

Research article

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***Dasydorylas* Skevington, 2001 (Pipunculidae, Tomosvaryellini) of Colombia, with description of three new species and a key to Neotropical males**Yardany RAMOS-PASTRANA ^{1,*}, Dayse Willkenia A. MARQUES ² &
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Abstract. The cosmopolitan pipunculid genus *Dasydorylas* Skevington, 2001 includes just a few species from the Neotropical Region and is completely unknown to Colombia. Three new species of *Dasydorylas* are described from protected areas and conflict territories of limited access in Colombia, namely *Dasydorylas colombiensis* sp. nov. (type locality: Santuario de Fauna y Flora Iguaque, Boyacá), *D. gibber* sp. nov. (type locality: Santuario de Fauna y Flora Iguaque, Boyacá), and *D. santainesensis* sp. nov. (type locality: Páramo de Santa Inés, Belmira, Antioquia). Diagnoses, illustrations and distributional data of the new species are presented. *Dasydorylas nigellus* (Rafael, 1991) is recorded for the first time from Colombia and its amended diagnosis is provided. An identification key to males of all Neotropical species is presented. With this paper, the number of Neotropical species of *Dasydorylas* is increased from six to nine.

Keywords. Big-headed flies, identification key, South America, Tomosvaryellini, taxonomy.

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Introduction

Dasydorylas Skevington, 2001 (Pipunculinae Walker, 1834: Tomosvaryellini Hardy, 1943) is a cosmopolitan pipunculid genus, with 35 species worldwide (Motamedinia *et al.* 2020). *Pipunculus horridus* (Becker, 1897) and *P. discoidalis* (Becker, 1897) were the first described species in the genus. Later, Becker (1908), Banks (1915), Hardy (1950, 1954, 1961, 1968, 1972), Koizumi (1959), and

Kuznetsov (1994) described other species of *Dasydorylas* under the genera *Pipunculus* Latreille, 1802, *Dorilas* Meigen, 1800 and *Eudorylas* Aczél, 1940.

Banks (1915) described *Pipunculus cinctus*, but later it was transferred by Hardy (1943) to *Dorilas* (*Eudorylas*). Curran (1928) described *Dasydorylas regalis* under *Pipunculus*. Hardy (1943) described *Dasydorylas cinctus subtilis* under *Dorilas*. Hardy (1954) described *Dasydorylas eremita* and *D. nigripides* under *Dorilas* (*Eudorylas*). Rafael (1991) described *D. nigellus* under *Eudorylas*. Rafael & Ale-Rocha (2004) described *Dasydorylas vulcanus* and proposed three new combinations, transferring *Dorilas* and *Eudorylas* species to *Dasydorylas*. Kehlmaier (2005a, 2005b) listed seven species from the Palearctic Region, including a new species to science. Földvári (2013) revised the Afrotropical species of *Dasydorylas* and listed eight species, of which two were described as new to science. Motamedinia *et al.* (2017) revised the Iranian species of *Dasydorylas* and proposed two new species and one new combination; additionally, the species were characterized morphologically and molecularly by using DNA barcoding of the mitochondrial COI gene. Motamedinia *et al.* (2020) revised seven Middle Eastern species of *Dasydorylas* and proposed three new species and one synonym.

Skevington & Yeates (2001) considered *Dasydorylas* as sister group to a large clade including *Amazunculus* Rafael, 1986, *Elmohardyia* Rafael, 1987a, *Basileunculus* Rafael, 1987b, *Allomethus* Hardy, 1943 and *Claraeola* Aczél, 1940, placed within the tribe Eudorylini. In a recent phylogenetic analysis by Motamedinia *et al.* (2021), *Dasydorylas* was recovered as related to *Dorylomorpha* + at least one undescribed genus within Tomosvaryellini.

Currently, six species of *Dasydorylas* are known in the Neotropical Region, namely, *Dasydorylas cinctus* (Banks, 1915) (Costa Rica, Nicaragua, Mexico; Rafel & Ale-Rocha 2004), *D. eremita* (Hardy, 1954) (Brazil; Rafael 1995), *D. nigellus* (Rafael, 1991) (Peru; Rafael 1995), *D. nigripedes* (Hardy, 1954) (Argentina, Brazil; Rafael 1995), *D. regalis* (Curran, 1928) (Brazil, Peru; Rafael 1991) and *D. vulcanus* Rafael, 2004 (Nicaragua; Rafel & Ale-Rocha 2004); however, none have been registered in Colombia. The objective of this paper is to study the species of *Dasydorylas* from Colombia, describe and illustrate all the species found in the country, as well as provide a new identification key to the males of all the Neotropical species.

Material and methods

This study is based on pinned specimens deposited in the following collections:

- CEUA = Colección Entomológica Universidad de Antioquia, Medellín, Antioquia, Colombia
- IAvH = Colección del Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Villa de Leyva, Boyacá, Colombia
- INPA = Invertebrate Collection of Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil
- LEUA = Colección del Laboratorio de Entomología Universidad de la Amazonia, Florencia, Caquetá, Colombia

The total length of a specimen was measured in lateral view by summing the distances from the frons (antenna excluded) to the scutellum apex and from the scutellum apex to the abdomen tip. To study the internal characteristics of the male genitalia, the distal portion of the abdomen was cut, placed into lactic acid (85%) and heated at 150°C over a Thermo Scientific Cimarec plate for approximately 1 hour, prior to the dissection of the genitalia. The genitals were dissected and photographed in dehydrated glycerine using an excavated slide. After study, the genital parts were stored in microvials with glycerine. The wings were mounted on microslides with Canada balsam. The holotype specimens were pinned, mounted, and deposited in their original collections. The microvial and microslide were pinned along with the respective specimen.

The external morphological terminology follows Cumming & Wood (2017). The measurements (in millimeters) that refer to the head, antenna and wing were made as proposed by Skevington (2002), Kehlmaier (2005a), Ramos-Pastrana *et al.* (2022a, 2022b, 2022c): F, length of frons; EM, length of eye contiguity; V, length of vertex; LW/ MWW, ratio between length and maximum width of the wing; LTC/ LFC, ratio between length of third costal section by length of fourth costal section of the wing; LPP/ WPP, ratio between length and maximum width of the postpedicel. The morphological terminology of the terminalia of male follows Skevington (2002), Kehlmaier (2005a) Motamedinia *et al.* 2017, 2020; Ramos-Pastrana *et al.* (2022a, 2022b, 2022c, 2023).

The following measurements of the ovipositor follow Skevington (2005): ovipositor length (OL), measured over a straight line from the tip of the piercer to the point where the base of the ovipositor articulates with sternite 6 dorsally; piercer length (PL), measured over a straight line from the proximal edge of the cerci to the tip of the piercer; length ovipositor's base (B), measured over a straight line from the proximal end of the cerci to the point where the base of the ovipositor articulates with sternite 6 dorsally.

Photographs were taken with a Leica digital camera DFC450 coupled to a stereo microscope Leica M205A and connected to a computer with Leica Application Suite software, with automatic mounting module (synchronization software) (<http://www.syncroscopy.com/syncroscopy>) and editing was done in Adobe Photoshop. The maps showing species' geographic records were plotted using the Simple Mapper software (Shorthouse 2010).

In the list of examined material, label data are given as presented on the labels. Complementary data not present on the specimen labels are given in square brackets. New records for the country are included within each species account and mentioned as a 'new record' in geographical distribution. Data for specimens with identical data are simplified as 'idem' and only data differing from the previous labels are presented.

