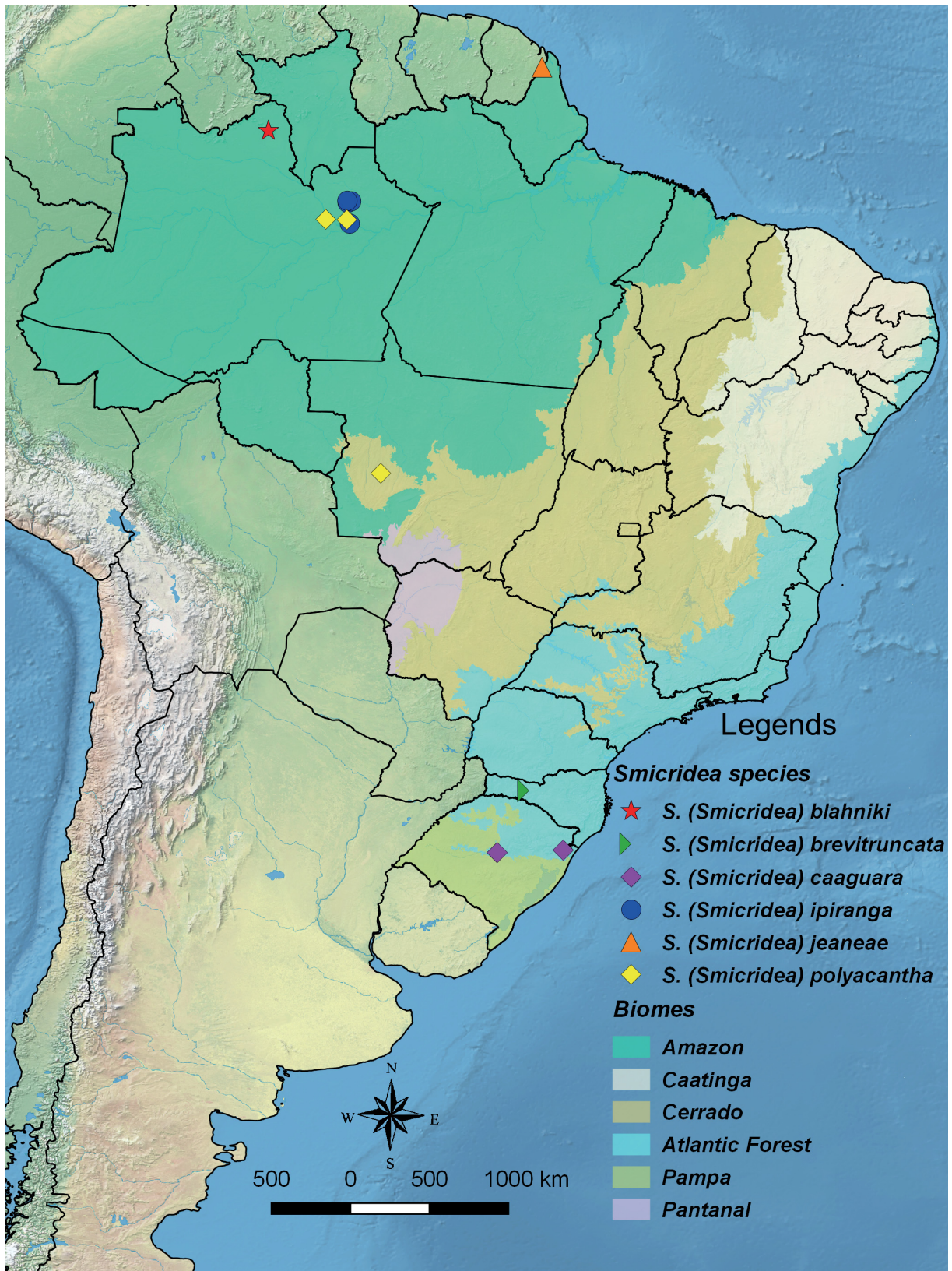


Fig. 3. Geographical distribution map for the new species of *Smicridea* McLachlan, 1871 treated in this study.

Bionomics

The males of *S. blahniki* sp. nov. were collected near a 1st order stream, where the predominant vegetation is highland savanna with a minimum altitude of 1112 m a.s.l. (Fig 4A). This stream is located in the Serra do Aracá mountain range, northern Brazilian Amazon. The water in the stream was black and acidic (pH 4.6), with low conductivity (10 μScm^{-1}), and a water temperature of 22°C. The stream was about 0.5 m wide, 0.30 m deep, with rocky bottoms characterized by boulders and slow-flowing water.

Distribution (Fig. 3)

Brazil: Amazon (Amazonas).

Smicridea (Smicridea) brevitruncata Desiderio, Pes & Hamada sp. nov.
urn:lsid:zoobank.org:act:47DD9364-4029-4B7C-A3EC-08B52BC03778
Figs 3, 4B, 5–6

Diagnosis

Smicridea brevitruncata sp. nov. belongs to the *albosignata* complex of Flint (1981). It is most similar to *S. riita* Flint, 1981 from Venezuela based on the obliquely truncated apex of tergite X in dorsal view. However, in *S. brevitruncata* sp. nov. the apical segment of the inferior appendage is thick and short, and the truncated apex has numerous medium-sized, acuminate setae on the mesal margin, whereas in *S. riita* it is long, slender, with an acute apex, bearing numerous short, thin setae. Furthermore, the new species can be diagnosed by the basal segment of the inferior appendage having four long, stout apical spine-like setae, two dorsal and two on the mesal margin, and by the shape of the phallotremal sclerite, mainly in dorsal view. Additionally, *S. brevitruncata* sp. nov. differs from all other species of *S. (Smicridea)* by the absence of the internal reticulate sacs on abdominal segments VI and VII.

Etymology

The specific epithet is an allusion to the characteristics of the inferior appendages, which are short and apically truncated. Derived from the Latin words, ‘*brevi*’ = ‘short’ and ‘*truncata*’ = ‘piece cut off, tip, end’.

Material examined

Holotype

BRAZIL • ♂; Santa Catarina, Ponte Serrada, BR-282, Rio Irani, Parque dos Butieiros; 26°55'49.2" S, 51°52'29.3" W; 1022 m a.s.l.; 5 Sep. 2009; N. Hamada, A.M.O. Pes and J.O. Silva leg.; white sheet with an LED light; INPA-TRI 000108.

Paratypes

BRAZIL • 8 ♂♂; same collection data as for holotype; INPA-TRI 000109 • 2 ♂♂; same collection data as for holotype; DZUP • 2 ♂♂; same collection data as for holotype; DZRJ • 2 ♂♂; same collection data as for holotype; MZUSP.

Description

Adult male (Figs 5–6)

FOREWING LENGTH. 4.52–5.49 mm (mean = 4.75 mm, SD = 0.37, n = 5).

COLOR. General color dark brown (in alcohol) (Fig. 5A). Antennae brown (Fig. 5A). Head dark, with grayish to black setae on dorsum (Fig. 5B–C); dorsally with slightly pronounced median suture; with five setal warts; anteromesal wart small, rounded; anterolateral pair undivided, weakly delimited; posterolateral pair large, ovoid (Fig. 5C). Maxillary palp with segments 1–4 increasing gradually about 0.8× in size

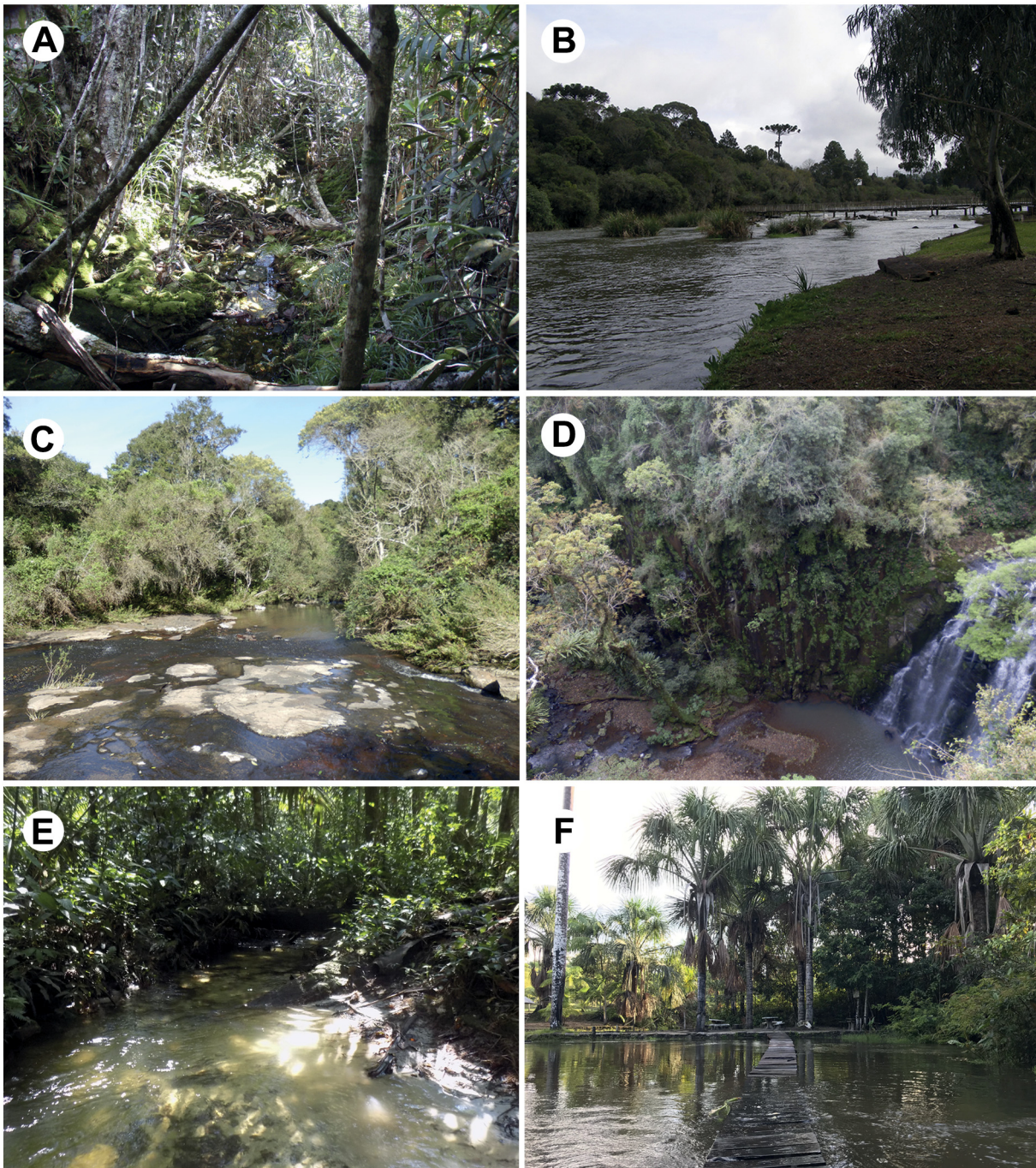


Fig. 4. Habitats of the new species of *Smicridea* McLachlan, 1871 treated in this study: **A.** First-order stream, Amazonas, Brazil, collection site of *Smicridea* (*Smicridea*) *blahniki* Desiderio, Pes & Hamada sp. nov. **B.** Rio Irani, Santa Catarina, Brazil, collection site of *S.* (*S.*) *brevitruncata* Desiderio, Pes & Hamada sp. nov. **C.** Arroio Lajeado, Rio Grande do Sul, Brazil, collection site of *S.* (*S.*) *caaguara* Desiderio, Pes & Hamada sp. nov. holotype. **D.** Cascata Raddatz, Arroio Teotônica, Rio Grande do Sul, Brazil, collection site of *S.* (*S.*) *caaguara* sp. nov. paratype. **E.** Igarapé Ipiranga, Amazonas, Brazil, collection site of *S.* (*S.*) *ipiranga* Desiderio, Pes & Hamada sp. nov. **F.** Balneário Km 18.5, Amazonas, Brazil, collection site of *S.* (*S.*) *polyacantha* Desiderio, Pes & Hamada sp. nov.

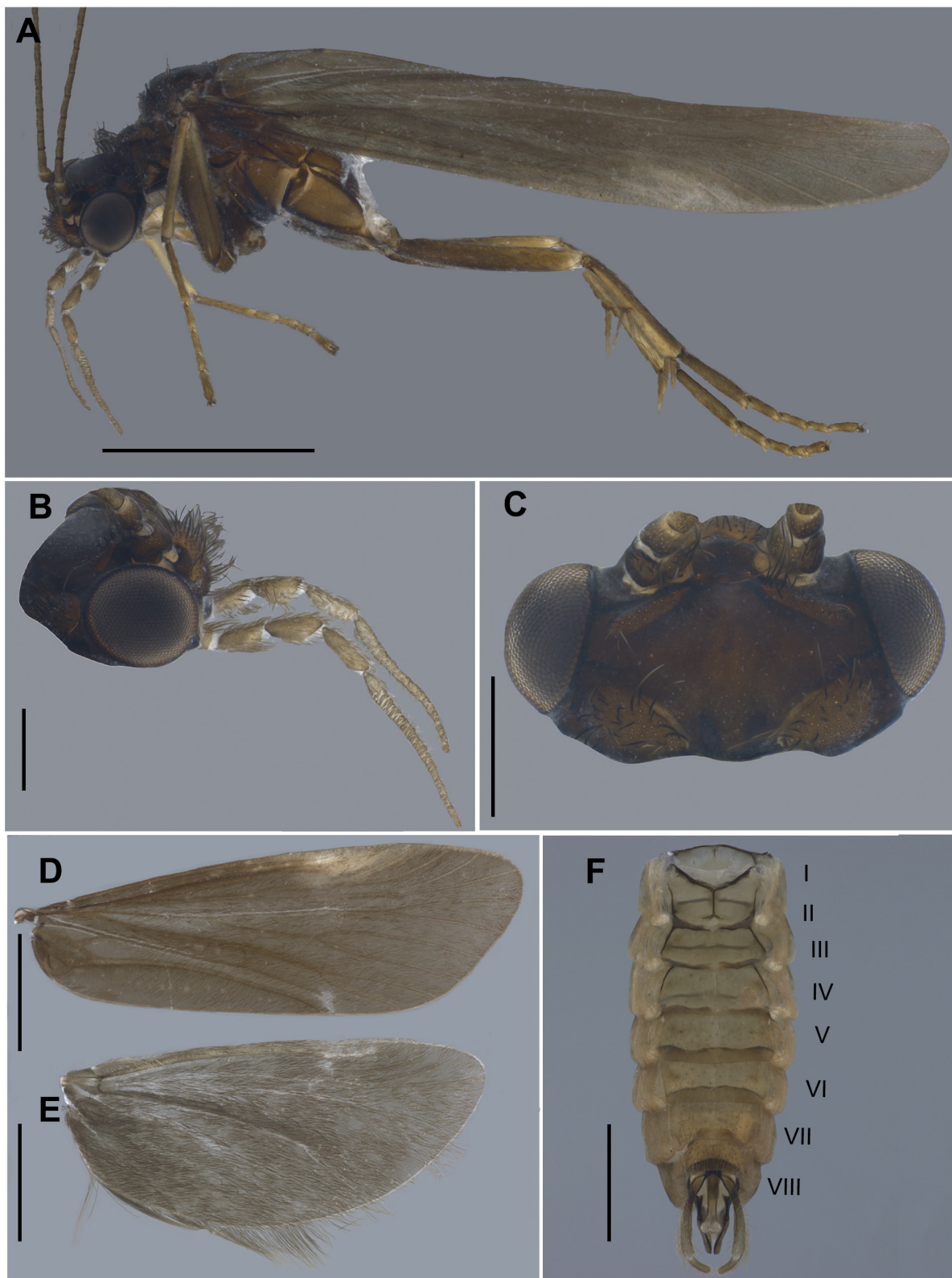


Fig. 5. *Smicridea (Smicridea) brevitruncata* Desiderio, Pes & Hamada sp. nov., holotype, ♂ (INPA-TRI 000108). **A.** Lateral habitus (in alcohol). **B.** Head, right lateral view. **C.** Head, dorsal view. **D.** Forewing, right dorsal view. **E.** Hind wing, right dorsal view. **F.** Abdomen, ventral view. Scale bars in mm: A = 2; B–C = 0.5; D–F = 1.

toward more apical segments, segment 5 long, about 1.2× as long as all previous segments combined (Fig. 5B). Thorax dark brown, covered with brown setae; legs brown, with mid-leg tarsi yellowish (Fig. 5A). Wing venation typical for subgenus (Fig. 5D–E). Forewings, in alcohol, uniformly fuscous, faintly marked with transverse band subapically on pterostigma reaching base of R4+5 and small spot on apex of Cu2 (Fig. 5D). Sternum V with anterolateral glandular processes slightly shorter than sternum. Abdominal segments VI and VII without pairs of internal reticulate sacs (Fig. 5F).

