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A new species of the sharpshooter genus *Dasmeusa* (Hemiptera: Cicadellidae: Cicadellini) from Central Amazon

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ABSTRACT

A new species of the genus *Dasmeusa* Melichar, 1926 is described and illustrated from specimens collected in the State of Amazonas, Northern Brazil. *Dasmeusa imperialis* sp. nov. can be distinguished from the five known species of the genus, as well as from those of closely related genera, by the following combination of features: dorsum yellow with orange, preapical transverse irregular stripe on forewing; male pygofer moderately produced posteriorly, with posterior margin broadly rounded; style without preapical lobe, narrow and truncate apically; aedeagus with robust apical process directed ventrally, ventral margin of this process dentate; paraphyses with pair of dorsal dentiform projections on stalk, rami slender and directed posterodorsally; posterior margin of female sternite VII with small quadrate lobe; first ovipositor valvula with dentiform apex; second ovipositor valvula with apical third directed ventrally. This paper includes the first detailed description and illustrations of the female terminalia of a *Dasmeusa* species. In addition, the known geographic distribution of the genus is presented; *D. pauperata* (Fabricius, 1803) is newly recorded from the Brazilian states of Roraima, Amazonas, Pará, Sergipe, and Bahia; the records from the last two states are interesting because they are from areas of Atlantic Forest. Previously, the genus was known only from the Amazon Forest.

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Introduction

Cicadellidae (leafhoppers), one of the largest insect families, comprises more than 22,000 described species currently grouped into about thirty subfamilies (Dietrich, 2004, 2005). Leafhoppers range in length from 2 to 32 mm and characteristically have four rows of enlarged spine-like setae on the hind tibiae that are employed in the peculiar behaviors of brochosome anointing and grooming (Rakitov, 2009; Bartlett et al., 2018). Many species of this family can be abundant and cause considerable damage to crops by feeding directly on plants or by being vectors of plant pathogens (Nielson, 1968; Freytag and Sharkey, 2002). Leafhoppers feed via piercing-sucking mouthparts, usually on the vascular fluids of plants, and oviposit directly into the living tissue of their host plants (Dietrich, 1999).

The subfamily Cicadellinae comprises approximately 2400 species in about 330 genera (Wilson and Turner, 2007). This subfamily is very large and diverse and includes taxa from all

zoogeographical regions, being especially rich in the Neotropics (Young, 1968, 1977; Mejdalani, 1998). All known members of the Cicadellinae are xylem-feeders (Young, 1968). Currently, two tribes are recognized within the Cicadellinae, a New World Proconiini and a cosmopolitan Cicadellini (Young, 1968, 1977; Mejdalani, 1998).

The Cicadellini genus *Dasmeusa* Melichar, 1926 is recorded from Northern Brazil and Guianas (Young, 1977) and currently comprises five species: *D. basseti* Cavichioli and Chiamolera, 1999, *D. flavescens* Metcalf, 1965, *D. isabellina* Cavichioli and Chiamolera, 1999, *D. mendica* Young, 1977, and *D. pauperata* (Fabricius, 1803) (type species) (Cavichioli and Chiamolera, 1999; McKamey, 2007). According to Young (1977), *Dasmeusa* is related in many respects to *Paromenia* Melichar, 1926, but can be distinguished by the following combination of features: (1) dorsum usually yellow, often with orange shades or spots at the base and near the apex of the forewing; (2) body slender; (3) head well produced anteriorly and with the anterior margin rounded; and (4) male terminalia with paraphyses.

The taxonomy of the Cicadellidae is based mainly on characters of the male terminalia. The female terminalia have not been commonly studied because their characters are considered less variable (Carvalho and Mejdalani, 2014). However, several studies have revealed useful characters in the female terminalia of

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the sharpshooters for species delimitation (e.g., Mejdalani, 1998; Takiya and Mejdalani, 2004; Carvalho and Mejdalani, 2014). The female terminalia in *Dasmeusa* are poorly known; Young (1977) illustrated only the sternite VII of *D. flavescens* and the pygofer and second ovipositor valvula of *Dasmeusa* sp., whereas Cavichioli and Chiamolera (1999) illustrated the sternite VII of *D. isabellina*. Thus, detailed morphological studies, which could provide useful characters for understanding phylogenetic relationships within the genus and among members of the *Paromenia* generic group (sensu Young, 1977), are needed.