Morphological abbreviations

B	=	ovipositor's base
EM	=	length of eye contiguity
F	=	length of frons
LFC	=	length of fourth costal section of wing
LPP	=	length of postpedicel
LTC	=	length of third costal section of wing
LW	=	length of wing
MWW	=	maximum width wing
OL	=	ovipositor length
PL	=	piercer length
V	=	length of vertex
WPP	=	width of postpedicel

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Family Pipunculidae Walker, 1834

Genus *Dasydorylas* Skevington, 2001

Dasydorylas Skevington in Skevington & Yeates, 2001: 435. Type species *Pipunculus eucalypti* Perkins, 1905 (original designation).

Pipunculus – Banks 1915: 169 (partim). — Curran 1928: 43 (partim). — Hardy 1943: 83 (partim). — Aczél 1948: 28 (partim); 1952: 247 (partim). — Arnaud & Owen 1981 (Curran types) (partim).

Dorilas – Hardy 1943: 84, pl. 6, figs 36a–b (partim).

Dorilas (*Eudorylas*) – Hardy 1954: 21, figs 7a–b, 32, figs 14a–c (partim).

Eudorylas – Rafael 1991: 156, figs 12–16, 37; 159, figs 21–28, 39 (partim).

Dasydorylas – Rafael & Ale-Rocha 2004: figs 33–37. — Földvári 2013: 23. — Motamedinia *et al.* 2017; 2020.

Diagnosis (adapted from Skevington 2001)

Small to medium size (2.5–4.8 mm). Eyes holoptic in males, dichoptic in females. Postpedicel with acuminate apex. Notopleuron usually with dense tuft of long setae. Scutum with dorsocentral setae conspicuous. Femora with ventral ctenidia and row of long setae posterodorsally. Hind tibia with one or more erected anterior spines on median part, fore and mid tibiae with distinct apical spines. Tegula usually with a cluster of setae. Wing with pterostigma. Abdomen ovate with conspicuous scattered setae (rarely inconspicuous) ground color dark; tergites 2–4 usually with posterior margin brown, gray, or yellowish brown pruinose. Syntergosternite 8 with a membranous area. Apex of phallic guide with apex hook-shaped, sometimes with large spines. Ejaculatory apodeme parasol-shaped or funnel-shaped. Phallus thin and trifid (rarely bifid).

Species of *Dasydorylas* from Colombia

Dasydorylas colombiensis sp. nov.

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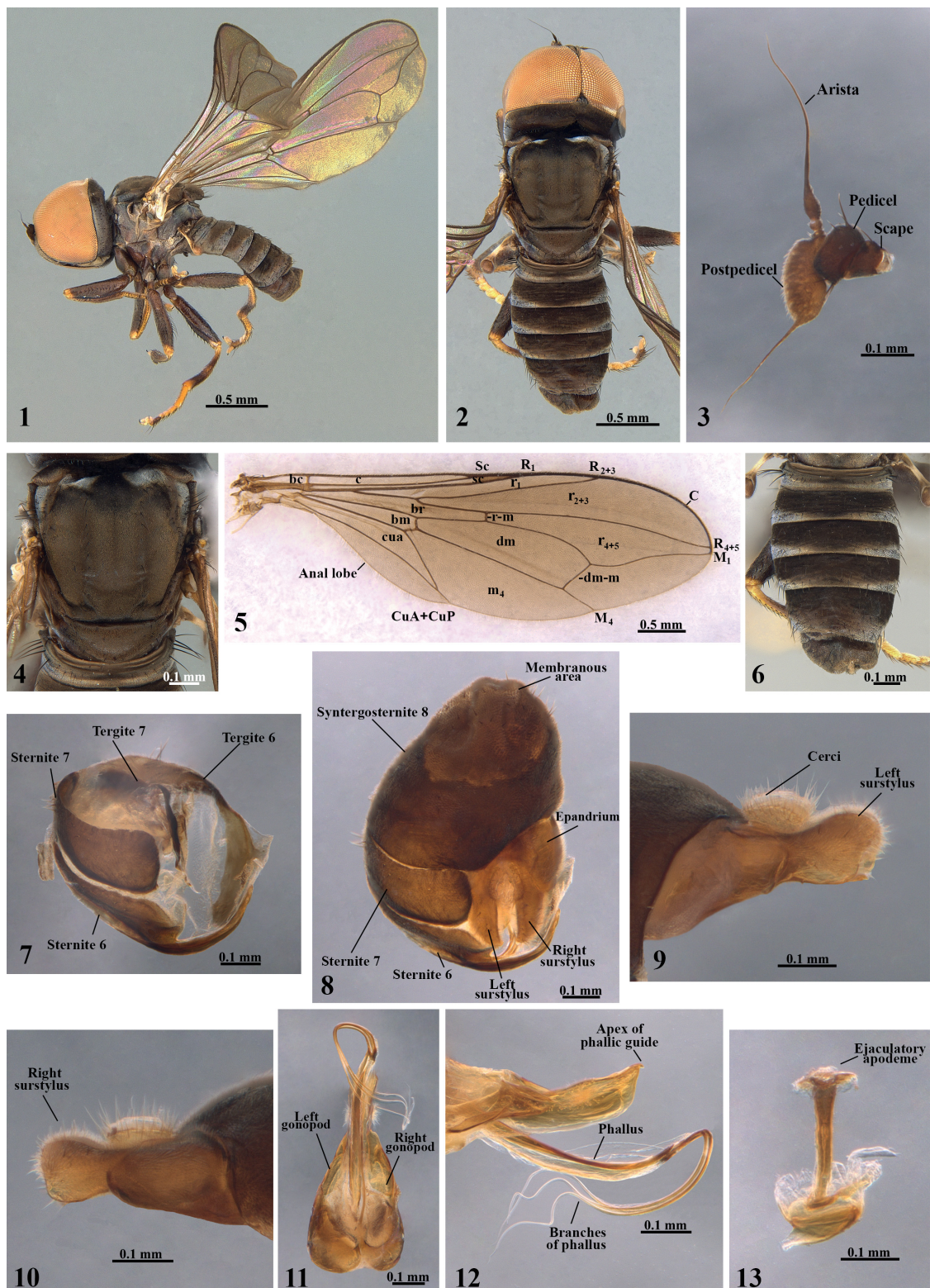
Figs 1–13, 53

Diagnosis

Postpedicel with aristiform apex. Tergites 1–5 brown, brown pruinose, with distal margin gray pruinose dorsolaterally, interrupted medially. Surstyli subsymmetrical, slightly shorter than epandrium; both surstyli thickened basally and medially, thin apically, with inner margins slightly straight, outer margin curved, and apices acute inward-directed in dorsal view; left surstylus with apex sinuous, right surstylus with apex truncated in lateral view. Apex of phallic guide with upper margin slightly sinuous and a tuft of small setae centrally in lateral view. Phallus trifid, with ejaculatory ducts distinctly separated only in distal half.

Etymology

The species name refers to Colombia, where holotype has been collected.



Figs 1–13. *Dasydorylas colombiensis* sp. nov., ♂, holotype (IAvH–M1063). 1. Habitus, left lateral view. 2. Habitus, dorsal view. 3. Antenna. 4. Thorax, dorsal view. 5. Wing. 6. Abdomen, dorsal view. 7. Tergites and sternites 6 and 7, ventral view. 8. Terminalia, dorsal view. 9. Left surstylus, lateral view. 10. Right surstylus, lateral view. 11. Hypandrium and gonopods, ventral view. 12. Phallic guide and phallus, left lateral view. 13. Ejaculatory apodeme.