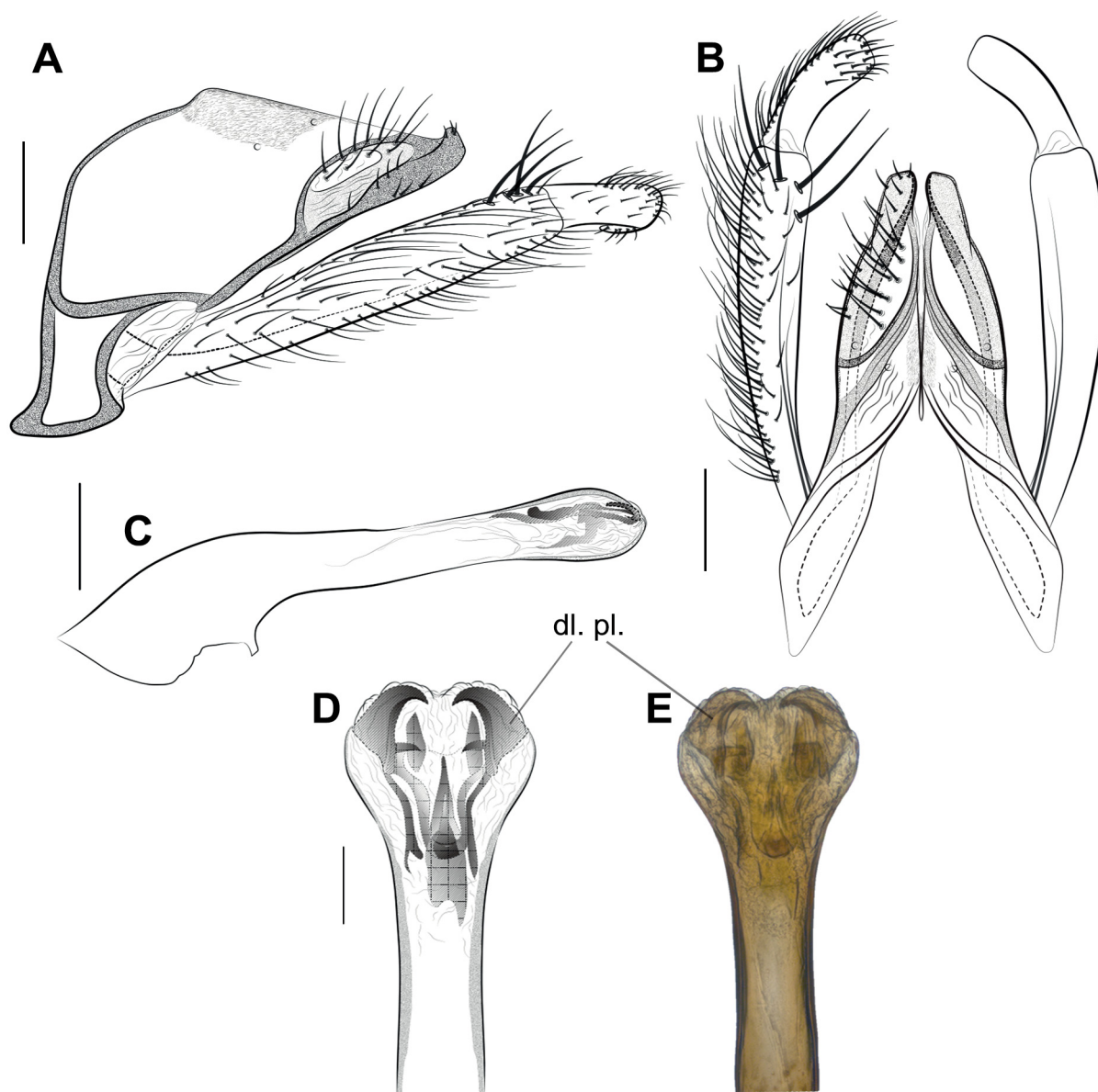


Fig. 6. *Smicridea (Smicridea) brevitruncata* Desiderio, Pes & Hamada sp. nov., male terminalia, holotype (INPA-TRI 000108). **A.** Terga IX, X and inferior appendages, lateral view. **B.** Same, dorsal view. **C.** Phallic apparatus, lateral view. **D.** Apex of phallic apparatus, dorsal view. **E.** Apex of phallic apparatus (photograph). Scale bars in mm: A–C = 0.1; D–E = 0.05.

MALE GENITALIA (Fig. 6). Segment IX in lateral view with anterolateral margin straight, strongly sclerotized (Fig. 6A); posterodorsal margin bearing small spicules, distributed in two subtriangular bands (Fig. 6B). Tergum X elongate; in lateral view, ventrolateral margin strongly sclerotized, with 10 to 12 short, stout setae on apical third; apex produced and upturned (Fig. 6A); in dorsal view, lateral margin slightly rounded; dorsomesal setose area bearing 10 medium-sized, thin setae; divided apicomesally by V-shaped incision about $\frac{1}{3}$ its length; apex of tergite obliquely truncated, with about three short, thin setae (Fig. 6B). Inferior appendages 2-segmented; basal segment long, slightly inflated distally, covered with long, thin setae, with four long, stout apical spine-like setae, two dorsal and two on mesal margin; apical segment short, about $\frac{1}{4}$ as long as basal segment, thick, slightly curved medially, apex truncated with numerous medium-sized, acuminate setae on mesal margin (Fig. 6B). Phallic apparatus long and tubular; basal section, in lateral view, enlarged, $4\times$ diameter of phallotheca at its narrowest point, forming an angle of about 113° with apical section; median section of phallotheca straight, without processes (Fig. 6C); apex enlarged, with pair of claw-shaped internal dorsolateral plates, longer than basal width, curved mesally and directed posterad; endothecal membranes without spines; phallotremal sclerite, in dorsal view, distinct, strongly sclerotized, proximal region with bifid base and pointed apex, distally with pair of subtriangular, tooth-like structures, which are overlapped by pair of slender, curved mesad processes (Fig. 6D–E); in lateral view, proximal region with small middorsal lobe, distally directed downward (Fig. 6C). Ejaculatory duct of endophallus, in lateral view, distinct, slightly sclerotized (Fig. 6C).

Bionomics

This species was collected near a large fast-flowing river about 20 m wide, located at 1022 m a.s.l. in the southern part of the Brazilian Atlantic Forest (Fig 4B). In this region the predominant vegetation is Mixed Ombrophilous Forest composed mainly of *Araucaria angustifolia* (Bertol.) Kuntze (Araucariaceae), with intense agricultural and pasture activities.

Distribution (Fig. 3)

Brazil: Atlantic Forest (Santa Catarina).

Smicridea (Smicridea) caaguara Desiderio, Pes & Hamada sp. nov.
urn:lsid:zoobank.org:act:6BC132ED-63EA-4E0C-A18F-7D2A367B0C0E
Figs 3, 4C–D, 7–8

Diagnosis

This new species is another member of the *albosignata* complex; it is most similar to the nominal species *S. albosignata* based on the enlarged, slightly bifid apex of the apical segment of the inferior appendage. However, the lateral margin of tergum X in the new species is rounded in dorsal view, while in *S. albosignata* this structure is straight. Both species also differ in the shape of the tergum X apex: in *S. albosignata* it is acute in dorsal view, while in *S. caaguara* sp. nov. it is rounded. Additionally, *S. albosignata* has the apex of tergum X with a subtriangular apicomeral flap directed laterad in dorsal view, while in *S. caaguara* sp. nov. this flap is absent. The new species also can be recognized by the distinct and complex phallotremal sclerite in dorsal view.

Etymology

The specific epithet is a reference to the indigenous people known as *caaguaras*, first inhabitants of the São Francisco de Paula municipality, which is the type locality of this species. This name is used as a noun in apposition.

Material examined**Holotype**

BRAZIL • ♂; Rio Grande do Sul, São Francisco de Paula, Floresta Nacional São Francisco de Paula, Arroio Lajeado; 29°25'57.01" S, 50°22'22.5" W; 832 m a.s.l.; 30 Aug.–2 Sep. 2015; N. Hamada, C.J. Benetti, G.P. Dantas and A.M.O. Pes leg.; INPA-TRI 000110.

Paratype

BRAZIL • 1 ♂; Rio Grande do Sul, Agudo, Cascata Raddatz, Arroio Teotônia; 29°35'12.05" S, 53°10'49.8" W; 248 m a.s.l.; 25 Aug. 2015; N. Hamada, C.J. Benetti, G.P. Dantas and A.M.O. Pes leg.; INPA-TRI 000111.

Description**Adult male** (Figs 7–8)

FOREWING LENGTH. 4.70, 5.92 mm (n = 2).

COLOR. General color dark brown (in alcohol) (Fig. 7A). Antennae brown (Fig. 7A). Head dark brown, with brown setae on dorsum (Fig. 7B–C); dorsally with weakly pronounced median suture; with five setal warts; anteromesal wart small, rounded; anterolateral pair undivided, weakly delimited; posterolateral pair large, ovoid (Fig. 7C). Maxillary palp with segments 1–4 increasing gradually about 0.8× in size toward more apical segments, segment 5 long, about 1.2× as long as all previous segments combined (Fig. 7B). Thorax dark brown, covered with brown setae; legs brown, with mid-leg tarsi yellowish (Fig. 7A). Wing venation typical for subgenus (Fig. 7D–E). Forewings, in alcohol, grayish to dark brown, with white transverse band subapically on pterostigma reaching base of R4+5 and small white spot on apex of Cu2 (Fig. 7D). Sternum V with anterolateral glandular processes slightly longer than sternum. Abdominal segments VI and VII with 2 pairs of internal glands, both pairs longer than their segments (Fig. 7F).

MALE GENITALIA (Fig. 8). Segment IX in lateral view with anterolateral margin nearly straight, weakly sclerotized (Fig. 8A); posterodorsal margin bearing small spicules, distributed in two dark, narrow parallel bands (Fig. 8B). Tergum X elongate; in lateral view, ventrolateral margin strongly sclerotized, with eight to 10 medium-sized, thin setae on apical third; apex produced and upturned (Fig. 8A); in dorsal view, lateral margin rounded; dorsomesal setose area bearing six to eight medium-sized, thin setae; divided apicomeresally by V-shaped incision about 1/3 its length; apex of tergite rounded, with about three short, thin setae (Fig. 8B). Inferior appendages 2-segmented; basal segment long, slightly inflated distally, covered with long, thin setae, with pair of long, stout apical spine-like setae on mesal margin; apical segment short, about 1/2 as long as basal segment, thick, curved medially, apex enlarged and slightly bifid with numerous short, acuminate setae on mesal margin (Fig. 8B). Phallic apparatus long and tubular; basal section, in lateral view, enlarged, 3× diameter of phallosome at its narrowest point, forming an angle of about 105° with apical section; median section of phallosome straight, with dorsal peripheral cap sclerotized and flattened (Fig. 8C); apex enlarged, with pair of claw-shaped internal dorsolateral plates, longer than basal width, curved mesally and directed posterad; endothelial membranes without spines; phallosomal sclerite, in dorsal view, distinct, strongly sclerotized, proximal region slender, rod-like, divided distally in two subtriangular lateral flaps (Fig. 8D–E); in lateral view, proximal region with small middorsal lobe, distally directed downward (Fig. 8C). Ejaculatory duct of endophallus, in lateral view, distinct, slightly sclerotized (Fig. 8C).

Bionomics

The males of *S. caaguara* sp. nov. were collected near medium-sized streams, about 5.0 m wide, located in the Pampa–Atlantic Forest transition zone in the state of Rio Grande do Sul. The vegetation of the collections sites varies from Grassy–Woody Steppe (Arroio Lageado – Rio dos Sinos Basin, Fig 4C) to

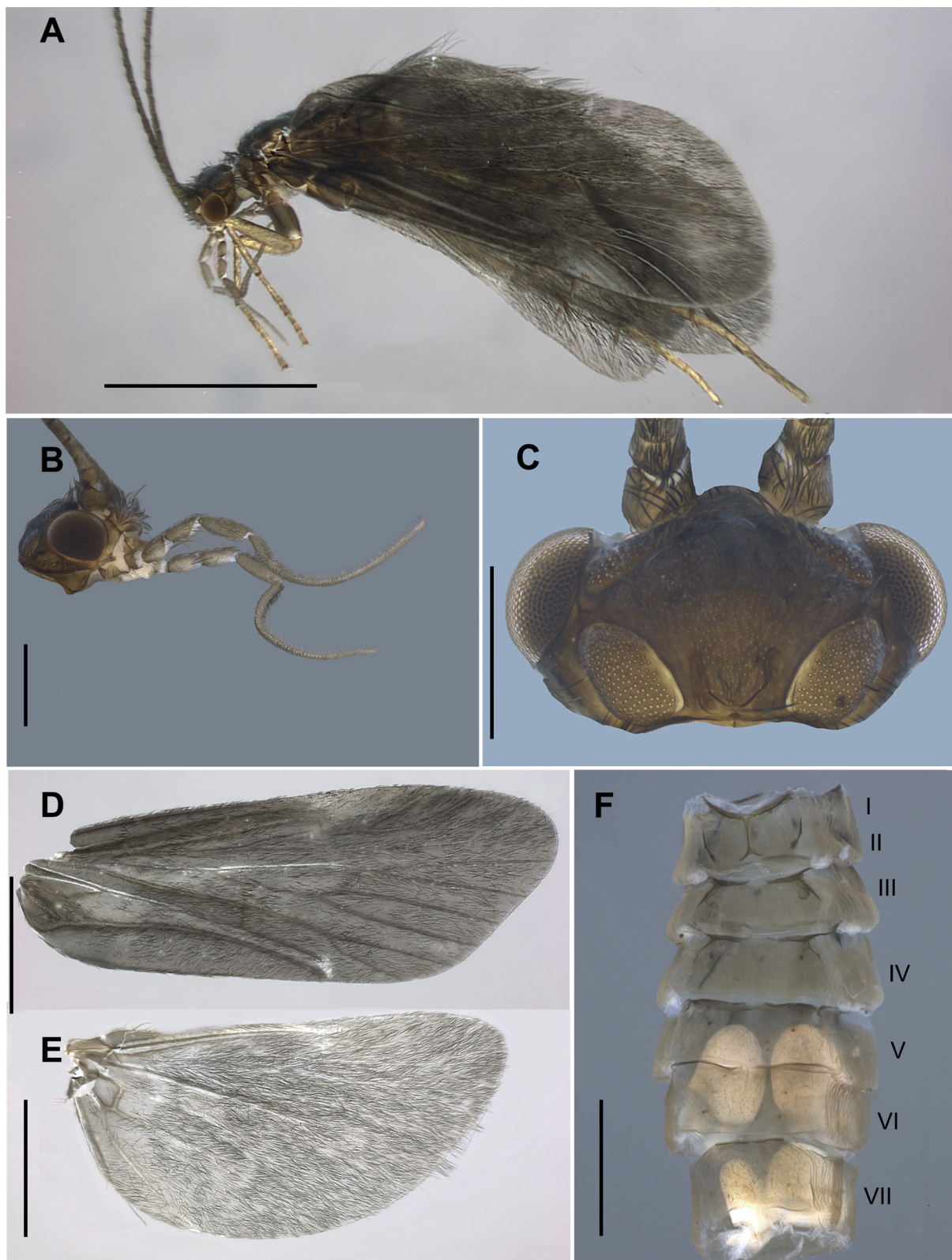


Fig. 7. *Smicridea (Smicridea) caaguara* Desiderio, Pes & Hamada sp. nov., holotype, ♂ (INPA-TRI000110). **A.** Lateral habitus. **B.** Head, right lateral view. **C.** Head, dorsal view. **D.** Forewing, right dorsal view. **E.** Hind wing, right dorsal view. **F.** Abdomen, ventral view. Scale bars in mm: A = 2; B–C = 0.5; D–F = 1.