In the present paper, a new species of *Dasmeusa* from the State of Amazonas, Northern Brazil, is described and illustrated based on female and male specimens. In addition, preliminary data on the geographic distribution of the genus are provided; *D. pauperata* (Fabricius, 1803) is newly recorded from the Brazilian states of Roraima, Amazonas, Pará, Sergipe, and Bahia.

Material and methods

Specimens studied are deposited in the following institutions: Coleção Entomológica Pe. Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba (DZUP); Coleção Entomológica Prof. José Alfredo Pinheiro Dutra, Departamento de Zoologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro (DZRJ); Coleção de Invertebrados, Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA); Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro (MNRJ); and Coleção Entomológica, Museu Paraense Emílio Goeldi, Belém (MPEG).

Terminalia structures were removed, macerated in 10% KOH to eliminate unsclerotized tissues, and dissected (Oman, 1949; Mejdalani, 1998). Dissected parts were stored in small vials with glycerin that were pinned beneath the specimen (Young and Beirne, 1958). Descriptive terminology followed mainly Young (1968, 1977), except for the facial areas of the head (Hamilton, 1981; Mejdalani, 1993, 1998) and the female terminalia (Nielson, 1965; Hill, 1970). Use of the term gonoplac (=third ovipositor valvula) and the names of the sculptured areas of the first ovipositor valvula followed Mejdalani (1998). Line drawings of the anterior dorsum and terminalia structures were prepared with the aid of a camera lucida attached to a stereomicroscope and then inked with India ink. Photographs of the body at different focal planes were taken using a digital camera attached to a stereomicroscope; a composite image created from the in-focus areas of the original photographs was produced by *CombineZP*, a free software developed by Alan Hadley (<http://combinezp.software.informer.com>). Photographs of the first and second ovipositor valvulae were prepared with a digital camera attached to a light microscope. Total length of specimens was measured from the apex of the crown to the tips of the forewings at rest position (Young, 1977). Label data were quoted exactly with a reversed virgule (\) separating lines on the labels. Using the online tool SimpleMapp (Shorthouse, 2010), we prepared a map to show the known distribution of *Dasmeusa* species in South America. Records were obtained from specimens deposited in DZRJ, DZUP, INPA, MNRJ, and MPEG, as well as from the literature (Young, 1977; Zanol and de Menezes, 1982; Cavichioli and Chiamolera, 1999; McKamey, 2007; Wilson et al., 2009).

Results

Dasmeusa imperialis sp. nov. (Figs. 1–17)

Length. Male holotype 8.1 mm; male paratypes 7.8–8.0 mm (n = 5); female paratypes 8.8–9.6 mm (n = 5).

Male holotype

Head (Figs. 1, 17), in dorsal view, strongly produced anteriorly; median length of crown almost equal to interocular width and approximately 5/10 transocular width; anterior margin rounded; without carina at transition from crown to face; coronal suture distinct, elongate, extending anteriorly beyond interocellar line; frontogenal suture extending onto crown and attaining ocellus; ocelli located on imaginary line between anterior eye angles, each ocellus approximately equidistant between median line of crown and adjacent eye angle; surface of crown flattened; antennal ledge, in dorsal view, slightly protuberant; in lateral view, with anterior margin convex. Frons, in anterior view, convex; median area slightly punctate; muscle impressions distinct; in lateral view, inferior third slightly angulate; epistomal suture incomplete medially; clypeus, in lateral view, convex, continuing inferior contour of frons.