Type material**Holotype**

COLOMBIA – **Boyacá** • ♂; “SFF[Santuario de Fauna y Flora] Iguaque, Cab.[Cabaña] Mamaramos; 05°25' N, 73°27' W; 2855 m[eters]; 13.Nov[XI]–04.Dic[XII].2001; P. Reina leg.”; IAvH M1063 (photographed specimen). Holotype with left wing mounted on microslide with Canada balsam. Left antenna and terminalia are in a microvial with glycerine, pinned along with the specimen.

Paratypes

COLOMBIA – **Boyacá** • 2 ♂♂; “SFF[Santuario de Fauna y Flora] Iguaque, Cab.[Cabaña] Mamaramos; 05°25' N, 73°26' W; 23.Sep[IX]–11.Oct.[X].2000”; IAvH (1 ♂ dissected) • 1 ♂; idem; “01–17. Aug[VIII].2000; (IAvH) • 1 ♂; idem; “04–21.Dec[X].2001”; IAvH M1080 • 1 ♂; idem; “05°25'12" N, 73°27'24" W; Malaise4; 01–19.IV.2000”; IAvH (dissected).

Description**Male** (holotype)

MEASUREMENTS. Body length 3.4 mm, Wing length 4.9 mm.

HEAD (Figs 1–2). Eyes contiguous for 19 facets. F, EM, V (mm) = 0.3, 0.4, 0.1. Frontal triangle dark brown, brown pruinose, with callus shiny dark brown. Occiput dark brown, gray pruinose ventrally and laterally, brown pruinose dorsally. Antenna (Fig. 3) scape and pedicel dark brown, pedicel with three setae dorsally and two ventrally; postpedicel with aristiform apex. LPP/WPP = 5.1.

THORAX (Figs 1–2, 4). Postpronotal lobe brown, brown pruinose, with six long setae along upper margin. Scutum, ground color brown, brown pruinose, with two gray pruinose spots anterolaterally; dorsocentral setae conspicuous. Notopleuron brown, gray-brown pruinose. Scutellum brown, brown pruinose, with 10 long, stout and black setae in the posterior margin. Mesopleuron and mediotergite concolorous with notopleuron.

WING. LW/MWW = 3.1; LTC/LFC = 5.6. Membrane brown infuscated; vein M_1 slightly curved upward. Halter stem and knob completely beige ventrally, brown dorsally, except beige in medial third of stem.

LEGS (Fig. 1). Coxae dark brown, gray-brown pruinose; trochanters brown, gray-brown pruinose; femora brown, gray-brown pruinose, except yellowish brown apices, femora with conspicuous ctenidia and a row of long setae anterolaterally and posterolaterally; tibiae brown, except yellowish brown in basal third; tarsomeres 1–4 brown, 5 dark brown; pulvilli yellowish brown.

ABDOMEN (Figs 1–2, 6). Ground color velvety brown, with conspicuous scattered setae; tergites 1–5 brown, brown pruinose, with distal margin gray pruinose dorsolaterally, interrupted medially; tergite 1 with five black and long setae laterally; tergites and sternites 6 and 7 as in Fig. 7. Syntergosternite 8 dark brown, gray-brown pruinose, shorter than tergite 5, with a membranous area apically (Fig. 6).

TERMINALIA (Figs 7–13). Epandrium and surstyli brown (Fig. 8). Surstyli (Figs 8–10) subsymmetrical, slightly shorter than epandrium, with some differentiated black setae scattered dorsally in dorsal view. Both surstyli thickened basally and medially, thin apically, with inner margins slightly straight, outer margin curved, and apices acute inward-directed in dorsal view; right surstylus slightly shorter than left (Fig. 8); left surstylus with apex sinuous, right surstylus with apex truncated in lateral view (Figs 9–10). Gonopods asymmetrical, right gonopod slightly thicker than left in ventral view (Fig. 11). Apex of phallic guide stout, with apex hook-shaped, upper margin slightly sinuous, with a tuft of small setae dorsocentrally in lateral view (Fig. 12). Ejaculatory apodeme parasol-shaped (Fig. 13). Phallus trifold, thin, with ejaculatory ducts distinctly separated only in distal half (Figs 11–12).

Female

Unknown.

Geographical distribution

Colombia (Boyacá) (Fig. 53).

Habitat

The specimens were collected in the Santuario de Fauna y Flora Iguaque reserve, where the vegetation is composed of cloud Andean forests of the cordillera of the Northeast region of Colombia.

Remarks

Based on males and due to the shape of the surstyli, *D. colombiensis* sp. nov. (Fig. 8) is similar in appearance to *D. gibber* sp. nov. (Fig. 21) but differs from the latter in having the tergites 1–5 brown, brown pruinose, with distal margin gray pruinose dorsolaterally, slightly interrupted medially (Figs 1–2, 6) (vs tergite 1 completely brown pruinose; tergites 2–4 with distal margins yellowish brown pruinose; tergite 5 dark brown, brown pruinose dorsally, yellowish brown pruinose laterally in *D. gibber* sp. nov.; Figs 14–15, 19); left surstylus with apex sinuous in lateral view (Fig. 9) (vs left surstylus with apex slightly rounded in lateral view; Fig. 22); apex of phallic guide with upper margin slightly sinuous and tuft of small setae dorsocentrally (Fig. 12) (vs apex of phallic guide with a translucent lobes lateroapically and a stout rigid lobe dorsally; Fig. 25); phallus with ejaculatory ducts distinctly separated only in distal half (Fig. 12) (vs phallus with ejaculatory ducts distinctly separated only in distal fifth; Fig. 25).

Dasydorylas gibber sp. nov.

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Figs 14–26, 53

Diagnosis

Postpedicel with aristiform apex. Tergites 2–4 with distal margins yellowish brown pruinose; tergite 5 dark brown, brown pruinose dorsally, yellowish brown pruinose laterally. Surstyli subsymmetrical, equal to epandrium length; both surstyli thickened basally and medially, thin apically, with inner margins slightly straight, outer margins curved in dorsal view; right surstylus with apex truncated and left surstylus with apex slightly rounded when seen in lateral view. Apex of phallic guide with stout and rigid lobe dorsally and translucent lobes lateroapically in lateral view. Phallus trifid, with ejaculatory ducts distinctly separated only in distal fifth in lateral view.

Etymology

From the Latin ‘*gibber*’ (= ‘hump’), in reference to the shape of the lobe on the dorsal margin of the phallic guide in the male genitalia.