Seasonal Deciduous Forest (Arroio Teotônia – Rio Jacuí Basin, Fig 4D). The streams have bedrock and fast-flowing water, with cloudy and alkaline water (pH 7.9), conductivity 25–50.4 μScm^{-1} , and water temperatures of 15–16.4°C.

Distribution (Fig. 3)

Brazil: Atlantic Forest (Rio Grande do Sul).

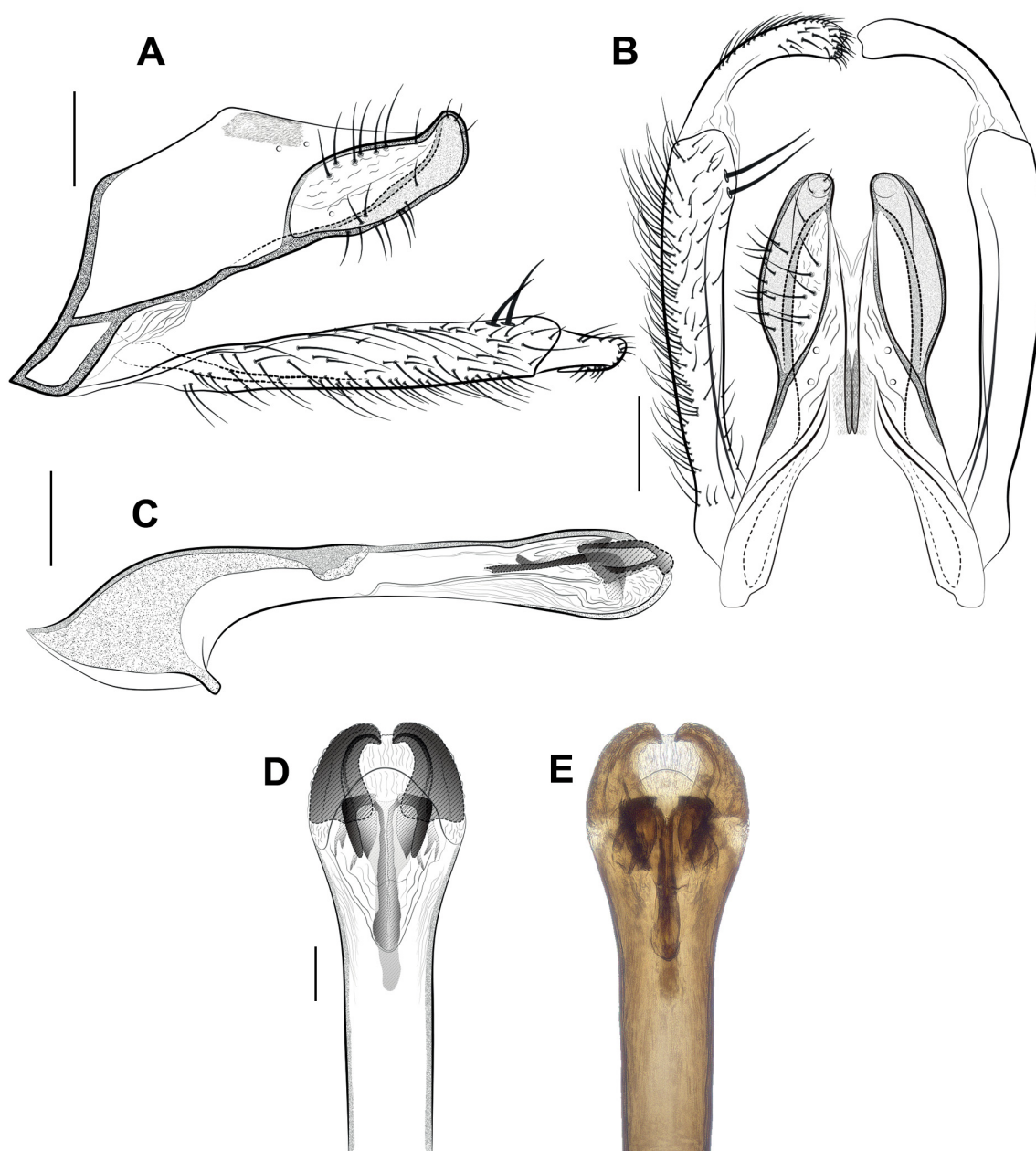


Fig. 8. *Smicridea (Smicridea) caaguara* Desiderio, Pes & Hamada sp. nov., male terminalia, holotype (INPA-TRI 000110). **A.** Terga IX, X and inferior appendages, lateral view. **B.** Same, dorsal view. **C.** Phallic apparatus, lateral view. **D.** Apex of phallic apparatus, dorsal view. **E.** Apex of phallic apparatus (photograph). Scale bars in mm: A–C = 0.1; D–E = 0.05.

Smicridea (Smicridea) ipiranga Desiderio, Pes & Hamada sp. nov.
urn:lsid:zoobank.org:act:1E07D339-6A5A-4E95-A76D-A94339AD91AC
Figs 3, 4E, 9–10

Diagnosis

This new species can be assigned to the *fasciatella* complex. *Smicridea ipiranga* sp. nov. is similar to *S. varia* (Banks, 1913), *S. lacanha* Bueno-Soria & Hamilton, 1986, and *S. catherinae* Blahnik, 1995 based on the shape of the apical segment of the inferior appendage, which is slender, strongly curved medially and has a pointed apex. These four species also have a single long, stout apical spine-like seta on the internal margin of the basal segment of the inferior appendage. However, *S. ipiranga* sp. nov. can be distinguished from its congeners by its diminutive size (on average 3.55 mm); the most similar species in the complex are twice its size on average: *S. catherinae* (about 6.0 mm), *S. lacanha* (about 7.9 mm), and *S. varia* (about 6.15 mm). Additionally, the new species has the phallotremal sclerite with the distal region M-shaped in dorsal view, while in *S. catherinae*, *S. lacanha*, and *S. varia*, this sclerite is Y-shaped.

Etymology

The specific epithet is a reference to the Ipiranga Stream, located in the Reserva Florestal Adolpho Ducke, where the type specimen was collected. This name is used in apposition.

Material examined

Holotype

BRAZIL • ♂; Amazonas, Manaus, Reserva Florestal Adolpho Ducke, Igarapé Ipiranga; 02°58'53.6" S, 59°54'24.4" W; 95 m a.s.l.; 30 Jun.–2 Jul. 2015; A.M.O. Pes, G.R. Desiderio, P. Barcelos-Silva and W. Xavier leg.; Pennsylvania trap; INPA-TRI 000112.

Paratypes

BRAZIL • 2 ♂♂; same locality as for holotype; 9 Aug. 2013; A.M.O. Pes and P. Barcelos-Silva leg.; white sheet with an LED light; INPA-TRI 000113 • 3 ♂♂; same collection data as for holotype; Malaise trap; INPA-TRI 000114 • 5 ♂♂; same collection data as for holotype; Malaise trap; MZUSP • 108 ♂♂; same collection data as for holotype; INPA-TRI 000115 • 1 ♂; Presidente Figueiredo, AM-240, Km 13, Corredeira da Dona Maroca; 02°02'00.1" S, 59°51'45.1" W; 19 Apr. 2008; U.G. Neiss leg.; white sheet with an LED light; DZUP • 6 ♂♂; Presidente Figueiredo, Balneário Sossego da Pantera, Igarapé da Onça; 02°05'57" S, 60°01'02" W; 92 m a.s.l.; 23 Aug. 2012; A.M.O. Pes leg.; white sheet with an LED light; DZRJ.

Description

Adult male (Figs 9–10)

FOREWING LENGTH. 3.40–3.62 mm (mean = 3.55, SD = 0.07, n = 6).

COLOR. General color dark brown (in alcohol) or black (pinned) (Fig. 9A). Antennae yellowish brown (Fig. 9A). Head dark, with white setae on dorsum (Fig. 9B–C); dorsally with weakly-pronounced median suture; with five setal warts; anteromesal wart small, rounded; anterolateral pair undivided, weakly delimited; posterolateral pair large, ovoid (Fig. 9C). Maxillary palp with segments 1–4 increasing gradually about 0.8× in size toward more apical segments, segment 5 long, about 1.2× as long as all previous segments combined (Fig. 9B). Thorax dark brown, covered with pale brown setae; legs dark brown, with mid-leg tarsi pale yellowish (Fig. 9A). Wing venation typical for subgenus (Fig. 9D–E). Forewings, in alcohol, brown, with white transverse band subapically on pterostigma reaching base of R4+5 and small white spot on apex of Cu2 (Fig. 9D); pinned specimens with 2 transversal bands of white setae, one continuous band in proximal portion reaching from base of subcostal vein to apex of 1A, the other band

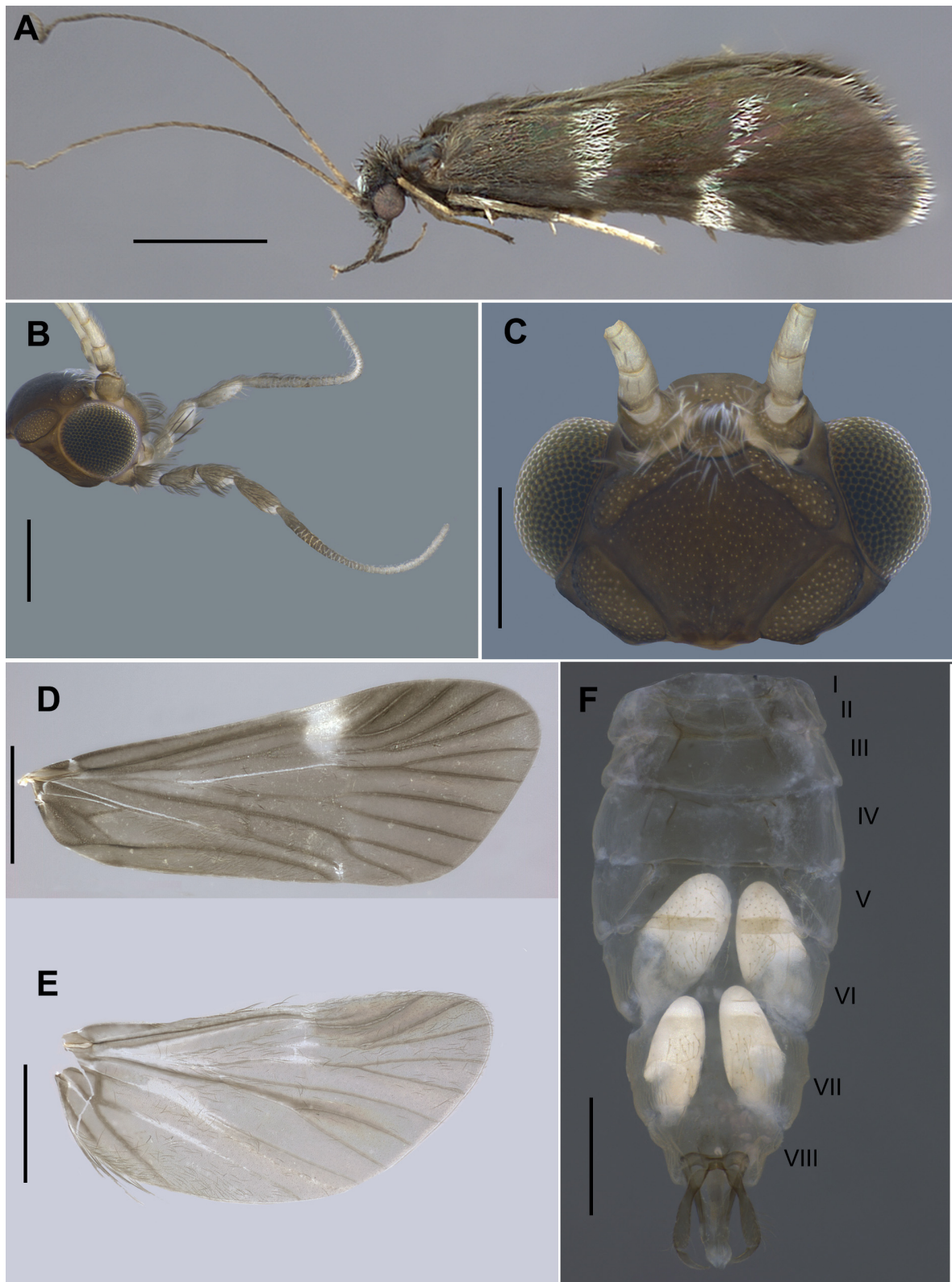


Fig. 9. *Smicridea (Smicridea) ipiranga* Desiderio, Pes & Hamada sp. nov., holotype, ♂ (INPA-TRI 000112). **A.** Lateral habitus (in alcohol). **B.** Head, right lateral view. **C.** Head, dorsal view. **D.** Forewing, right dorsal view. **E.** Hind wing, right dorsal view. **F.** Abdomen, ventral view. Scale bars in mm: A = 2; B–C = 0.5; D–F = 1.

discontinuous in distal portion reaching from pterostigma to apex of Cu1; apex of wing with fringe of white setae (Fig. 9A). Sternum V with anterolateral glandular processes slightly shorter than sternum. Abdominal segments VI and VII with 2 pairs of internal glands, both pairs longer than their containing segments (Fig. 9F).