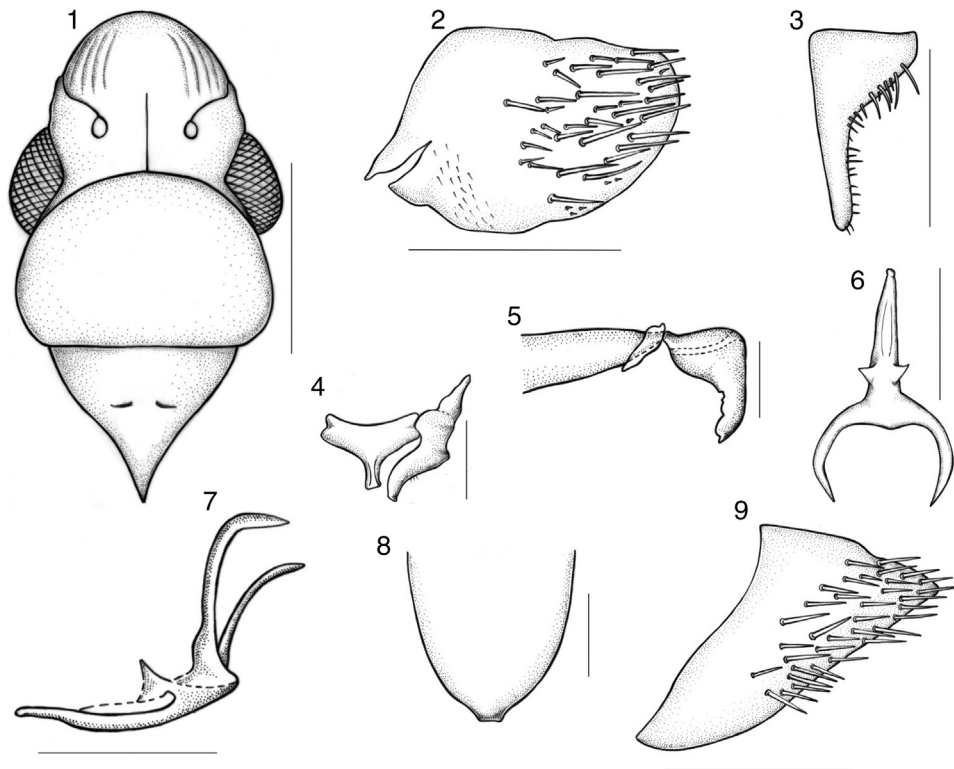
Thorax (Figs. 1, 17) with pronotum, in dorsal view, with width approximately equal to transocular width of head; lateral margins convergent anteriorly; posterior margin rectilinear; dorsolateral carina complete, rectilinear, declivent anteriorly; disk without pubescence or punctures. Mesonotum with scutellum not transversally striate and without punctures. Forewing with membrane indistinct; veins not elevated; apex slightly expanded and obliquely truncate; with four apical cells, base of fourth slightly more proximal than base of third, and three closed anteapical cells, their bases located more proximally than claval apex; costal apical cell broadened posteriorly; without anteapical plexus of veins; texture subhyaline. Hind wing with vein R_{2+3} incomplete. Hind leg with femoral setal formula 2:1:1; first tarsomere longer than combined length of two more distal tarsomeres, with two longitudinal rows of small setae on plantar surface.

Terminalia with pygofer (Fig. 2), in lateral view, moderately produced posteriorly; posterior margin broadly rounded; without processes; macrosetae distributed on posterior half but some located more anteriorly; microsetae distributed on basiventral portion. Subgenital plate (Fig. 3), in ventral view, with basal third broad and distal two-thirds strongly narrowed; not fused basally to its counterpart; with elongate uniseriate macrosetae on basal third, microsetae distributed along outer lateral margin; in lateral view, plate not extending as far posteriorly as pygofer apex. Style (Fig. 4), in dorsal view, extending posteriorly farther than apex of connective, without preapical lobe, narrow and truncate apically. Connective (Fig. 4), in dorsal view, T-shaped; stalk short, arms broad. Aedeagus (Fig. 5) symmetrical; shaft short, with robust apical process directed ventrally, ventral margin of process irregularly dentate; gonoduct distinct, gonopore located apically. Paraphyses (Figs. 6, 7) symmetrical, articulated to apex of connective, extending beyond subgenital plates; in dorsal view (Fig. 6), stalk long and robust, with dorsoapical pair of dentiform projections; rami slender and with acute apexes, in lateral view (Fig. 7) directed dorsally for most of their length but with apical portion directed posteriorly.