Type material

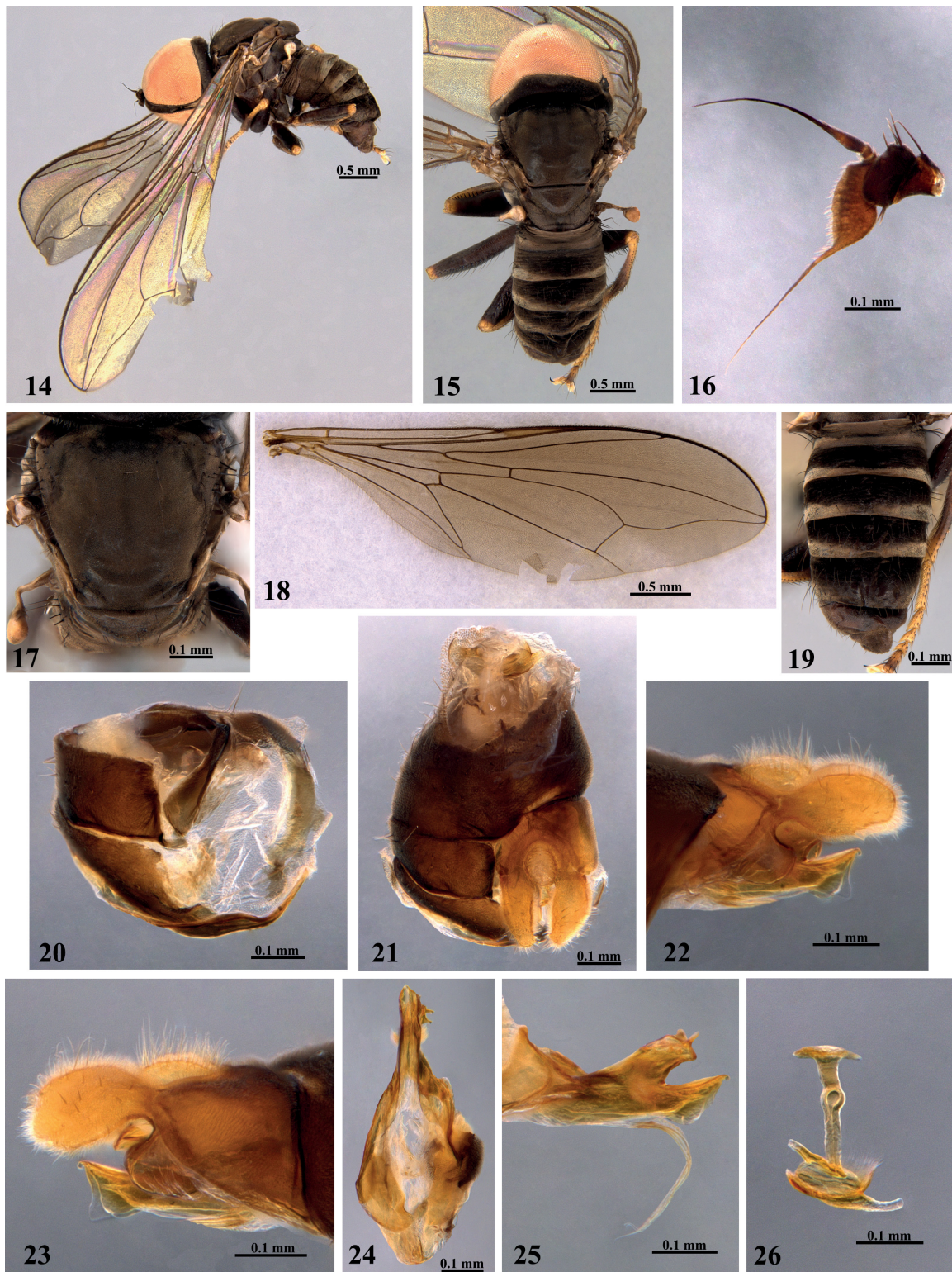
Holotype

COLOMBIA – Boyacá • ♂; “SFF[Santuario de Fauna y Flora] Iguaque, Cab.[Cabaña] Mamaramos; 05°25' N, 73°27' W; 2855 m[eters]; 23.May[V]–08.Jun[VI].2000; P. Reina leg.”; IAvH (photographed specimen). Holotype with left wing mounted on microslide with Canada balsam. Left antenna and terminalia placed in a microvial with glycerine, both pinned along with the specimen.

Description

Male (holotype)

MEASUREMENTS. Body length 4.8 mm, Wing length 5.8 mm.



Figs 14–26. *Dasydorylas gibber* sp. nov., ♂, holotype (IAvH). **14.** Habitus, left lateral view. **15.** Habitus, dorsal view. **16.** Antenna. **17.** Thorax, dorsal view. **18.** Wing. **19.** Abdomen, dorsal view. **20.** Tergites and sternites 6 and 7, ventral view. **21.** Terminalia, dorsal view. **22.** Left surstylus, lateral view. **23.** Right surstylus, lateral view. **24.** Hypandrium and gonopods, ventral view. **25.** Phallic guide and phallus, left lateral view. **26.** Ejaculatory apodeme.

HEAD (Figs 14–15). Eyes contiguous for 19 facets. F, EM, V (mm) = 0.4, 0.4, 0.2. Frontal triangle dark brown, brown pruinose, with callus shiny dark brown. Occiput brown, brown pruinose. Antenna (Fig. 16) scape brown, with one seta dorsally; pedicel dark brown, with four setae dorsally and two ventrally; postpedicel with aristiform apex. LPP/WPP = 5.6.

THORAX (Figs 15, 17). Postpronotal lobe dark brown, brown pruinose, with four long setae along upper margin. Scutum, ground color brown, brown pruinose, with one spot black anteriorly and dorsocentral setae conspicuous. Notopleuron brown, gray-brown pruinose. Scutellum concolorous with scutum, with six long, stout and black setae in the posterior margin. Mesopleuron and mediotergite concolorous with notopleuron.

WING (Fig. 18). Length 5.8 mm. LW/MWW = 3.2; LTC/LFC = 0.8. Membrane brown infuscated, vein M_1 slightly curved upward. Halter stem and knob completely beige ventrally, brown dorsally, except beige medial third of stem.

LEGS (Figs 14–15). Coxae dark brown, gray-brown pruinose; fore trochanter brown; mid and hind trochanters brown, except brownish yellow distal third; femora dark brown, gray-brown pruinose, except brownish yellow apices, femora with conspicuous ctenidia and a row of long setae anterolaterally and posterolaterally; tibiae dark brown, with bases and apices brownish yellow; tarsomeres 1–5 yellowish brown; pulvilli brownish yellow.

ABDOMEN (Figs 14–15, 19). Ground color velvety dark brown, with conspicuous scattered setae; tergite 1 completely brown pruinose, with four black and long setae laterally; tergites 2–4 with distal margins yellowish brown pruinose; tergite 5 dark brown, brown pruinose dorsally, yellowish brown pruinose laterally; tergites and sternites 6 and 7 as in Fig. 20. Syntergosternite 8 brown, gray-brown pruinose, slightly shorter than tergite 5, with a membranous area apically (Fig. 19).

TERMINALIA (Figs 20–26). Epandrium and surstyli yellowish brown (Fig. 21). Surstyli (Figs 21–23) subsymmetrical, equal to epandrium length in dorsal view. Both surstyli thickened basally and medially, thin apically, with inner margins slightly straight, and outer margins curved in dorsal view; right surstylus thicker than left, with apex truncated; left surstylus with apex rounded (Fig. 21); right surstylus with apex truncated; left surstylus with apex slightly rounded in lateral view (Figs 22–23). Gonopods asymmetrical, right gonopod thicker than left in ventral view (Fig. 24). Apex of phallic guide stout, with apex hook-shaped, with stout and rigid lobe dorsally and translucent lobes lateroapically in lateral view (Fig. 25). Ejaculatory apodeme parasol-shaped (Fig. 26). Phallus trifid, thin, with ejaculatory ducts distinctly separated only in distal fifth (Fig. 25).

Female

Unknown.

Geographical distribution

Colombia (Boyacá) (Fig. 53).

Habitat

The specimen was collected in the Santuario de Fauna y Flora Iguaque reserve, where the vegetation is composed of cloud Andean forests of the cordillera of the Northeast region of Colombia.