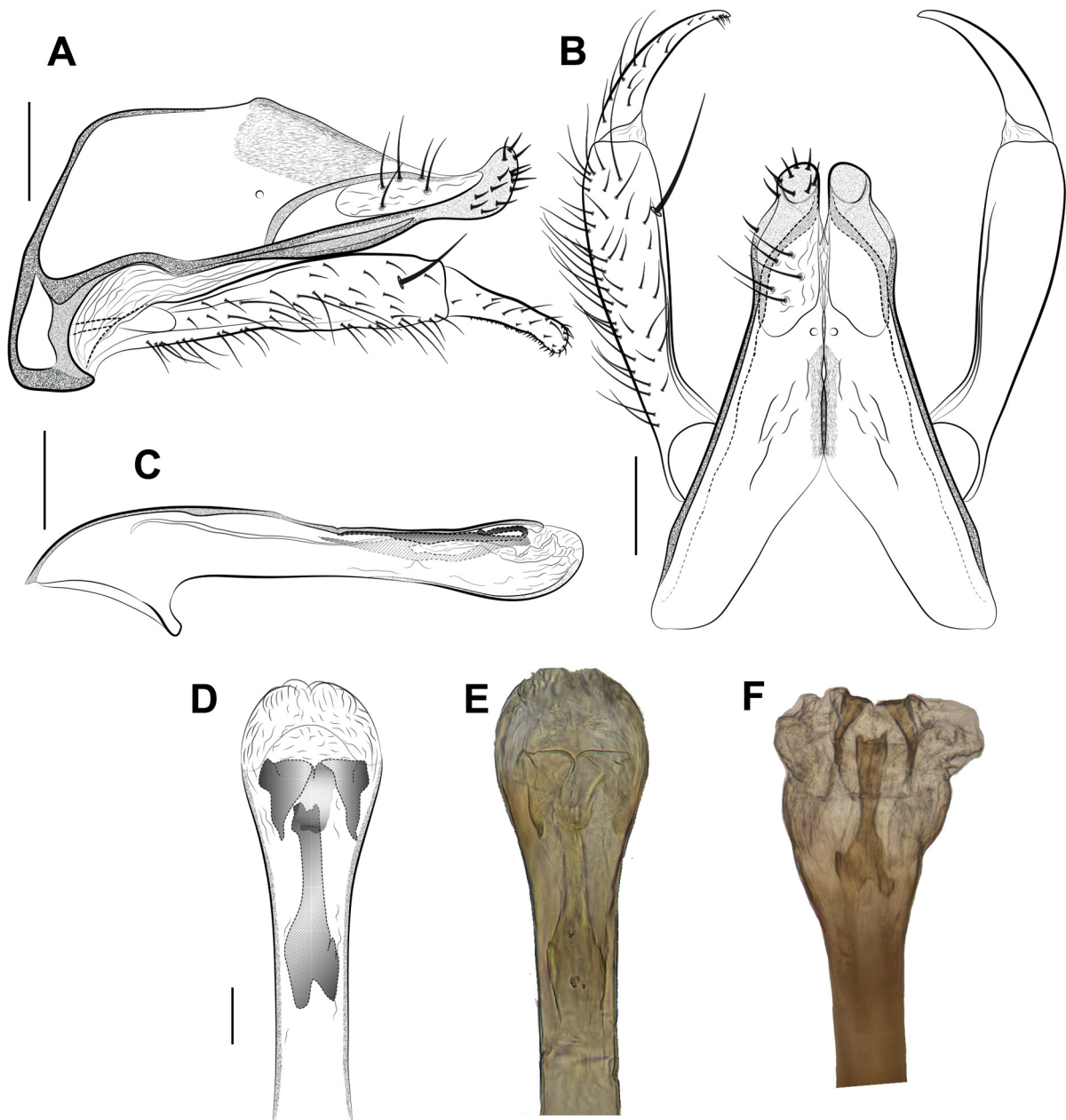


Fig. 10. *Smicridea (Smicridea) ipiranga* Desiderio, Pes & Hamada sp. nov., male terminalia. – A–E. Holotype (INPA-TRI 000112). A. Terga IX, X and inferior appendages, lateral view. B. Same, dorsal view. C. Phallic apparatus, lateral view. D. Apex of phallic apparatus, dorsal view. E. Apex of phallic apparatus (photograph). – F. Paratype (INPA-TRI 0115), apex of everted phallic apparatus (photograph), dorsal view. Scale bars in mm: A–C = 0.1; D–F = 0.05.

MALE GENITALIA (Fig. 10). Segment IX in lateral view with anterolateral margin straight, strongly sclerotized (Fig. 10A); posterodorsal margin bearing small spicules, distributed in two subquadrate bands (Fig. 10B). Tergum X elongate; in lateral view, ventrolateral margin strongly sclerotized, with small subapical lobe; apex produced and upturned (Fig. 10A); in dorsal view, lateral margin slightly sinuous; dorsomesal setose area bearing five medium-sized, thin setae; divided apicomésally by V-shaped incision about $\frac{1}{4}$ its length; apex of tergite rounded, with large globose lobe and about eight short, stout setae (Fig. 10B). Inferior appendages 2-segmented; basal segment long, slightly inflated distally, covered with long, thin setae, with one long, stout apical spine-like seta on mesal margin; apical segment short, about $\frac{1}{3}$ as long as basal segment, slender, strongly curved medially, apex acute with numerous short, thin setae on mesal margin (Fig. 10B). Phallic apparatus long and tubular; basal section, in lateral view, enlarged, $2\times$ diameter of phallosome at its narrowest point, forming an angle of about 116° with apical section; median section of phallosome straight, without processes (Fig. 10C); apex slightly enlarged, without processes or plates; endothelial membranes without spines; phallosomal sclerite, in dorsal view, distinct, strongly sclerotized, proximal region enlarged and narrowing mesally, distal region M-shaped (Fig. 10D–E); in lateral view, aciculate (Fig. 10C). Ejaculatory duct of endophallus, in lateral view, distinct, slightly sclerotized (Fig. 10C). When endothelial membranes are everted, phallosomal sclerite divided into two disconnected parts, one long, apicomésal, rod-like, and the other with a pair of comma-shaped sclerites, distally slightly curved (Fig. 10F).

Bionomics

The males of *S. ipiranga* sp. nov. were collected near streams in the central Amazon, mainly in a 2nd order stream (Igarapé Ipiranga) located in the Reserva Florestal Adolpho Ducke, an area of primary Amazon rainforest of about 100 km² that is under the protection of the Instituto Nacional de Pesquisas da Amazônia (INPA). The riparian vegetation along this stream is about 2.4 m wide and 0.29 m deep, with a sandy bottom, and a medium-speed water flow (Fig. 4E). Its water is clear and acidic (pH 5.1), oxygen solubility levels are high (6.9 mg/L), electrical conductivity is low (8.5 μScm^{-1}), and the average temperature is 25.6°C. Specimens of *S. ipiranga* sp. nov. were also collected in medium-sized streams in the municipality of Presidente Figueiredo (Corredeira da Dona Maroca and Igarapé da Onça), 3.5–12.5 m in width, 0.19–0.44 m deep, with fast-flowing water. These streams were used for recreation (swimming and camping), with rocky bottoms characterized by black and acidic water (pH 4.2–4.8), low electrical conductivity (10.9 μScm^{-1}), and a water temperature of 25°C.

Distribution (Fig. 3)

Brazil: Amazon (Amazonas).

Smicridea (Smicridea) jeaneae Desiderio, Pes & Hamada sp. nov.
 urn:lsid:zoobank.org:act:B3B2E393-F3E0-4FAD-8838-32481EB11877
 Figs 3, 11–12

Diagnosis

Smicridea jeaneae sp. nov. also belongs to the *albosignata* complex. Among the species in this complex, it is most similar to *S. bulbosa* Flint, 1974 from Suriname based on the strong, parallel, pointed apicomésal lobes on tergum X and the short, slender apical segment of the inferior appendage with slightly acute apex. In both species the claw-shaped internal dorsolateral plates of the phallic apparatus are as long as the basal width, but in *S. jeaneae* sp. nov. the plates are straight mesally, while in *S. bulbosa* they are curved. In addition, the phallosomal sclerite of the phallic apparatus has a hastate shape distally in dorsal view and is kidney-shaped in lateral view in the new species, but is strap-like in dorsal view and rod-like in lateral view in *S. bulbosa*. *Smicridea jeaneae* sp. nov. can also be recognized by the three stout apical

spine-like setae on the basal segment of the inferior appendage, one long seta dorsally and two medium-sized setae on the mesal margin.

Etymology

This new species is named in honor of Dr Jeane Marcelle Cavalcante do Nascimento (Instituto Nacional de Pesquisas da Amazônia, INPA – Brazil) for her valuable friendship, cooperation in the field and the laboratory, and in gratitude for her help in collecting material during the doctoral studies of the first author.

Material examined

Holotype

BRAZIL • ♂; Amapá, Oiapoque, Oiapoque River, Buraco do Cristal; 03°48'16" N, 51°51'25" W; 7 Dec. 2018; M. Silva leg.; INPA-TRI 000116.

Description

Adult male (Figs 11–12)

FOREWING LENGTH. 6.37 mm (n = 1).

COLOR. General color dark brown (in alcohol) (Fig. 11A). Antennae yellowish brown (Fig. 11A). Head brown, with grayish to brown setae (Fig. 11B–C); dorsally with weakly pronounced median suture; with five setal warts; anteromesal wart small, rounded; anterolateral pair undivided, weakly delimited; posterolateral pair large, ovoid (Fig. 11C). Maxillary palp with segments 1–4 increasing gradually, about 0.8× in size toward the more apical segments, segment 5 long, about 1.2× as long as all previous segments combined (Fig. 11B). Thorax dark brown, covered with pale-brown setae; legs brown, with mid-leg tarsi yellowish (Fig. 11A). Wing venation typical for subgenus (Fig. 11D–E). Forewings, in alcohol, brown, with white transverse band subapically reaching base of R2+3, another arising on M1+2 and reaching base of Cu1a+b, and small white spot on apex of Cu2 (Fig. 11D). Sternum V with anterolateral glandular processes slightly shorter than sternum. Abdominal segments VI and VII with 2 pairs of internal glands, both pairs longer than their containing segments (Fig. 11F).

MALE GENITALIA (Fig. 12). Segment IX in lateral view with anterolateral margin nearly straight, strongly sclerotized (Fig. 12A); posterodorsal margin bearing small spicules, distributed in two subtriangular bands (Fig. 12B). Tergum X elongate; in lateral view, ventrolateral margin strongly sclerotized, with three medium-sized, thin setae on apical third; apex with shallow notch, ending in a slender, straight lobe (Fig. 12A); in dorsal view, lateral margin slightly rounded; dorsomesal setose area bearing four medium-sized, thin setae; divided apicomesally by V-shaped incision about ½ its length; apex of tergite rounded, with strong, pointed apicomesal lobe, each bearing three medium-sized, thin apical setae (Fig. 12B). Inferior appendages 2-segmented; basal segment long, slightly inflated distally, covered with long, thin setae, with group of stout apical spine-like setae (one very long dorsal seta and two long setae on mesal margin); apical segment short, about ½ as long as basal segment, slender, strongly curved medially, apex slightly acute with numerous short, thin setae on mesal margin (Fig. 12B). Phallic apparatus long and tubular; basal section, in lateral view, enlarged, 4× diameter of phallosome at its narrowest point, forming an angle of about 103° with apical section; median section of phallosome straight, without processes (Fig. 12C); apex enlarged, with pair of claw-shaped internal dorsolateral plates, as long as basal width, straight mesally and directed posterad; endothelial membranes without spines; phallosomal sclerite, in dorsal view, distinct, strongly sclerotized, with U-shaped proximal region and hastate distal region (Fig. 12D–E); in lateral view, dorsal region kidney-shaped, ventrally slender and sinuous (Fig. 12C). Ejaculatory duct of endophallus, in lateral view, distinct, slightly sclerotized (Fig. 12C).

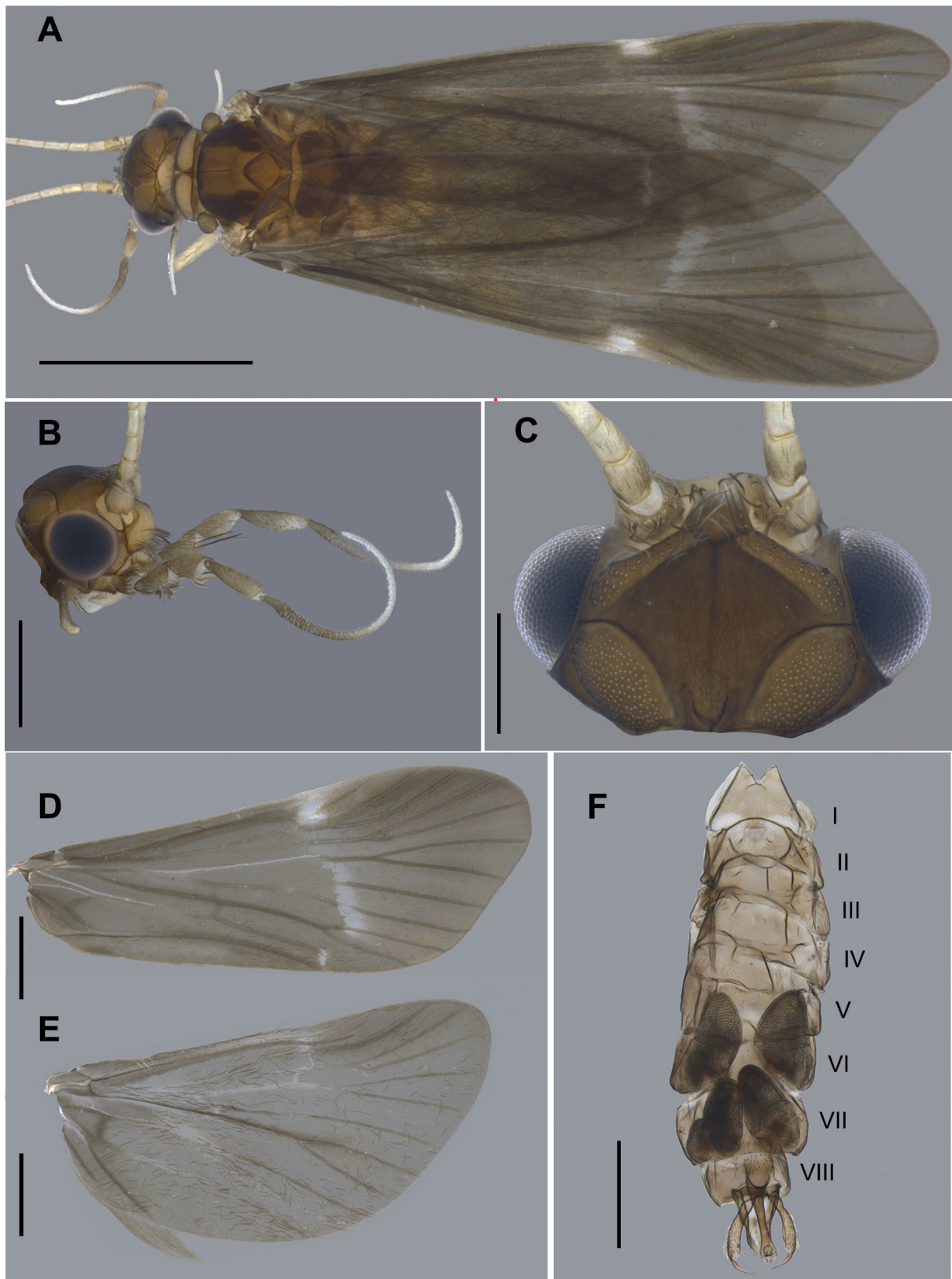


Fig. 11. *Smicridea (Smicridea) jeaneae* Desiderio, Pes & Hamada sp. nov., holotype, ♂ (INPA-TRI 000116). **A.** Lateral habitus, pinned. **B.** Head, right lateral view. **C.** Head, dorsal view. **D.** Forewing, right dorsal view. **E.** Hind wing, right dorsal view. **F.** Abdomen, ventral view. Scale bars in mm: A, D–F = 1; B–C = 0.5.