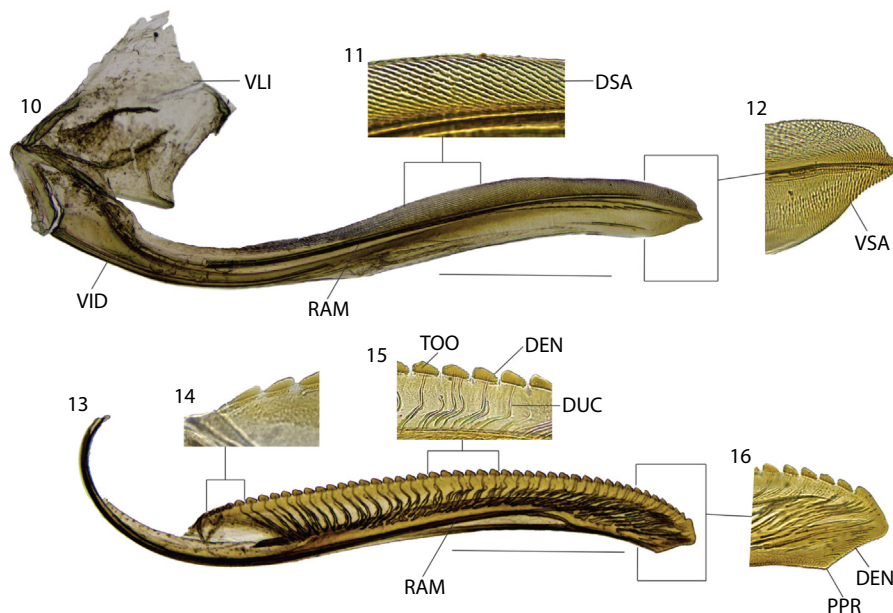
Color (Fig. 17). Dorsum yellow. Forewing with orange, preapical transverse irregular stripe, apex colorless. Face, lateral and ventral portions of thorax, and legs pale yellow.

Female

External morphology and color similar to those of male. Terminalia with sternite VII (Fig. 8), in ventral view, well produced posteriorly, narrowing gradually towards apex; posterior margin with small quadrate lobe. Pygofer (Fig. 9), in lateral view, well produced posteriorly; posterior margin narrowly rounded to subacute; surface with large macrosetae distributed mostly on posterior half. "Internal" sternite VIII, in dorsal view, without sclerotized areas. First valvifer (Fig. 10), in lateral view, subquadrate. First valvula



Figs. 1–9. *Dasmeusa imperialis* sp. nov. 1–7, male. 1, head, pronotum, and mesonotum, dorsal view. 2, pygofer, lateral view. 3, subgenital plate, ventral view. 4, connective and style, dorsal view. 5, ejaculatory bulb and aedeagus, lateral view. 6, paraphyses, dorsal view. 7, paraphyses, lateral view. 8–9, female. 8, sternite VII, ventral view. 9, pygofer, lateral view. Scale bars: Figs. 1, 8, 9 = 1 mm, 2, 3, 6, 7 = 0.5 mm, 4, 5 = 0.25 mm.



Figs. 10–16. *Dasmeusa imperialis* sp. nov., female. 10, ovipositor valvula I, lateral view (the basal portion of the ramus is broken). 11, dorsal sculptured area. 12, apical portion. 13, ovipositor valvula II, lateral view. 14, basal teeth. 15, median teeth. 16, apical portion. (DEN) denticle; (DSA) dorsal sculptured area; (DUC) duct; (PPR) preapical prominence; (RAM) ramus; (TOO) tooth; (VID) ventral interlocking device; (VLI) valvifer I; (VSA) ventral sculptured area. Scale bars: 0.5 mm.