Remarks

Based on males and due to the shape of surstyli, *D. gibber* sp. nov. (Fig. 21) is similar in appearance to *D. colombiensis* sp. nov. (Fig. 8). It differs from *D. colombiensis* sp. nov. by having the tergite 1

completely brown pruinose, with four black and long setae laterally; tergites 2–4 with distal margins yellowish brown pruinose, tergite 5 dark brown, brown pruinose dorsally, yellowish brown pruinose laterally (Figs 14–15, 19) (vs tergite 1–5 brown, brown pruinose, with distal margin gray pruinose dorsolaterally, interrupted medially, in *D. colombiensis* sp. nov.; Figs 1–2, 6); left surstylus with apex slightly rounded when seen in lateral view (Fig. 22) (vs left surstylus with apex sinuous when seen in lateral view; Fig. 9); apex of phallic guide with a translucent lobe lateroapically and a stout rigid lobe dorsally in lateral view (Fig. 25) (vs apex of phallic guide with upper margin slightly sinuous and a tuft of small setae centrally; Fig. 12); phallus with ejaculatory ducts distinctly separated only in distal fifth (Fig. 25) (vs phallus with ejaculatory ducts distinctly separated only in distal half; Fig. 12).

***Dasydorylas nigellus* (Rafael, 1991)**

Figs 27–39, 53

Eudorylas nigellus Rafael, 1991: 156, figs 12–16, 37.

Dasydorylas nigellus – Rafael & Ale-Rocha 2004: 12.

Diagnosis

Male

Postpedicel with acuminate apex. Vein M_1 straight. Fore and mid femora with conspicuous ventral ctenidia; hind femur without ventral ctenidia. Tergite 1 completely covered by brown pruinosity, with spot dark brown pruinose dorsocentrally and six black and long setae laterally; tergites 2–4 with posterior thin margins brown pruinose; tergite 5 with posterior wide margin gray-brown pruinose. Surstyli equal to epandrium length I dorsal view. Both surstyli thickened in basal half, thin in distal half, with apices outwards-directed; both surstyli with tips downward-directed and rounded apex when seen in lateral view. Apex of phallic guide stout, with margin slightly straight in lateral view. Ejaculatory apodeme funnel-shaped. Phallus trifold, thin, with ducts distinctly separated only in the apex.

Material examined

COLOMBIA – **Boyacá** • 1 ♂; “SFF [Santuario de Fauna y Flora] Iguaque, Cab. [Cabaña] Mamaramos; 06°26' N, 73°27' W; 2855 m[eters]; 13–30.Jul[VII].2000; P. Reina leg.”; IAvH M380 (photographed specimen).

Intraspecific variability

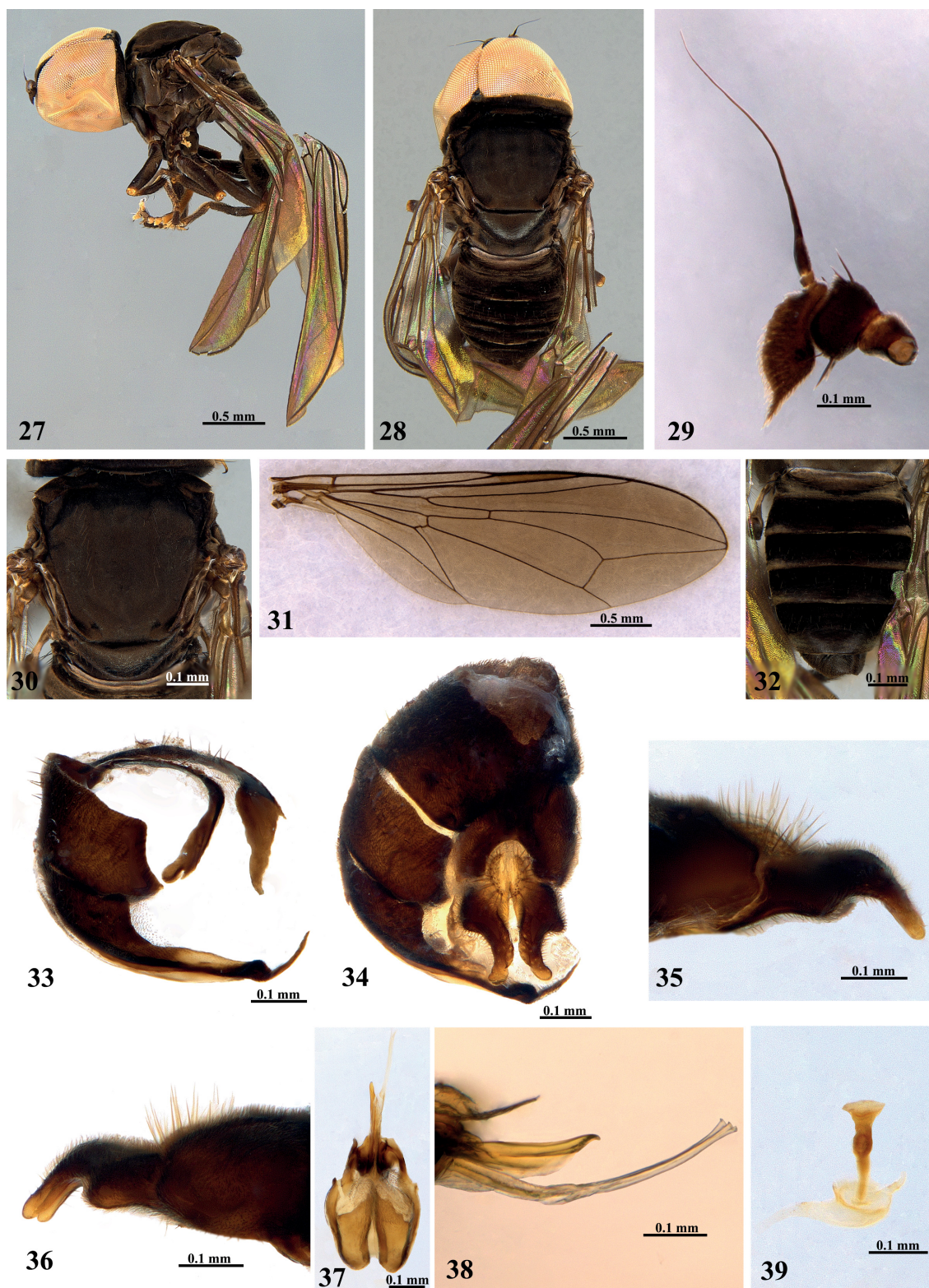
Male

Rafael (1991) provided a complete description and illustrations of the Brazilian holotype; however, we found variations in the Colombian specimens, therefore, we provide a comparison of the variations between the Colombian and Peruvian specimens (in parentheses, when applicable).

MEASUREMENTS. Wing length 5.9 mm.

HEAD (Figs 27–28). Eyes contiguous for 20 facets. F, EM, V (mm) = 0.3, 0.5, 0.1. Frontal triangle dark brown, gray-brown pruinose, with callus shiny dark brown (vs frontal triangle opaque black, with callus shiny black in the holotype). Occiput brown, gray-brown pruinose. Antenna (Fig. 29) brown, pedicel with two setae dorsally, three ventrally; postpedicel with acuminate apex (vs antenna black, pedicel with three setae dorsally and four setae ventrally; see Rafael 1991: fig. 12). LPP/WPP = 2.9.