Bionomics

The only male specimen of *S. jeaneae* sp. nov. was collected near the Oiapoque River, at a place known as “Buraco do Cristal”; this river is about 400 m in width. The prevalent vegetation is Dense Ombrophilous Lowland Forest. The collection site is located in the northern-most part of the Brazilian Amazon.

Distribution (Fig. 3)

Brazil: Amazon (Amapá).

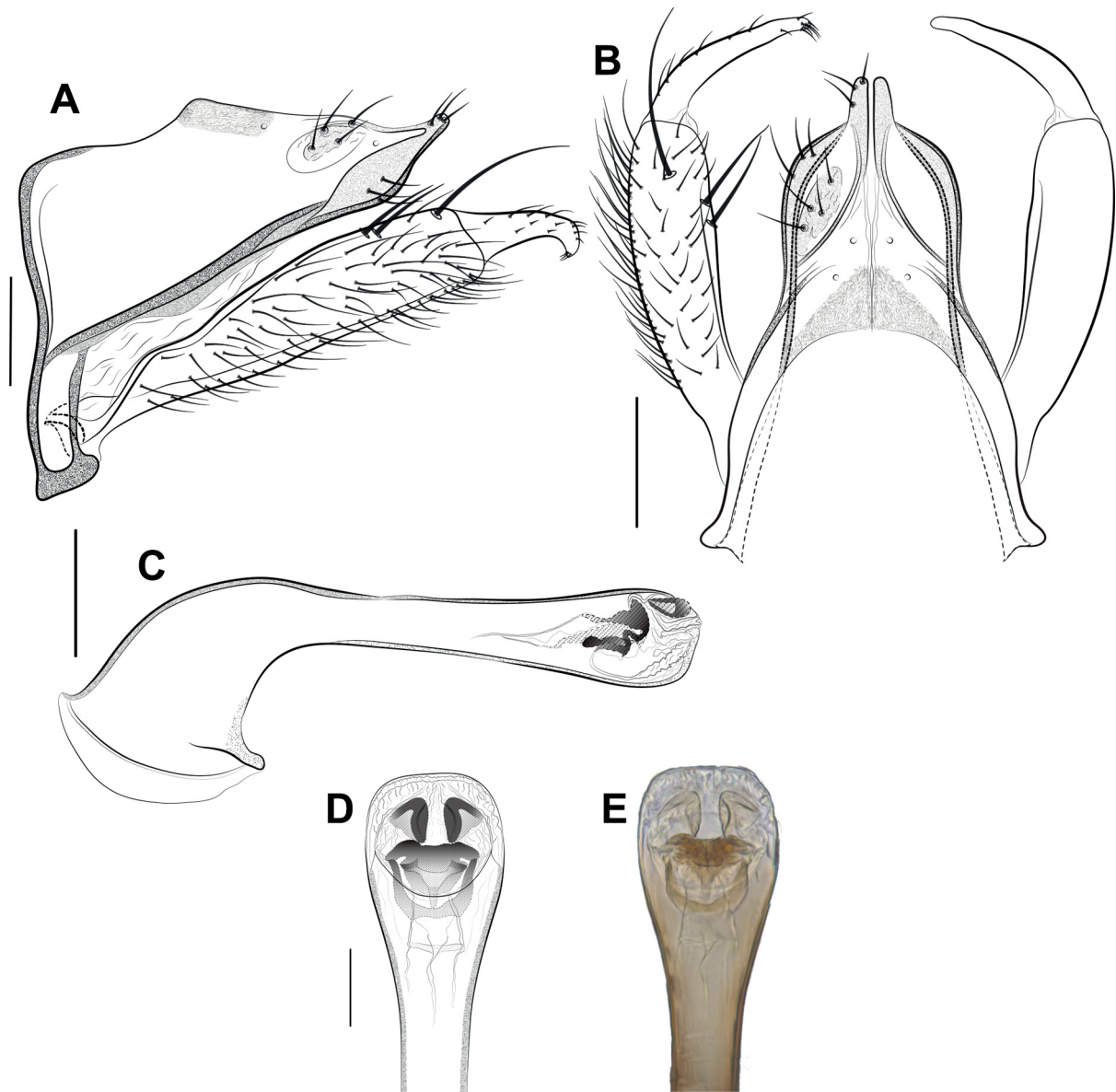


Fig. 12. *Smicridea (Smicridea) jeaneae* Desiderio, Pes & Hamada sp. nov., male terminalia, holotype (INPA-TRI 000116). **A.** Terga IX, X and inferior appendages, lateral view. **B.** Same, dorsal view. **C.** Phallic apparatus, lateral view. **D.** Apex of phallic apparatus, dorsal view. **E.** Apex of phallic apparatus (photograph). Scale bars in mm: A–C = 0.1; D–E = 0.05.

Smicridea (Smicridea) polyacantha Desiderio, Pes & Hamada sp. nov.
urn:lsid:zoobank.org:act:3D7EB67E-4896-419A-AC6C-A1171653B9F0

Figs 3, 4F, 13–14

Diagnosis

This new species is a distinct member of the *fasciatella* group due the presence of small endothelial spines on the apex of the phallic apparatus. *Smicridea polyacantha* sp. nov. and *S. paranensis* are the sole species in the group that share this character. However, the new species has 40 conical endothelial spines grouped in a V-shaped arrangement in dorsal view, while *S. paranensis* has numerous fine spines organized in four rows. Additionally, the apex of the apical segment of the inferior appendage is rounded in the new species and obliquely truncated in *S. paranensis*. The phallotremal sclerite has a proximal region that is bifid, curved downward in lateral view, and a dorsolateral projection on the distal region that is unique in *S. polyacantha* sp. nov.

Etymology

The specific epithet is an allusion to the large number of endothelial spines present on the apex of the phallus. Derived from the Greek words, ‘*poly*’ = ‘very’ or ‘many’ and ‘*akantha*’ = ‘spine’.

Material examined

Holotype

BRAZIL • ♂; Amazonas, Manaus, BR-174, Balneário Km 18.5; 02°49′00.80″ S, 60°02′05.60″ W; 33 m a.s.l.; 27 Oct. 2009; A.M.O. Pes, J.O. Silva and R. Boldrini leg.; white sheet with an LED light; INPA-TRI 000117.

Paratypes

BRAZIL • 18 ♂♂; same collection data as for holotype; INPA-TRI 000118 • 1 ♂; same collection data as for holotype; 7 Apr. 2009; INPA-TRI 000119 • 2 ♂♂; same collection data as for holotype; 22 Jan. 2009; DZRJ • 3 ♂♂; same collection data as for holotype; Nov. 2012; DZUP • 5 ♂♂; Novo Airão, Igarapé Mato Grosso; 02°49′03.8″ S, 60°55′47.1″ W; 24–26 Nov. 2014; R.L.F. Keppler and J.O. Silva leg.; Pennsylvania trap; MZUSP • 1 ♂; Mato Grosso, Sapezal, MT-235, Rio Papagaio, outside indigenous reserve; 13°33′39.5″ S, 58°24′24.2″ W; 473 m a.s.l.; 31 Oct.–1 Nov. 2012; N. Hamada and J.M.C. Nascimento leg.; Pennsylvania trap; INPA-TRI 000120.

Description

Adult male (Figs 13–14)

FOREWING LENGTH. 3.61–4.02 mm (mean = 3.79, SD = 0.15, n = 6).

COLOR. General color dark brown (in alcohol) (Fig. 13A). Antennae yellowish brown (Fig. 13A). Head dark brown, with brown setae on dorsum (Fig. 13B–C); dorsally with weakly pronounced median suture; with five setal warts; anteromesal wart small, rounded; anterolateral pair undivided, weakly delimited; posterolateral pair large, ovoid (Fig. 13C). Maxillary palp with segments 1–4 increasing gradually about 0.8× in size toward more apical segments, segment 5 long, about 1.2× as long as all previous segments combined (Fig. 13B). Thorax dark brown, covered with pale-brown setae; legs brown, with mid-leg tarsi yellowish (Fig. 13A). Wing venation typical for subgenus (Fig. 13D–E). Forewings, in alcohol, brown, with white transverse band subapically on pterostigma reaching base of R4+5 and small white spot on apex of Cu2 (Fig. 13D). Sternum V with anterolateral glandular processes slightly shorter than sternum. Abdominal segments VI and VII with 2 pairs of internal glands, both pairs as long as their containing segments (Fig. 13F).

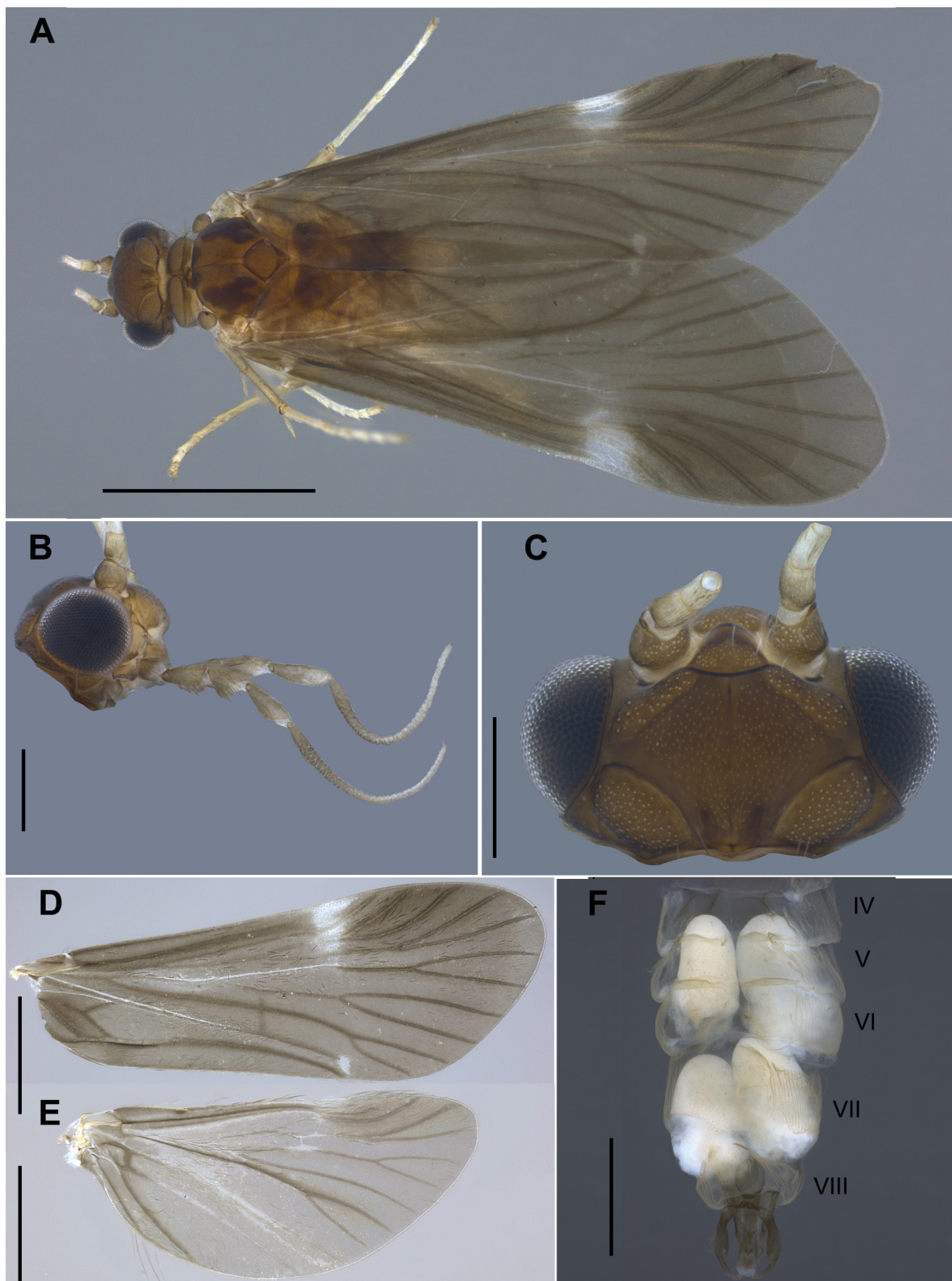


Fig. 13. *Smicridea (Smicridea) polyacantha* Desiderio, Pes & Hamada sp. nov., holotype, ♂ (INPA-TRI 000117). **A.** Dorsal habitus. **B.** Head, right lateral view. **C.** Head, dorsal view. **D.** Forewing, right dorsal view. **E.** Hind wing, right dorsal view. **F.** Abdominal segments IV–VIII, ventral view. Scale bars in mm: A = 2; B–C = 0.5; D–F = 1.