(Figs. 10–12), in lateral view, abruptly narrowed apically, ventroapical margin somewhat sinuous, apex acute, dentiform; dorsal sculptured area (Fig. 11) extending from basal portion of blade to apex, formed mostly by scale-like processes arranged in oblique lines (strigate); ventral sculptured area (Fig. 12) restricted to apical portion of blade, formed mostly by scale-like processes; ventral interlocking device distinct on basal half of blade. Second valvula

(Figs. 13–16), in lateral view, with dorsal margin convex and apical third directed ventrally; with about 45 non-contiguous, mostly subtriangular teeth; denticles distributed on teeth and on dorsal and ventral apical portions of blade (ventral dentate apical portion longer than dorsal one) (Figs. 15, 16); preapical prominence distinct (Fig. 16); apex obtuse; ducts (Fig. 15) extending towards teeth and apical area. Gonoplac of the usual Cicadellinae type: in lateral view,

with basal half narrow; apical half expanded, gradually narrowing towards apex; latter obtuse.

Etymology. The name of the new species, *imperialis*, is a tribute to the Museu Nacional (Universidade Federal do Rio de Janeiro). The main Museum building (São Cristóvão Imperial Palace) was almost completely destroyed by the fire during the night of September 2, 2018. Unfortunately, most of the entomological collection was also destroyed.

Type material. Northern Brazil, Amazon Forest. Male holotype: “BR [Brazil], A.M. [State of Amazonas], Manaus, \ Reserva Ducke \ 09/IX/1986 \ Ulisses, Luís” (DZUP). Paratypes: fifteen males and one female: “BRASIL, AM, 80 km N \ Manaus, Reserva do \ PDBFF [Projeto Dinâmica Biológica de Fragmentos Florestais], Km 41 \ 02°24'S, 59°43'W \ 22.xii-07.i.2005” (INPA); two males and one female: same data as preceding except “09-10.vi.2004” (DZRJ); two males and one female: “10-12.xi.2004” (DZRJ); two males: “27-28.x.2004” (DZRJ); one male: “21-22.vii.2004” (DZRJ); nine males and one female: “02-04.iii.2005” (DZRJ); three males: “26-27.v.2004” (DZRJ); twelve males and two females: “16-18.iii.2005” (INPA); three males: “02-04.ii.2005” (DZRJ); two males and one female: “24-25.xi.2004” (DZRJ); four males: “30.iii-01.iv.2005” (DZRJ); one male: “16-17.ii.2005” (DZRJ); one male: “15-16.ix.2004” (DZRJ); three males: “07-08.vii.2004” (DZRJ); one male: “12-13.v.2004” (DZRJ); ten males and two females: “08-09.xii.2004” (MNRJ); four males: “16-17.ii.2005” (DZRJ); eight males: “19-21.i.2005” (DZRJ); one male and one female: “23-24.vi.2005” (DZUP); one male: “05-06.viii.2004” (DZRJ); two males: “Brasil, Amazonas, Manaus, ZF2 \ KM-14, 02°35'21"S-60°06'55"W \ 03-17.viii.2016 \ Malaise grande no chão \ J.A. Rafael & F.F. Xavier” (INPA); one male: same data as preceding except “16-30.ix.2016” (INPA).

Discussion

Dasmeusa imperialis sp. nov. can be distinguished from the other species of the genus, as well as from those of closely related genera (e.g., *Paromenia* Melichar, *Alocha* Melichar, *Albiniana* Cavichioli, and *Jeepiulus* Cavichioli), by the following combination of features: (1) dorsum yellow with orange, preapical transverse irregular stripe on forewing (Fig. 17); (2) male pygofer moderately produced posteriorly, with posterior margin broadly rounded (Fig. 2); (3) style without preapical lobe, narrow and truncate apically (Fig. 4); (4) aedeagus with robust apical process directed ventrally, ventral margin of this process dentate (Fig. 5); (5) paraphyses with pair of dorsal dentiform projections on stalk, rami slender and directed dorsoposteriorly (Figs. 6, 7); (6) posterior margin of female sternite VII with small quadrate lobe (Fig. 8); (7) first ovipositor valvula with dentiform apex (Fig. 12); second ovipositor valvula with apical third directed ventrally (Fig. 13). The male terminalia of the new species are similar to those of *D. basseti* and *D. isabellina*. However, these three species can be readily distinguished from one another by the shape of the paraphyses. In *D. basseti*, the rami of the paraphyses are bifid apically (see Cavichioli and Chiamolera, 1999), a condition that is not observed in the new species and in *D. isabellina*. The pair of dentiform projections of the stalk and the posterodorsally-directed rami distinguish the paraphyses of the new species from those of *D. isabellina* (see Cavichioli and Chiamolera, 1999). The vast majority of *D. imperialis* specimens from the PDBFF reserve were collected with suspended intercept traps placed at understory level. Based on statistical analyses conducted, the new species is an understory indicator (*D.* Takiya, unpublished data).