THORAX (Figs 27–28, 30). Postpronotal lobe dark brown, brown pruinose, with four long setae along upper margin (vs postpronotal lobe opaque black). Scutum dark brown, gray-brown pruinose, with



Figs 27–39. *Dasydorylas nigellus* (Rafael, 1991), ♂ (IAvH–M380). 27. Habitus, left lateral view. 28. Habitus, dorsal view. 29. Antenna. 30. Thorax, dorsal view. 31. Wing. 32. Abdomen, dorsal view. 33. Tergites and sternites 6 and 7, ventral view. 34. Terminalia, dorsal view. 35. Left surstylus, lateral view. 36. Right surstylus, lateral view. 37. Hypandrium and gonopods, ventral view. 38. Phallic guide and phallus, left lateral view. 39. Ejaculatory apodeme.

dorsocentral setae conspicuous (vs scutum opaque black, brown pruinose). Notopleuron concolorous with scutum (vs notopleuron opaque black, brown pruinose). Scutellum concolorous with scutum (vs opaque black, brown pruinose). Mesopleuron and mediotergite brown, gray-brown pruinose (vs mesopleuron and mediotergite black, brown pruinose).

WING (Fig. 31). Length 5.9 mm. LW/MWW = 3.9; LTC/LFC = 1.9. Membrane brown infuscated, vein M_1 straight. Halter stem dark brown, except beige third medial, knob dark brown.

LEGS (Fig. 27). Coxae dark brown, gray-brown pruinose (vs coxae black); trochanters brown, brown pruinose (vs trochanters black); femora dark brown, gray-brown pruinose, except brown apices (vs femora black); tibiae dark brown, gray-brown pruinose, except basal quarter; tarsomeres 1–4 brown, 5 brown; pulvilli yellowish brown.

ABDOMEN (Figs 28, 32). Ground color velvety dark brown, with inconspicuous scattered setae; tergite 1 completely covered by brown pruinosity, with spot dark brown pruinose dorsocentrally (vs abdomen opaque black, gray pruinose) and six black and long setae laterally; tergites 2–4 with posterior thin margins brown pruinose; tergite 5 with posterior wide margin gray-brown pruinose; tergites and sternites 6 and 7 as in Fig. 33. Syntergosternite 8 dark brown, gray-brown pruinose, shorter than tergite 5, with a membranous area apically (Fig. 32) (vs Syntergosternite 8 acuminate, larger than tergite 5; see Rafael 1991: fig. 13).

TERMINALIA (Figs 33–39). Epandrium and surstyli dark brown (Fig. 34). Surstyli (Figs 34–36) subsymmetrical, equal to epandrium length, setose marginally. Both surstyli thickened in basal half, thin in distal half, with apices outwards-directed in dorsal view (Fig. 34); left surstylus slightly thinner than right (Fig. 34) (vs surstylus long; see Rafael 1991: fig. 15), both surstyli with tips downward-directed and rounded apex when seen in lateral view (Figs 35–36). Gonopods asymmetrical; right gonopod slightly thicker than left in ventral view (Fig. 37). Apex of phallic guide stout, with apex hook-shaped and upper margin slightly straight in lateral view (Fig. 37). Ejaculatory apodeme funnel-shaped (Fig. 39). Phallus trifid, thin, with ducts distinctly separated only in distal quarter (Figs 37–38).

Female

Unknown.

Geographical distribution

Colombia (Boyacá) (new record), Peru (Huánuco) (Fig. 53).

Habitat

The specimen was collected in the Santuario de Fauna y Flora Iguaque reserve, where the vegetation is composed of cloud Andean forests of the cordillera of the Northeast region of Colombia.

Dasydorylas santainesensis sp. nov.

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Figs 40–52, 53

Diagnosis

Postpedicel with aristiform apex. Tergite 1 brown pruinose dorsally, yellowish brown pruinose laterally. Tergites 2–4 with distal margins yellowish brown pruinose. Tergite 5 with distal third gray-brown pruinose. Surstyli subsymmetrical, slightly longer than epandrium in dorsal view. Both surstyli more thickened medially than basally and apically, with inner and outer margins sinuous and apices slightly rounded and inward-directed; both surstyli with apices slightly rounded when seen in lateral view. Apex of phallic

guide with an upper margin with a tuft of small setae basally, and translucent lobes lateroapically in lateral view. Phallus trifold, with ejaculatory ducts distinctly separated only in distal seventh.

Etymology

The species name refers to the type locality, Paramo of Santa Inés, Belmira, Colombia.

Type material

Holotype

COLOMBIA – **Antioquia** • ♂; “Belmira, Páramo de Sta[Santa] Inés, El Morro; 06°38'03" N, 75°38'28" W; 3100–3300 m[eters]; Red entomológica; 21–30.Junio[VI].2017; Proy.[Proyecto] moscas de las flores; A.L. Montoya, C. Rodríguez, J.P. Carmona leg.”; CEUA–101599 (photographed specimen). Holotype with left wing mounted on microslide with Canada balsam. Left antenna and terminalia placed in a microvial with glycerine, both pinned along with the specimen.

Paratypes

COLOMBIA – **Antioquia** • 1 ♂; “Belmira, Páramo de Sta[Santa] Inés, El Morro; 06°39'28" N, 75°40'17" W; T.[Trampa] Malaise suelo; 4–14.Dic[XII].2016”; CEUA–101564 (dissected). – **Boyacá** • 2 ♂♂; “SFF[Santuario de Fauna y Flora] Iguaque; 05°25'12" N, 73°27'24" W; 2855 m[eters]; Malaise 4; 01–19.IV.2000; P. Reina leg.”; IAvH (1 ♂ dissected).

Description

Male (holotype)

MEASUREMENTS. Body length 4.2 mm, Wing length 6.7 mm.