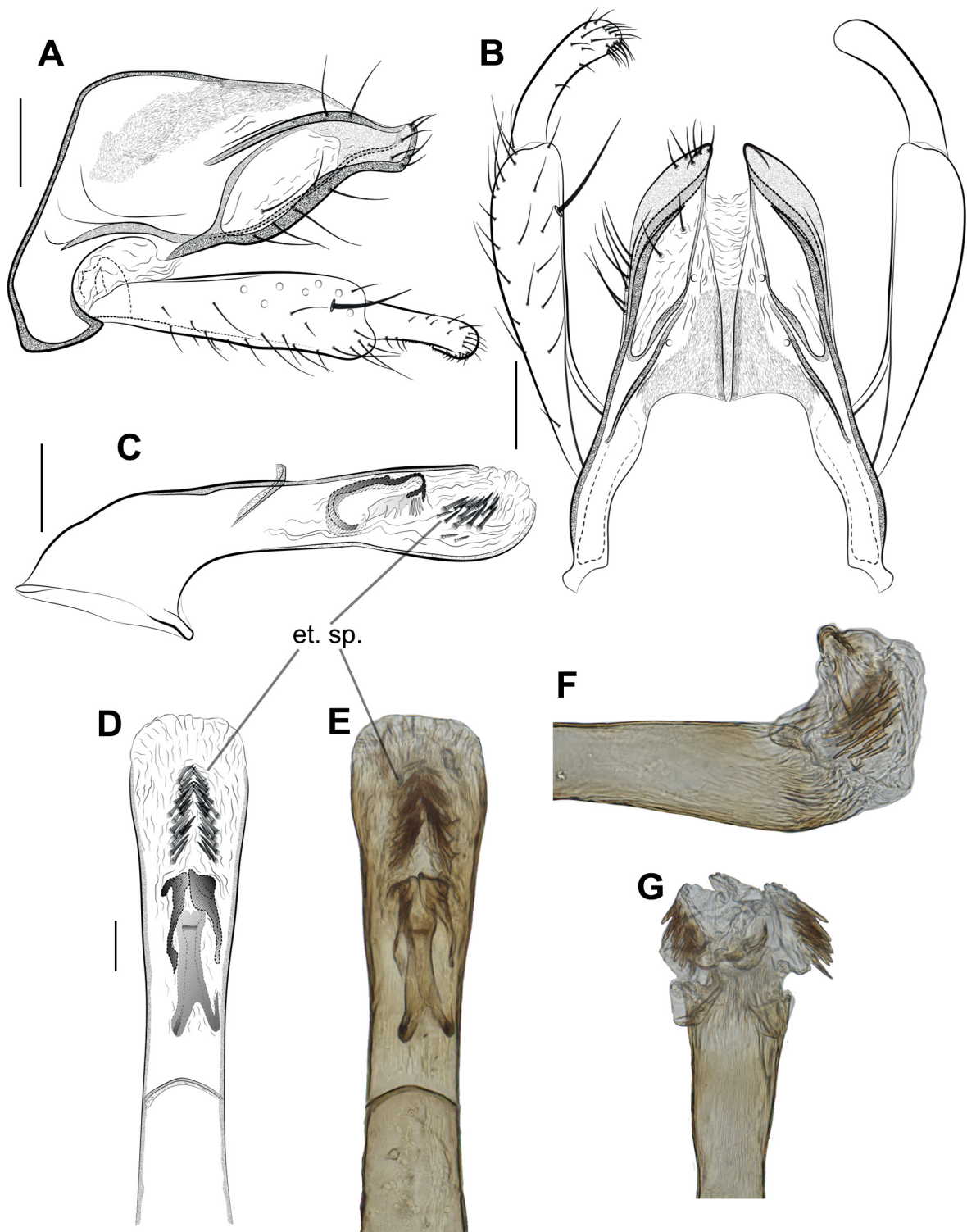


Fig. 14. *Smicridea (Smicridea) polyacantha* Desiderio, Pes & Hamada sp. nov., male terminalia. – A–E. Holotype (INPA-TRI 000117). A. Terga IX, X and inferior appendages, lateral view. B. Same, dorsal view. C. Phallus, lateral view. D. Apex of phallus, dorsal view. E. Apex of phallus (photograph). – F. Paratype (MZUSP), apex of everted phallus (photograph), lateral view. – G. Paratype (INPA-TRI 000119), apex of everted phallus (photograph), dorsal view. Scale bars in mm: A–C = 0.1; D–G = 0.05.

MALE GENITALIA (Fig. 14). Segment IX in lateral view with anterolateral margin nearly straight, weakly sclerotized (Fig. 14A); posterodorsal margin bearing small spicules, distributed in two rounded bands (Fig. 14B). Tergum X elongate; in lateral view, ventrolateral margin slightly sclerotized, with five long, thin setae on apical third; apex produced and upturned (Fig. 14A); in dorsal view, lateral margin straight; dorsomesal setose area bearing two medium-sized, thin setae; divided apicomeresally by a V-shaped incision about $\frac{1}{2}$ its length; apex of tergite slightly pointed, with small apicomeresal lobe and about six medium-sized, thin setae (Fig. 14B). Inferior appendages 2-segmented; basal segment long, slightly inflated distally, covered with medium-sized, thin setae, with one long, stout subapical spine-like seta on mesal margin; apical segment short, about $\frac{1}{3}$ as long as basal segment, thick, slightly curved medially, apex rounded with numerous short, thin setae on mesal margin (Fig. 14B). Phallic apparatus long and tubular; basal section, in lateral view, enlarged, $3 \times$ diameter of phallosome at its narrowest point, forming an angle of about 116° with apical section; median section of phallosome straight, with dorsal peripheral cap sclerotized, slender and upturned (Fig. 14C); apex slightly enlarged, without processes or plates; endothelial membranes with 40 small, conical spines, grouped in a V-shaped arrangement and directed posterad; phallosomal sclerite, in dorsal view, distinct, strongly sclerotized, proximal region bifid, curved downward in lateral view and directed posterad, distal region with dorsolateral projections more than half length of sclerite, broad apically, folding and touching dorsomesally, and with another pair of slender ventrolateral projections curved downward and directed anterad (Fig. 14D–E); in lateral view, proximal and distal regions hooked, not parallel in proximal region (Fig. 14C). Ejaculatory duct of endophallus, in lateral view, indistinct (Fig. 14C). When endothelial membranes are everted, phallosomal sclerite modified into two dorsolateral slender lobes, forked at apex, connected to a dorsomesal ring, and apical spines divided into two lateral lobes with 20 spines each, in lateral view, directed anterad (Fig. 14F–G).

Bionomics

This species was collected near medium-sized streams with slow flow in central Amazonia. The streams were strongly impacted by human activities, especially recreational use (swimming) and road building (Fig. 4F). These streams have sandy bottoms and are characterized by Dense Ombrophilous Forest Lowlands to Dense Ombrophilous Forest. Only one male of *S. polyacantha* sp. nov. was collected near a large river (Rio Papagaio) with fast-flowing water and a rocky bottom, located in the western part of the Brazilian Cerrado, where the vegetation is composed by Primary Savanna, Seasonal-Forest Savanna, and Wooded Savanna. The surroundings of this region are also strongly impacted by agricultural and pasture activities.

Distribution (Fig. 3)

Brazil: Amazon (Amazonas), Cerrado (Mato Grosso).

New distributional records

Smicridea (Smicridea) albosignata Ulmer, 1907

Fig. 15A

Smicridea albosignata Ulmer, 1907: 34 (type locality: Brazil, Santos; ZSZMH; ♂).

Smicridea maculata Banks, 1920: 359 (type locality: Brazil; MCZ; ♂).

Smicridea albosignata – Weidner 1964: 97 (lectotype). — Denning & Sykora 1968: 176 (♂, redescription).

— Marinoni & Almeida 2000: 286 (distribution, biology). — Blahnik *et al.* 2004: 4 (distribution).

— Paprocki *et al.* 2004: 10 (checklist). — Dumas *et al.* 2009: 359 (distribution). — Calor 2011:

321 (checklist). — Dumas & Nessimian 2012: 14 (distribution). — Paprocki & França 2014: 37

(checklist). — Holzenthal & Calor 2017: 161 (catalog). — Vilarino & Calor 2017: 512 (distribution).

Smicridea maculata – Flint 1967: 13 (♂, redescription, to synonymy).

Material examined

BRAZIL • 22 ♂♂; Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, Rio Caraguejo acima do alojamento; 09°15'26" S, 36°25'07.90" W; 21–28 Jun. 2014; A.P.M. Santos, D.M. Takiya, A.C. Domahovski and W.R.M. Souza leg.; Malaise trap; DZRJ • 1 ♂; Pernambuco; Tamandaré, Reserva Biológica Saltinho, Riacho Saltinho; 8°43'47" S, 35°10'31" W; 50 m a.s.l.; 20 May 2018; R. Pereira-Silva, R.P. Lima and D.W.S. Gomes leg.; UV light pan trap; UFBA • 1 ♂; Sergipe, Itabaiana, Parque Nacional da Serra de Itabaiana, Riacho Água Fria; 10°45'17" S, 37°20'32.40" W; 196 m a.s.l.; 19 Jun. 2014; A.P.M. Santos, D.M. Takiya, A.C. Domahovski and W.R.M. Souza leg.; Pennsylvania trap; DZRJ • 1 ♂; Tocantins, Mateiros, Parque Estadual Jalapão, Cachoeira da Formiga; 10°20'58" S, 46°28'23.1" W; 461 m a.s.l.; 17 Oct. 2008; A.R. Calor, R. Mariano and M. Pepinelli leg.; white sheet with an LED light; UFBA.

Distribution (Fig. 15A)

Brazil: Atlantic Forest (Alagoas [**new record**], Bahia [Vilarino & Calor 2017], Paraná [Marinoni & Almeida 2000], Pernambuco [**new record**], Rio de Janeiro [Ulmer 1907; Blahnik *et al.* 2004; Dumas *et al.* 2009; Dumas & Nessimian 2012], São Paulo [Ulmer 1907], Sergipe [**new record**]), Cerrado (Distrito Federal [**new record**], Minas Gerais [Blahnik *et al.* 2004], Tocantins [**new record**]).

Smicridea (Smicridea) bivittata (Hagen, 1861)

Fig. 15B

Hydropsyche? bivittata Hagen, 1861: 291 (type locality: Panama; MCZ; ♀).

Wormaldia albata Navás, 1924: 75 (type locality: Costa Rica, La Caja; MNHNP; ♀).

Smicridea bivittata – Ross 1952: 33 (lectotype). — Flint 1967: 13 (♂); 1974a: 16 (♂; ♀; distribution; redescription; larva; pupa); 1974b: 90 (♂; distribution); 1981: 22 (♂; distribution); 1991: 63 (♂; distribution); 1996: 82 (distribution). — Bueno-Soria & Flint 1978: 207 (distribution). — Maes & Flint 1988: 5 (distribution). — Holzenthal 1988: 70 (distribution). — Botosaneanu 1989: 205 (distribution); 2002: 94 (checklist). — Flint & Reyes 1991: 481 (distribution). — Aguila 1992: 541 (distribution). — Botosaneanu & Sakal 1992: 203 (distribution; ecology). — Botosaneanu & Alkins-Koo 1993: 34 (distribution). — Blahnik 1995: 88 (♂; ♀; diagnosis; redescription; distribution). — Maes 1999: 1186 (checklist). — Muñoz-Quesada 2000: 277 (checklist). — Botosaneanu & Vilorio 2002: 108 (distribution). — Blahnik *et al.* 2004: 4 (distribution). — Paprocki *et al.* 2004: 10 (checklist). — Bueno-Soria *et al.* 2005: 75 (distribution). — Chamorro-Lacayo *et al.* 2007: 42 (checklist). — Albino *et al.* 2011: 3 (distribution). — Bueno-Soria & Barba-Álvarez 2011: 356 (checklist). — Calor 2011: 321 (checklist). — Oláh & Johanson 2012: 246 (distribution). — Paprocki & França 2014: 37 (checklist). — Armitage *et al.* 2015: 5 (checklist). — Armitage & Cornejo 2015: 194 (checklist). — Takiya *et al.* 2016: 77 (distribution). — Holzenthal & Calor 2017: 164 (catalog). — Sganga & Gibon 2018: 12 (distribution).

Wormaldia albata – Flint 1974a: 16 (to synonymy).

Material examined

BRAZIL • 1 ♂; Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, Riacho Cafuringa below the dam; 09°15'15.2" S, 36°25'7" W; 20 Jun. 2014; A.P.M. Santos D.M. Takiya, A.C. Domahovski and W.R.M. Souza leg.; Pennsylvania trap; DZRJ • 1 ♂; Amazonas, São Gabriel da Cachoeira, BR-307, Km 19; 00°02'58.40" N, 66°57'47.10" W; 111 m a.s.l.; 27 Aug. 2011; R.L.F. Keppler, P.V. Cruz and A. Fernandes leg.; INPA • 4 ♂♂; Bahia, Igrapiúna, Reserva Ecológica Michelin, Córrego das Matas, 2° ponte; 13°49'24.6" S, 39°10'9.0" W; 67 m a.s.l.; 25 Sep. 2013; Equipe Pafor leg.; UV light pan trap; UFBA • 1 ♂; Tanquinho, Morro Branco, river cutting the road; 12°00'21.10" S, 39°06'07.20" W; 119 m a.s.l.; 31 Jul. 2010; N. Hamada leg.; INPA • 1 ♂; Distrito Federal, Brasília, Parque Nacional

de Brasília, afluente 1º ordem do Córrego Santa Maria; 15°41'18.1" S, 48°01'27.1" W; 1077 m a.s.l.; 9 Apr.–4 Jul. 2018; G.R. Desiderio and C. Campos leg.; Malaise trap; INPA • 4 ♂♂; Espírito Santo, Castelo, Parque Estadual Mata das Flores, Cachoeira I; 20°36'42.7" S, 41°10'12.1" W; 86 m a.s.l.; 8 Jul. 2011; F. Massariol and K.B. Angeli leg.; white sheet with an LED light; INPA • 10 ♂♂; Pará, Santarém, Florestal Nacional do Tapajós, Igarapé da Gica; 03°15'38.7" S, 54°56'42.8" W; 63 m a.s.l.; 18–25 Sep. 2016; G.R. Desiderio, A.M.O. Pes, G. Amora and J.O. Silva leg.; Malaise trap; INPA • 16 ♂♂; Paraíba, Mamanguape, Reserva Biológica Guaribas, Rio Barro Branco, ox head house; 06°43'7.3" S, 35°10'55" W; 25 Jul. 2014; A.P.M. Santos, D.M. Takiya, A.C. Domahovski and W.R.M. Souza leg.; Pennsylvania trap; DZRJ • 3 ♂♂; Pernambuco, Igarassu, Refúgio Ecológico Charles Darwin; 07°49'42" S, 34°52'26" W; 4 m a.s.l.; 18 Nov. 2017; R. Pereira-Silva leg.; UFBA • 1 ♂; Tocantins, Palmas, Parque Estadual do Lajeado, Igarapé da Onça; 10°06'44.50" S, 48°15'31.10" W; 596 m a.s.l.; 6–11 May 2017; N. Hamada and G. Amora leg.; Malaise trap; INPA.

Distribution (Fig. 15B)

Brazil: Amazon (Amazonas [**new record**], Pará [**new record**], Roraima [Albino *et al.* 2011]), Atlantic Forest (Alagoas [**new record**], Bahia [**new record**], Espírito Santo [**new record**], Paraíba [**new record**], Pernambuco [**new record**]), Caatinga (Ceará, Piauí [Takiya *et al.* 2016]), Cerrado (Distrito Federal [**new record**], Minas Gerais [Blahnik *et al.* 2004], São Paulo [Calor 2011], Tocantins [**new record**]), Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Suriname, Tobago, Trinidad, Venezuela.

Remarks

This species is widely distributed in Central America and some countries in northern South America (Colombia, Peru, Suriname, Venezuela) (Fig. 15B) (Holzenthal & Calor 2017). In Brazil, *S. bivittata* has been recorded only from the Cerrado biome in the states of Minas Gerais and São Paulo (Southeast region), and the Amazon biome in the state of Pará (North region) (Santos *et al.* 2020a). Nevertheless, this species was incorrectly recorded from the state of Pará by Paprocki *et al.* (2004) in their checklist of Brazilian Trichoptera because Paprocki's work was based on data from the literature and until then no previous study had reported the occurrence of *S. bivittata* from either the state of Pará or Brazil. This species was recorded in Brazil for the first time by Blahnik *et al.* (2004), from the state of Minas Gerais. Thus, this study provides the first record of *S. bivittata* from the Amazon biome in the state of Pará, based on specimens collected in a small stream located in the Floresta Nacional do Tapajós, a protected Amazon forest area.

The range of *S. bivittata* is extended in the Cerrado to the Distrito Federal and the state of Tocantins, and in the Amazon biome to the state of Amazonas. In addition, this study provides the first records of this species in the Atlantic Forest biome in the states of Alagoas, Bahia, Espírito Santo, Paraíba, and Pernambuco (Fig. 15B).

Smicridea (Smicridea) erecta Flint, 1974

Fig. 16A

Smicridea erecta Flint, 1974b: 87 (type locality: Suriname, Nassau Mountains, Km 11.3, creek; RNH; ♂).