The known distribution of *Dasmeusa* species is shown in Fig. 18. Unfortunately, we have no detailed data on the distribution of *D. flavescens*, which was described from Brazil (Young, 1977; Zanol and de Menezes, 1982; McKamey, 2007) and subsequently

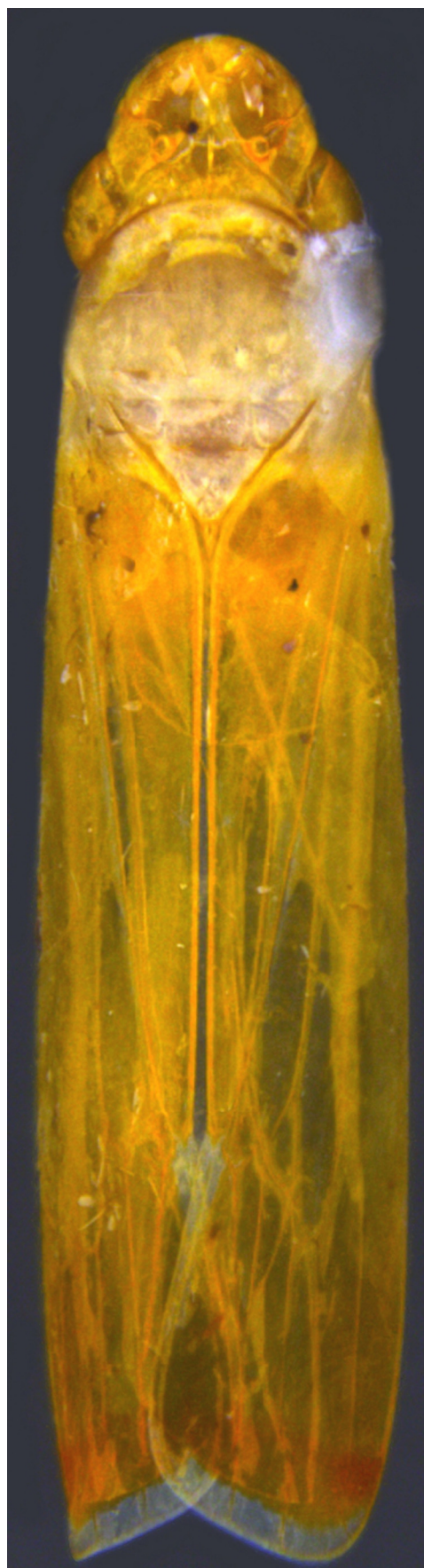


Fig. 17. *Dasmeusa imperialis* sp. nov. Male holotype, body (total length 8.1 mm), dorsal view (antennae and legs not depicted; the pin has been glued to the right side of the thorax).