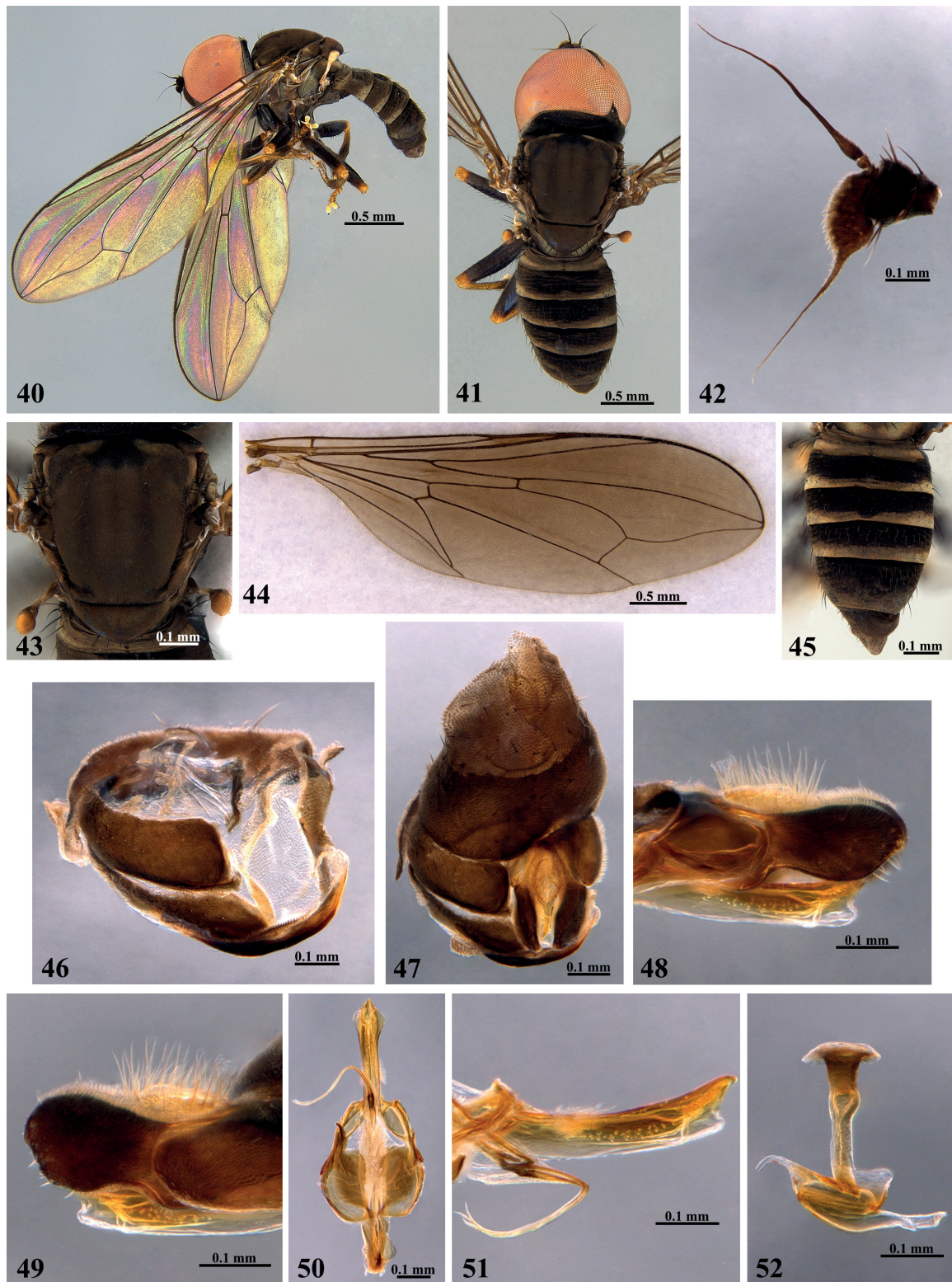
HEAD (Figs 40–41). Eyes contiguous for 19 facets. F, EM, V (mm) = 0.5, 0.4, 0.1. Frontal triangle dark brown, brown pruinose, with callus shiny dark brown. Occiput dark brown, gray pruinose ventrally and laterally, brown pruinose dorsally. Antenna (Fig. 42) dark brown; scape with one seta dorsally, pedicel with four setae dorsally and three ventrally; postpedicel with aristiform apex. LPP/WPP = 5.

THORAX (Figs 41, 43). Postpronotal lobe brown, brown pruinose, with four long setae along upper margin. Scutum, ground color brown, brown pruinose, with one spot black anteriorly; dorsocentral setae conspicuous. Notopleuron brown, gray-brown pruinose. Scutellum concolorous with scutum, with eight long, stout and black setae in the posterior margin. Mesopleuron and mediotergite concolorous with notopleuron.

WING (Fig. 44). LW/MWW = 5.6; LTC/LFC = 1. Membrane brown infusate, vein M_1 slightly curved upward. Halter beige ventrally, brown dorsally.

LEGS (Figs 40–41). Coxae dark brown, gray-brown pruinose; fore and mid trochanters brown, gray-brown pruinose, except brownish yellow anterolaterally, hind trochanters completely dark brown; femora dark brown, gray-brown pruinose, except brownish yellow apices, femora with conspicuous ctenidia and a row of long setae posterolaterally; tibiae dark brown, with bases and apices brownish yellow; tarsomeres 1–5 yellowish brown; pulvilli brownish yellow.

ABDOMEN (Figs 40–41, 45). Ground color velvety dark brown, with conspicuous scattered setae; tergite 1 brown pruinose dorsally, yellowish brown pruinose laterally, with five black and long setae laterally; tergites 2–4 with distal margins yellowish brown pruinose; tergite 5 with distal third gray-brown pruinose; tergites and sternites 6 and 7 as in Fig. 46. Syntergosternite 8 brown, gray-brown pruinose, slightly shorter than tergite 5, with a membranous area apically (Fig. 45).



Figs 40–52. *Dasydorylas santainesensis* sp. nov., ♂, holotype (CEUA–M101599). **40.** Habitus, left lateral view. **41.** Habitus, dorsal view. **42.** Antenna. **43.** Thorax, dorsal view. **44.** Wing. **45.** Abdomen, dorsal view. **46.** Tergites and sternites 6 and 7, ventral view. **47.** Terminalia, dorsal view. **48.** Left surstylus, lateral view. **49.** Right surstylus, lateral view. **50.** Hypandrium and gonopods, ventral view. **51.** Phallic guide and phallus, left lateral view. **52.** Ejaculatory apodeme.

TERMINALIA (Figs 46–52). Epandrium and surstyli dark brown (Fig. 47). Surstyli (Figs 47–49) subsymmetrical, and slightly longer than epandrium. Both surstyli more thickened medially than basally and apically, with inner and outer margins sinuous and apices slightly rounded and inward-directed; right surstylus slightly shorter and thicker than left in dorsal view (Fig. 47); both surstyli with apices slightly rounded when seen in lateral view (Figs 48–49). Gonopods subsymmetrical, right gonopod slightly thicker than left I ventral view (Fig. 50). Apex of phallic guide stout, with apex hook-shaped, upper margin slightly curved upward, with a tuft of small setae basally, and a translucent lobe lateroapically in lateral view (Fig. 51). Ejaculatory apodeme parasol-shaped (Fig. 52). Phallus trifid, thin, with ducts distinctly separated only in distal seventh (Fig. 51).

Female

Unknown.

Geographical distribution

Colombia (Antioquia, Boyacá) (Fig. 53).