Smicridea erecta – Oláh & Johanson 2012: 252 (distribution). — Holzenthal & Calor 2017: 169 (catalog).
— Alves *et al.* 2018: 394 (distribution).

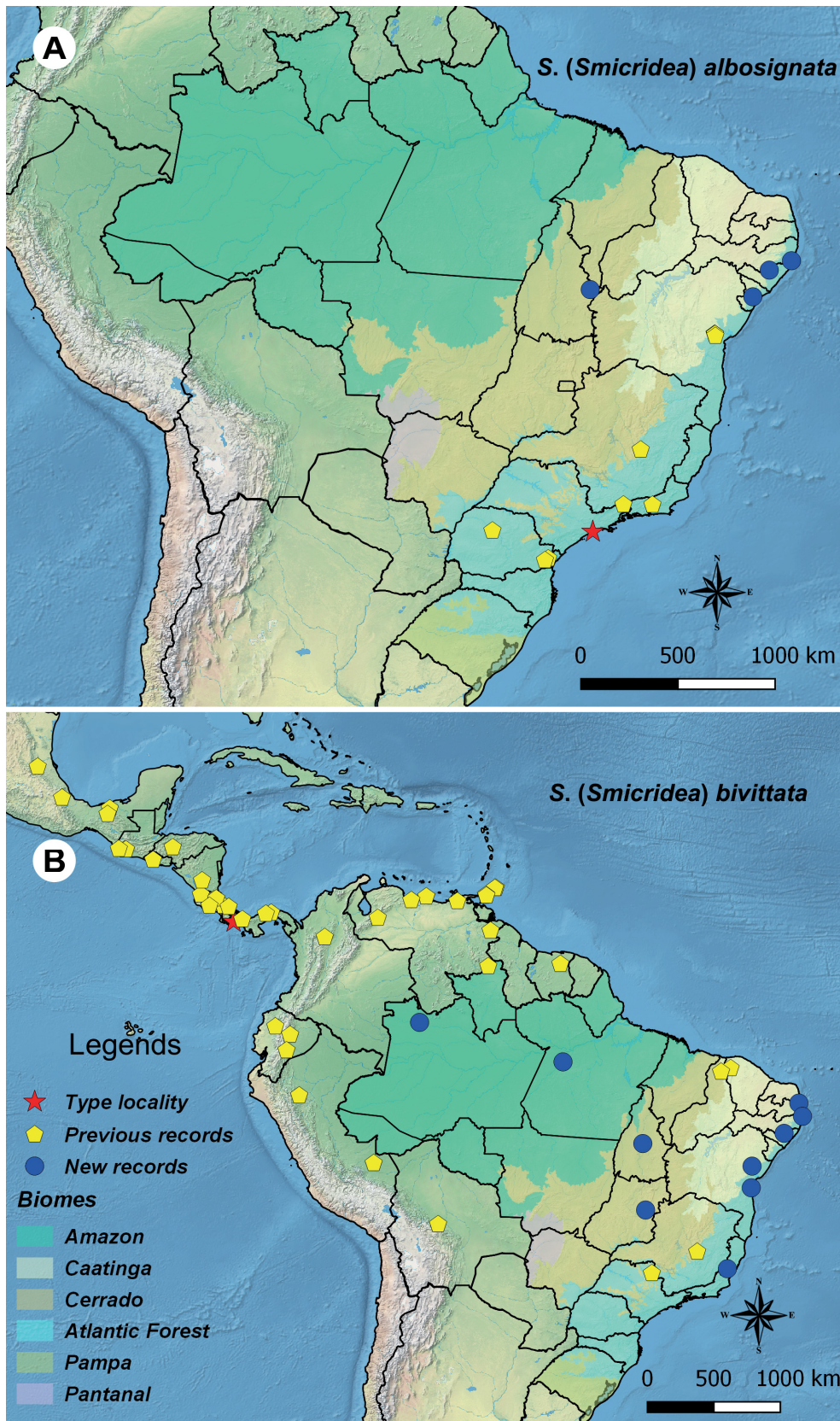


Fig. 15. Geographical distribution maps. **A.** Distribution of *Smicridea (Smicridea) albosignata* Ulmer, 1907. **B.** Distribution of *Smicridea (Smicridea) bivittata* (Hagen, 1861).

Material examined

BRAZIL • 3 ♂♂; Roraima, Amajari, Serra do Tepequém, Igarapé afluente do Silêncio; 03°45'29.3" N, 61°45'29.3" W; 532 m a.s.l.; 11 Jul. 2016; A.M.O. Pes, G. Amora, G.P. Dantas and J.O. Silva leg.; Malaise trap; INPA • 2 ♂♂; Amajari, Serra do Tepequém, Igarapé Geladeira; 03°47'00.8" N, 61°44'51.8" W; 549 m a.s.l.; 8–11 Jul. 2016; A.M.O. Pes, G. Amora, G.P. Dantas and J.O. Silva leg.; Malaise trap; INPA • 4 ♂♂; Amajari, Serra do Tepequém, Igarapé Promessa; 03°46'10.6" N, 61°45'27.0" W; 535 m a.s.l.; 11 Jul. 2016; A.M.O. Pes, G. Amora, G.P. Dantas and J.O. Silva leg.; Malaise trap; INPA.

Distribution (Fig. 16A)

Brazil: Amazon (Amazonas [Alves *et al.* 2018], Roraima [**new record**]), French Guiana, Suriname.

Smicridea (Smicridea) obliqua Flint, 1974

Fig. 16B

Smicridea obliqua Flint, 1974b: 90 (type locality: Suriname, Kaboeri Creek, first camp, near Winnana creek; RNH; ♂).

Smicridea obliqua – Flint 1978: 398 (distribution). — Paprocki *et al.* 2004: 10 (checklist). — Albino *et al.* 2011: 25 (larva; pupa; biology; distribution). — Paprocki & França 2014: 37 (checklist). — Desiderio *et al.* 2017: 162 (distribution). — Holzenthal & Calor 2017: 178 (catalog). — Gibon & Sganga 2019: 189 (distribution).

Material examined

BRAZIL • 1 ♂; Acre, Senador Guiomard, Fazenda Experimental Catuaba (UFAC), Igarapé Floresta; 10°04'26.7" S, 67°36'53.0" W; 158 m a.s.l.; 21–24 Sep. 2020; N. Hamada, A.M.O. Pes, J.M.C. Nascimento and J.O. Silva leg.; Pennsylvania trap; INPA • 1 ♂; Amapá, Oiapoque, Igarapé do Aeroporto da FAB; 04°10'06.20" N, 51°47'31.0" W; 8 Aug. 2011; A.M.O. Pes, P.V. Cruz, A. Fernandes and N. Hamada leg.; white sheet with an LED light; INPA • 6 ♂♂; Oiapoque, Rio Oiapoque, Cachoeira Alta; 03°48'13.0" N, 51°52'31.2" W; 13 m a.s.l.; 9 Aug. 2011; A.M.O. Pes, P.V. Cruz, A. Fernandes and N. Hamada leg.; white sheet with an LED light; INPA • 10 ♂♂; Pedra Branca do Amapari, Igarapé da BR–210 near Pedra Branca; 00°37'38.00" N, 51°38'15.20" W; 3 Aug. 2011; A.M.O. Pes, P.V. Cruz and A. Fernandes leg.; white sheet with an LED light; INPA • 1 ♂; Mato Grosso, Sapezal, MT–235, Rio Papagaio, antes da Reserva Indígena; 13°33'39.5" S, 58°24'24.2" W; 473 m a.s.l.; 31 Oct.–1 Nov. 2012; N. Hamada and J.M.C. Nascimento leg.; Pennsylvania trap; INPA • 1 ♂; Pará, Santarém, Floresta Nacional do Tapajós, BR–163, Km 108, Igarapé Jatuarana; 03°15'44.7" S, 54°57'22.0" W; 97 m a.s.l.; 15–24 Sep. 2016; G.R. Desiderio, A.M.O. Pes G. Amora and J.O. Silva leg.; Pennsylvania trap; INPA • 4 ♂♂; Pará, Igarapé da Gica; 03°15'38.7" S, 54°56'42.8" W; 63 m a.s.l.; 18–25 Sep. 2016; G.R. Desiderio, A.M.O. Pes, G. Amora and J.O. Silva leg.; Malaise trap; INPA • 1 ♂; Paraíba, Mamanguape, Reserva Biológica Guaribas, Rio Barro Branco, casa da cabeça de boi; 06°43'7.3" S, 35°10'55" W; 29 Jul. 2009; A.R. Calor leg.; white sheet with an LED light; UFBA • 22 ♂♂; Sergipe, Areia Branca, Parque Nossa Senhora de Itabaiana, Riacho Água Fria; 10°45'16" S, 37°20'32.5" W; 187 m a.s.l.; 5 Aug. 2009; A.R. Calor and L. Lecci leg.; UV light pan trap; UFBA • 1 ♂; Itabaiana, Parque Nacional da Serra de Itabaiana, Riacho Água Fria; 10°45'17" S, 37°20'32.40" W; 196 m a.s.l.; 19 Jun. 2014; A.P.M. Santos, D.M. Takiya, A.C. Domahovski and W.R.M. Souza leg.; Pennsylvania trap; DZRJ.

Distribution (Fig. 16B)

Brazil: Amazon (Acre [**new record**], Amapá [**new record**], Amazonas [Flint 1978; Albino *et al.* 2011], Pará [**new record**]), Atlantic Forest (Paraíba [**new record**], Sergipe [**new record**]), Cerrado (Maranhão [Desiderio *et al.* 2017], Mato Grosso [**new record**]), French Guiane, Suriname.

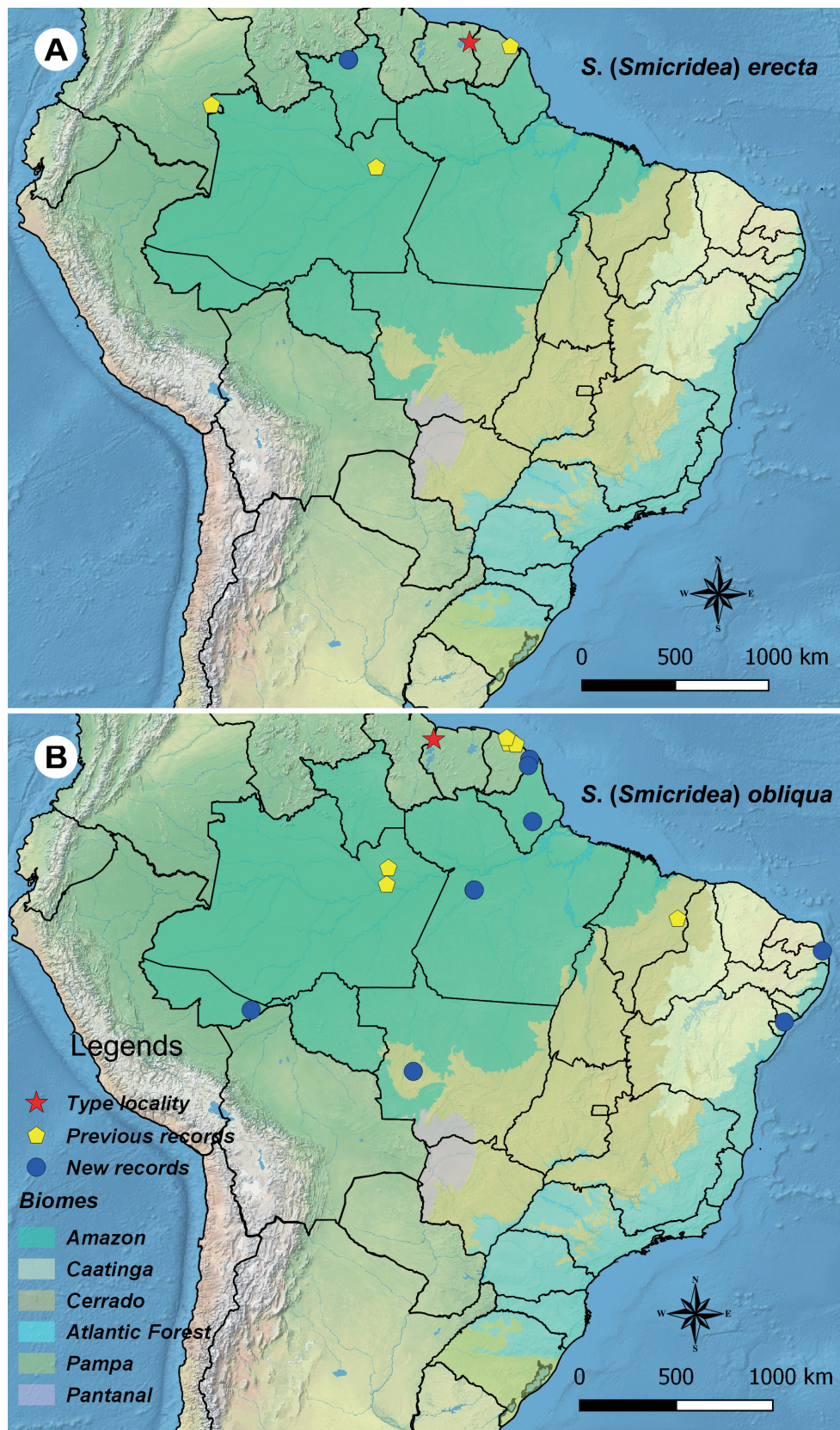


Fig. 16. Geographical distribution maps. **A.** Distribution of *Smicridea (Smicridea) erecta* Flint, 1974. **B.** Distribution of *Smicridea (Smicridea) obliqua* Flint, 1974.

Smicridea (Smicridea) paranensis Flint, 1983

Fig. 17A

Smicridea paranensis Flint, 1983: 55 (type locality: Argentina, Pcia. Misiones, 7 km E of El Dorado; NMNH; ♂).

Smicridea paranensis – Marinoni & Almeida 2000: 286 (distribution; biology). — Blahnik *et al.* 2004: 4 (distribution). — Paprocki *et al.* 2004: 10 (checklist). — Sganga 2005: 142 (distribution). — Dumas *et al.* 2009: 360 (distribution). — Calor 2011: 321 (checklist). — Paprocki & França 2014: 38 (checklist). — Holzenthal & Calor 2017: 179 (catalog). — Alves *et al.* 2018: 393 (distribution).