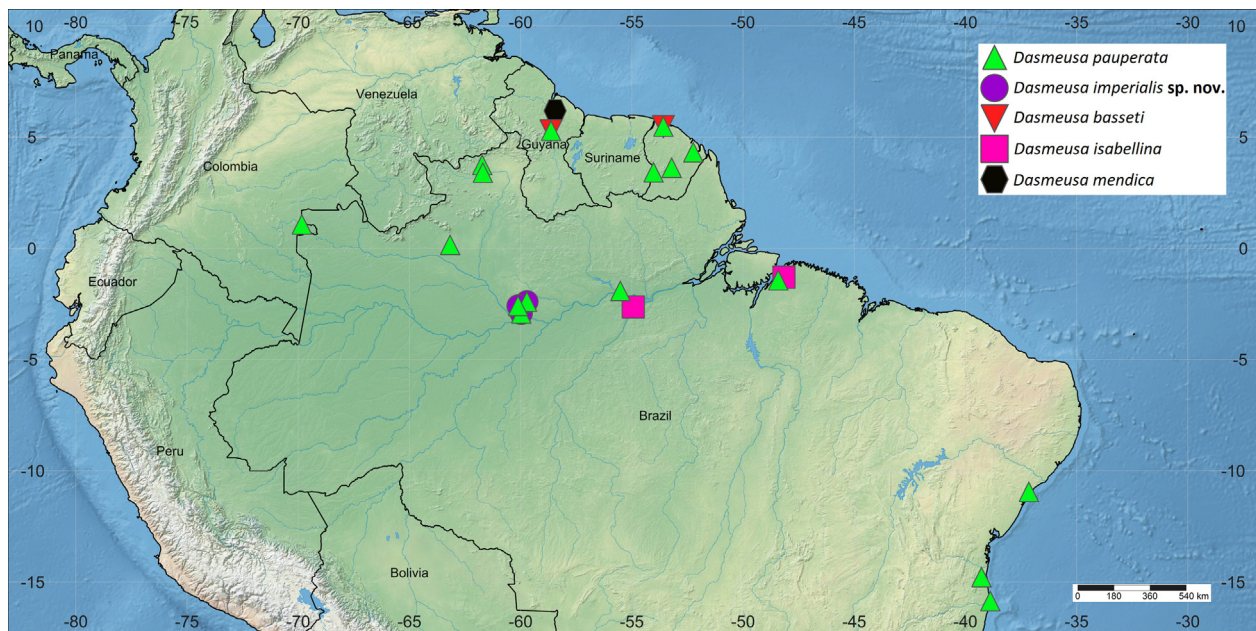


Fig. 18. Distribution of *Dasmear* species (preliminary data). Records were obtained from specimens deposited in DZRJ, DZUP, INPA, MNRJ, and MPEG, as well as from the literature (Young, 1977; Zanol and de Menezes, 1982; Cavichioli and Chiamolera, 1999; McKamey, 2007; Wilson et al., 2009). *Dasmear flavescens* is not included because the only records available for this species are “Brazil” and “Suriname.” *Dasmear pauperata* is also recorded from Suriname (McKamey, 2007) and *D. mendica* is also recorded from French Guiana (Wilson et al., 2009).

recorded from Suriname (Wilson et al. 2009). Based on specimens herein studied, we have firstly recorded *D. pauperata* from the Brazilian states of Roraima, Amazonas, Pará, Sergipe, and Bahia (a record from “Brazil” was provided by Wilson et al., 2009). Records from the last two states, which are located in Northeastern Brazil, are particularly interesting because they are from areas of Atlantic Forest. Previously, the genus was known only from the Amazon Forest. Furthermore, the distribution of *D. pauperata* in the Brazilian Amazon region strongly suggests that this species also occurs in lowlands of Venezuela and Colombia.

Additional material examined (new Brazilian records of *Dasmear pauperata*)

State of Roraima: one male: Amajari (DZRJ); one male: Amajari (DZUP); six males and two females: Amajari (INPA). **State of Amazonas:** eight males: São Gabriel da Cachoeira (INPA); two males: Barcelos (DZUP); 13 males and 13 females: Manaus (DZRJ); one male: Manaus (DZUP); six males and six females: Manaus (MNRJ); 16 males and 20 females: Manaus (INPA). **State of Pará:** one male: Belém, Curió-Utinga (MPEG); two males: Óbidos (DZUP). **State of Sergipe:** one male and one female: São Cristóvão (DZRJ). **State of Bahia:** one female: Itabuna (DZRJ); one male and one female: Belmonte (DZRJ).

Conflicts of interest

The authors declare no conflicts of interest.

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