Material examined

BRAZIL – **Distrito Federal** • 1 ♂; Brasília, Estação Ecológica de Águas Emendadas, Córrego Brejinho; 15°35'33.3" S, 47°38'14.4" W; 983 m a.s.l.; 4 Apr.–24 May 2018; G.R. Desiderio, C.A. Campos and F.R.B. Camelo leg.; Malaise trap; INPA • 22 ♂♂; Estação Ecológica de Águas Emendadas, Córrego Tabatinga; 15°32'43.3" S, 47°33'58.4" W; 1047 m a.s.l.; 4–24 Apr. 2018; G.R. Desiderio, C.A. Campos and F.R.B. Camelo leg.; Malaise trap; INPA • 10 ♂♂; same collection data as for preceding; 9 Apr.–7 May 2018; INPA • 2 ♂♂; Estação Ecológica de Águas Emendadas, Córrego Vereda Grande I; 15°32'33.0" S, 47°34'42.1" W; 1008 m a.s.l.; 4 Apr.–7 May 2018; G.R. Desiderio, C.A. Campos and F.R.B. Camelo leg.; Malaise trap; INPA • 2 ♂♂; Brasília, Fazenda Água Limpa, Córrego Bonito; 15°57'17.7" S, 47°57'46.0" W; 1071 m a.s.l.; 17–19 Jul. 2017; N. Hamada, G.R. Desiderio and G. Amora leg.; Pennsylvania trap; INPA • 7 ♂♂; Brasília, Parque Nacional de Brasília, Córrego Milho Cozido; 15°39'45.0" S, 48°00'59.6" W; 1076 m a.s.l.; 9 Apr.–4 Aug. 2018; G.R. Desiderio, C.A. Campos and F.R.B. Camelo legs.; Malaise trap; INPA • 5 ♂♂; Brasília, Reserva Ecológica do IBGE, Córrego Roncador; 15°56'15.1" S, 47°53'08.8" W; 1064 m a.s.l.; 3 Apr.–15 Jun. 2018; G.R. Desiderio, C.A. Campos and F.R.B. Camelo leg.; Malaise trap; INPA • 29 ♂♂; same collection data as for preceding; 3 Apr.–4 May 2018; INPA • 11 ♂♂; Brasília, Reserva Ecológica Jardim Botânico, Córrego Cabeça de Veado I; 15°53'23.7" S, 47°50'33.0" W; 1119 m a.s.l.; 2 Apr.–15 May 2018; G.R. Desiderio, C.A. Campos and F.R.B. Camelo leg.; Malaise trap; INPA • 12 ♂♂; same collection data as for preceding; 2 Apr.–17 May 2018; INPA. – **Mato Grosso do Sul** • 1 ♂; Bodoquena, Estrada para a boca da onça; 20°45'13.8" S, 56°39'50.9" W; 10 Sep. 2013; D.M. Takiya and A.P.M. Santos leg.; white sheet with an LED light; DZRJ. – **Santa Catarina** • 2 ♂♂; Florianópolis, Córrego Pantanal; 27°36'35" S, 48°30'57" W; 13 Jul. 2012; L.C. Pinho leg.; entomological net; UFBA. – **Tocantins** • 7 ♂♂; Palmas, Parque Estadual do Lajeado, Igarapé Brejo da Besta; 10°03'55.90" S, 48°14'57.70" W; 469 m a.s.l.; 6–14 Jun. 2016; A.M.O. Pes, G. Amora and J.O. Silva leg.; Pennsylvania trap; INPA • 1 ♂; Parque Estadual do Lajeado, Igarapé da Onça; 10°06'44.50" S, 48°15'31.10" W; 596 m a.s.l.; 6–11 May 2017; N. Hamada, G. Amora leg.; Malaise trap; INPA • 1 ♂; Parque Estadual do Lajeado, Igarapé Brejo da Lagoa Seca; 10°04'25.00" S, 48°13'29.10" W; 447 m a.s.l.; 2–10 Jun. 2016; A.M.O. Pes, G. Amora and J.O. Silva leg.; Pennsylvania trap; INPA • 1 ♂; Parque Estadual do Lajeado, Igarapé da Maritaca; 10°03'33.60" S, 48°13'34.30" W; 597 m a.s.l.; 5–10 Jun. 2016; A.M.O. Pes, G. Amora and J.O. Silva leg.; Malaise trap; INPA • 2 ♂♂; Parque Estadual do Lajeado, Igarapé do Saltim; 10°03'33.40" S, 48°13'49.30" W; 581 m a.s.l.; 5–10 Jun. 2016; A.M.O. Pes, G. Amora and J.O. Silva leg.; Malaise trap; INPA.

Distribution (Fig. 17A)

Argentina, Brazil: Caatinga (Ceará, Piauí [Alves *et al.* 2018]), Cerrado (Distrito Federal [**new record**], Mato Grosso do Sul [**new record**], Tocantins [**new record**]), Atlantic Forest (Minas Gerais [Blahnik *et al.* 2004], Paraná [Marinoni & Almeida 2000], Rio de Janeiro [Blahnik *et al.* 2004; Dumas *et al.* 2009], São Paulo [Calor 2011], Santa Catarina [**new record**]), Paraguay.

Smicridea (Smicridea) sattleri Denning & Sykora, 1968
Fig. 17B

Smicridea sattleri Denning & Sykora, 1968: 175 (type locality: Brazil, Sao Paulo, waterfall on Iporanga Beach, Guarujá Island near Santos; CAS; ♂).

Smicridea sattleri – Paprocki *et al.* 2004: 10 (checklist). — Calor 2011: 321 (checklist). — Paprocki & França 2014: 38 (checklist). — Rocha *et al.* 2016: 429 (distribution). — Holzenthal & Calor 2017: 182 (catalog).

Material examined

BRAZIL – **Bahia** • 1 ♂; Camacan, Reserva Particular do Patrimônio Natural Serra Bonita; 15°22'59.1" S, 39°33'21.2" W; 2 Aug. 2010; N. Hamada, R. Querino and R. Boldrini leg.; INPA • 1 ♂; Camacan, Reserva Particular do Patrimônio Natural Serra Bonita, Córrego Fechadinho; 15°23'9.1" S, 39°33'21.2" W; 27 Nov. 2011; A.R. Calor leg.; UV light pan trap; UFBA • 5 ♂♂; Wescleslau Guimarães, E.E.E.W.G. Riacho Serra Grande, Cachoeira; 13°35'35.4" S, 39°42'51.2" W; 513 m a.s.l.; 6 Sep. 2013; A.R. Calor, T. Duarte and E.S. Dias leg.; entomological net; UFBA • 1 ♂; same collection data as for preceding; 7 Sep. 2013; UV light pan trap; UFBA • 2 ♂♂; same collection data as for preceding; 8 Sep. 2013; UFBA – **Espírito Santo** • 3 ♂♂; Espírito Santo, Alegre, Cachoeira da Fumaça, trilha do remanso; 20°37'52.1" S, 41°36'18.8" W; 27 May 2011; J.M.C. Nascimento, P. Barcelos-Silva, K. Angeli and K. Bertazo leg.; white sheet with an LED light; INPA • 2 ♂♂; Fundão, Timbuí, Hotel Fazenda Monte São; 19°56'02.0" S, 40°24'45.0" W; 57 m a.s.l.; Sep. 2014; P. Barcelos-Silva leg.; Malaise trap; INPA • 1 ♂; Santa Leopoldina, Rio da Prata, acima da cachoeira Véu da Noiva; 20°02'49.7" S, 40°31'55.9" W; 487 m a.s.l.; 3 Apr. 2011; L.L. Dumas and J.L. Nessimian leg.; DZRJ • 3 ♂♂; Santa Teresa, REBIO Santa Lúcia; 9–10 Jan. 2013; A.L. Carvalho leg.; DZRJ • 6 ♂♂; Santa Teresa, REBIO Santa Lúcia, Córrego Bonito, acima da Cachoeira Heloísa Torres; 19°58'25.9" S, 40°31'46.3" W; 695 m a.s.l.; 3 Apr. 2011; L.L. Dumas and G.A. Jardim leg.; DZRJ.

Distribution (Fig. 17B)

Brazil: Atlantic Forest (Bahia [**new record**], Espírito Santo [**new record**], São Paulo [Denning & Sykora 1968]), Cerrado (Minas Gerais [Rocha *et al.* 2016]).

Discussion

Although *Smicridea* is highly diverse and widely distributed in Brazil, its geographic distribution is poorly known, and its diversity may be underestimated because some Brazilian states, regions, and biomes have not been sampled yet. Some recent contributions have been made to reduce the biodiversity shortfalls regarding the Brazilian *Smicridea* fauna (Rocha *et al.* 2016; Alves *et al.* 2018; Vilarino *et al.* 2019; Desiderio *et al.* 2020, 2021). In this paper, we describe six new species of *S.* (*Smicridea*), significantly increasing the number of species of this subgenus in Brazil from 21 to 27. We also provide the first records of the genus *Smicridea* for the Brazilian states of Acre, Amapá, and Sergipe; and of *S.* (*Smicridea*) for the states of Rio Grande do Sul and Santa Catarina. The records of *S. jeaneae* sp. nov. in Amapá State and *S. caaguara* sp. nov. in Rio Grande do Sul State are the northernmost and southernmost records of the genus in Brazil, respectively.

Genital structures have been remarkably useful for differentiating species in the *S. fasciatella* group treated here. The number, type, and position of the setae and the shape of the apex of tergum X are the most useful characters. Additionally, the number of stout apical spine-like setae on the basal segment of the inferior appendage and the shape of the apical segment, which has acuminate setae or thin setae on its apex, are useful characters to discriminate species in this group. The shape of the phallotremal sclerite of the phallus (especially as viewed dorsally), used by Flint (1974a) to differentiate species in

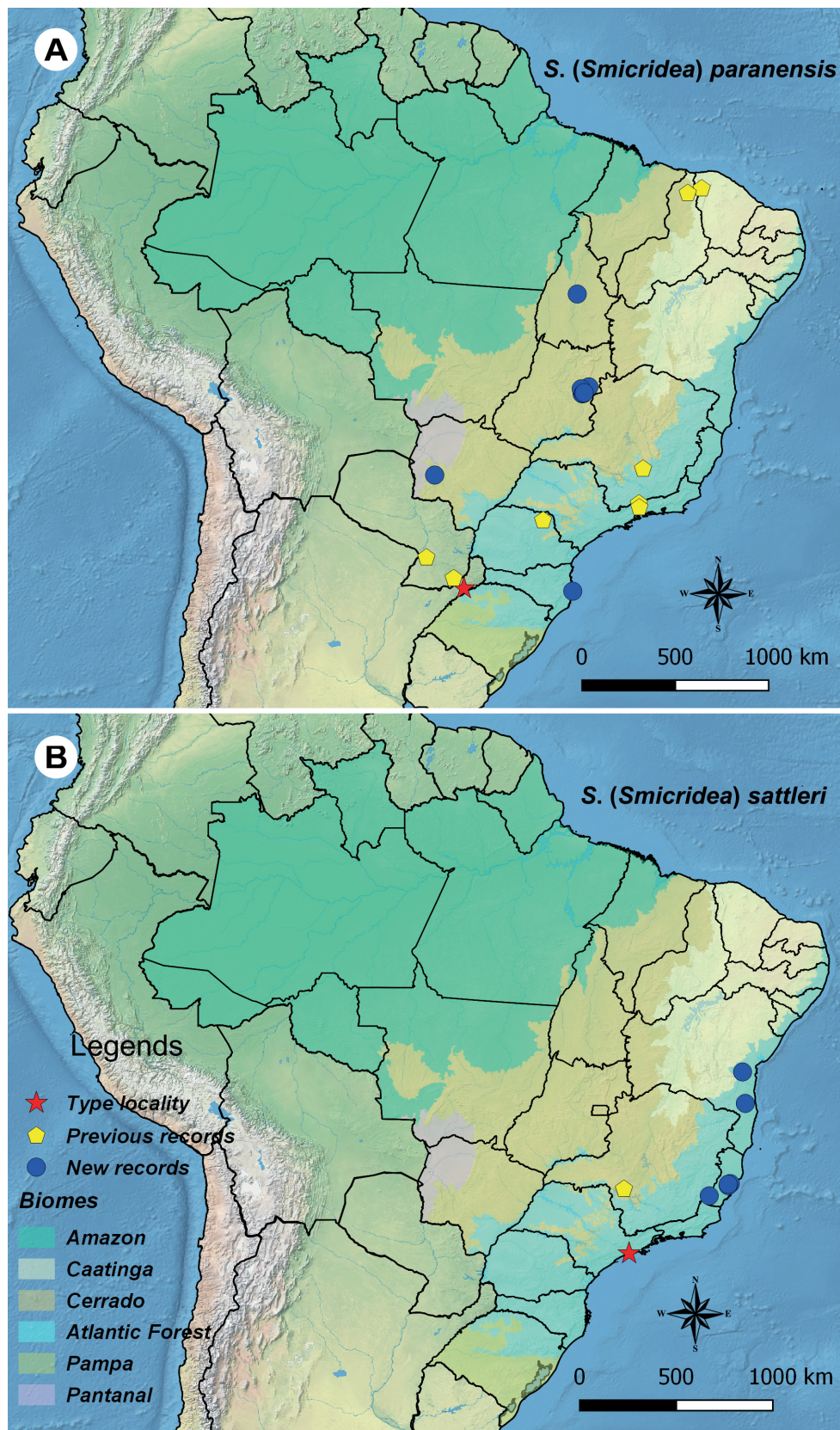


Fig. 17. Geographical distribution maps. **A.** Distribution of *Smicridea (Smicridea) paranensis* Flint, 1983. **B.** Distribution of *Smicridea (Smicridea) sattleri* Denning & Sykora, 1968.

S. fasciatella group from North and Central America, also proved to be a useful character for diagnosing Brazilian species in this group. Even though the shape of the phallotremal sclerite has not been useful for separating species in the *S. fasciatella* complex (Blahnik 1995), we believe that this is one of the most important diagnostic characters for identifying species in the *fasciatella* species group as a whole.

In this study, some new species do not present diagnostic characters that would allow us to place them in one of the two currently recognized species subgroups (*albosignata* and *fasciatella*). However, we note that they share characters that are unusual within the *S. fasciatella* group, such as a distinct apicomeral lobe on each tergite X in *S. blahniki* sp. nov., *S. erecta*, and *S. jeaneae* sp. nov., and the presence of endothelial spines in *S. paranensis* and *S. polyacantha* sp. nov. These shared characteristics may be an indication of the existence of a new subgroup within the *S. fasciatella* group.

Curiously, the reticulate sacs are absent in *S. brevitruncata* sp. nov. This fact is unique within the subgenus *Smicridea*. In *S. patinae* Pauls, Blahnik & Holzenthal, 2010 and *S. microsaccata* Flint, 1991 from Chile and Colombia, respectively, only a pair of reduced internal glands are present in segment VII. The internal glands in abdominal segments VI and VII seem to be a plesiomorphic character in *S. (Smicridea)*, as they also occur in the closely related Smicrideinae genus *Smicrophylax* Neboiss, 1977, and in the Diplectroninae genera *Austropsyche* Banks, 1939, *Arcyphysa* Wells & Neboiss, 2018, and *Diplectrona* Westwood, 1839 (Neboiss 1977; Wells & Neboiss 2018).

Because *S. (Smicridea)* groups or subgroups have never been treated under a cladistic approach, a phylogenetic study would be very relevant to evaluate how these characters are related to each other. This is needed to delimit the already-proposed taxonomic subgroups (e.g., *albosignata*, *fasciatella* complexes) and to establish any potentially new subgroups. Nevertheless, this is outside of the scope of this paper because we only focused on the description of new species and the distribution of Brazilian species in the *S. fasciatella* group.

This study highlights the need for more taxonomic studies focused on *S. (Smicridea)* in Brazil in general, especially in the poorly sampled Caatinga, Pampas, and Pantanal biomes. The *S. (Smicridea)* species seem to prefer small to medium-sized streams based on the bionomic data for the new species and the collection data on the known species that are treated here. Future collections should therefore be directed to poorly sampled environments. Additionally, there are many undescribed species deposited in different entomological collections worldwide (Santos *et al.* 2020b). Therefore, more taxonomists are needed to make all of this unknown diversity available.

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