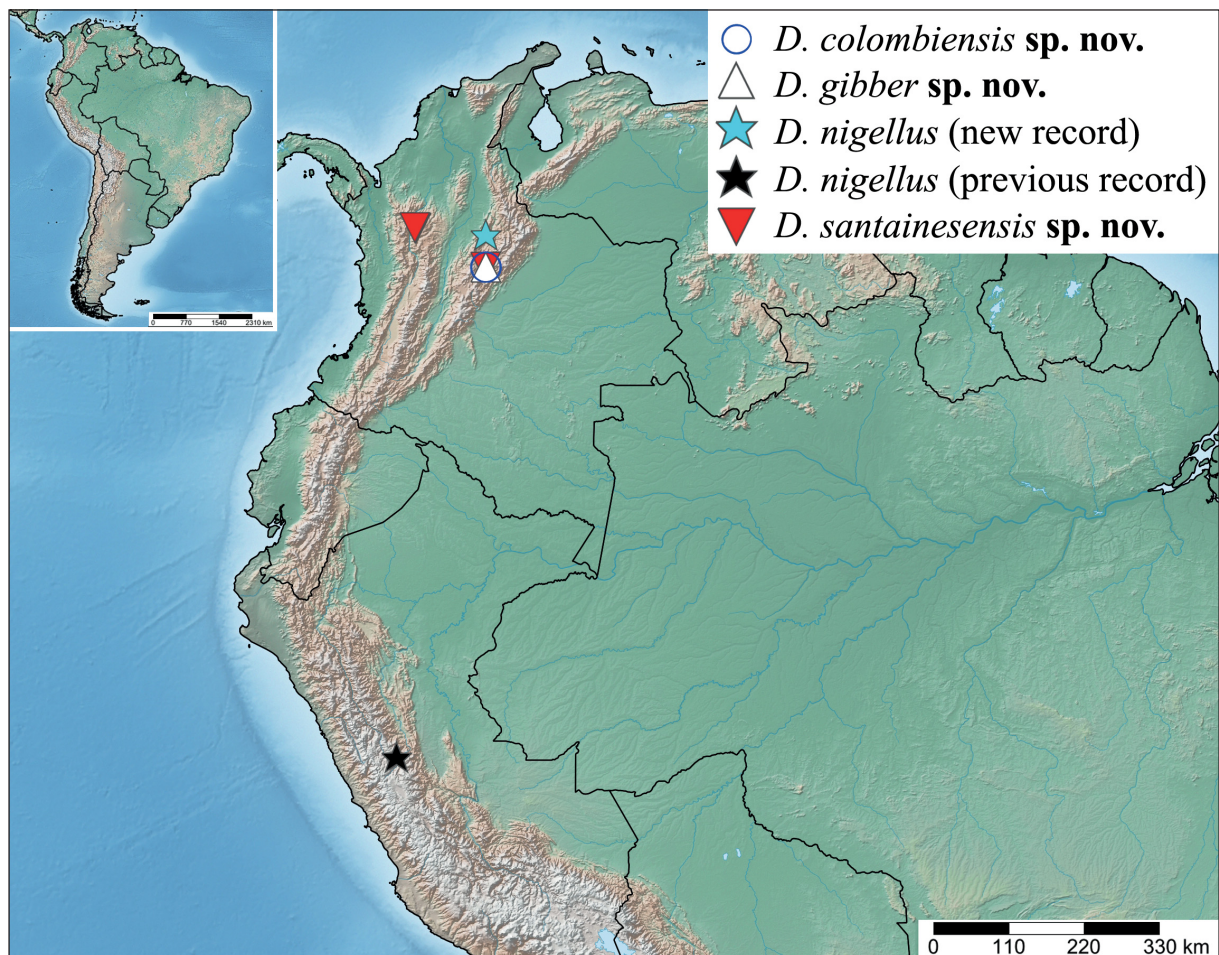


Fig. 53. Geographical records of species of *Dasydorylas* Skevington, 2001 in Colombia. *Dasydorylas colombiensis* sp. nov., *D. gibber* sp. nov., *D. nigellus* (Rafael, 1991) and *D. santainesensis* sp. nov.

Habitat

The specimens were collected in the Páramo Santa Inés, with areas of very humid premontane forest of the Oriental and Central cordillera of Northwest Colombia and Santuario de Fauna y Flora Iguaque reserve, where the vegetation is composed of cloud Andean forests of the cordillera of Northeast Colombia.

Remarks

Based on males and due to the shape of the phallus, *D. santainesensis* sp. nov. (Fig. 51) is similar in appearance to *D. gibber* sp. nov. (Fig. 25) but differs from the latter in having both surstyli more thickened medially than basally and apically, with inner and outer margins sinuous, apices slightly rounded inward-directed; right surstylus slightly shorter and thicker than left in dorsal view (Fig. 47) (vs both surstyli thickened basally and medially, thin apically with inner margins slightly straight, outer margins curved; right surstylus thicker than left, with apex truncated; left surstylus with apex rounded in *D. gibber* sp. nov. in dorsal view; Fig. 21); gonopods subsymmetrical (Fig. 50) (vs gonopods asymmetrical; Fig. 24); upper margin of apex of phallic guide with a tuft of small setae basally in lateral view (Fig. 51) (vs apex of phallic with a stout and rigid lobe dorsally in lateral view; Fig. 25).

Unidentified females of *Dasydorylas*

Twenty-four females of *Dasydorylas*, subdivided into nine morphospecies could not be associated with males. Future DNA-sequencing of these specimens likely will help with this association.

Material examined

COLOMBIA – **Boyacá** • 3 ♀♀; “SFF[Santuario de Fauna y Flora] Iguaque, Cab.[Cabaña] Mamaramos; 05°25' N, 73°27' W; 2855 m[eters]; 13.Nov[XI]–04.Dic[XII].2000; P. Reina leg.”; IAvH M1064 • 2 ♀♀; idem; “13–30.Jul[VII].2000”; IAvH M380 • 1 ♀; idem; “23.Sep.[IX]–11.Oct[x].2000”; IAvH • 3 ♀♀; idem; “1–17.Aug.[VIII].2000”; IAvH • 3 ♀♀; idem; “Cabaña Carrizal; 1–23.Sep.[IX].2000”; IAvH M614 • 1 ♀; idem; “Malaise 4; 1–19.IV.2000”; IAvH M614 • 1 ♀; idem; “El Nispero; 05°38' N, 73°31' W; 2730 m[eters]; 3–18.II.2002”; IAvH M3068 • 1 ♀; idem; “Qda.[Quabrada] Los Francos; 05°25' N, 73°27' W; 2850 m[eters]; 7–24.Feb[II].2001”; IAvH M1270 • 3 ♀♀; idem; “Cab.[Cabaña] Mamaramos; 05°25'12" N, 73°27'24" W; 2855 m[eters]; 17.VIII–01.IX.2000”; IAvH • 4 ♀♀; idem; “Malaise 4; 25.Jun[VI]–13.Jul[VII].2000”; IAvH • 1 ♀; idem; “01–19.IV.2000”; IAvH. – **Cundinamarca** • 1 ♀; “PNN[Parque Nacional Natural] Chingaza, Sendero Suasie; 04°31' N, 73°45' W; 3100 m[eters], 08–22. Dic[XII].2000; E. Niño leg.”; IAvH M1032.

Key to males of the Neotropical species of *Dasydorylas*

1. Postpedicel with acuminate apex (Fig. 29); vein M_1 slightly straight or clearly straight (Fig. 31) 2
 - Postpedicel with aristiform apex (Figs 3, 16, 42); vein M_1 slightly to clearly upward curved (Figs 5, 18, 44) 7
2. Phallus bifid [fig. 36 in Rafael & Ale-Rocha (2004)] *D. vulcanus* Rafael, 2004
 - Phallus trifid [Figs 12, 25, 51] 3
3. Both surstyli with bases slightly thicker than apices [fig. 25 in Rafael (1991)]; third costal section subequal in length to fourth [fig. 39 in Rafael (1991)] *D. regalis* (Rafael, 1991)
 - Both surstyli with bases clearly thicker than apices (Fig. 34); third costal section slightly longer than fourth (Fig. 31) 4
4. Left surstylus left-directed and right surstylus directed clearly downwards, when seen in frontal view [fig. 35c in Hardy (1943)] *D. cinctus* (Banks, 1915)
 - Both surstyli slightly sideways-directed [fig. 100 in Rafael (1995)] or clearly sideways-directed (Fig. 34) 5

5. Phallic guide with a tuft of small setae dorsally [fig. 101 in Rafael (1995)]; junction of ventral and frontal margin forming an angle of about 110° [fig. 101 in Rafael (1995)]; phallus trifid, with ejaculatory ducts not distinctly separated [fig. 101 in Rafael (1995)] *D. nigripedes* (Hardy, 1954)
 - Phallic guide without tuft of setae dorsally (Fig. 38); junction of ventral and frontal margin of phallic guide curved, not forming an angle (Fig. 38); phallus trifid, with ejaculatory ducts distinctly separated only in distal seventh (Fig. 38) 6
6. Both surstyli thickened basally and medially, thin apically, with outer margins sinuous not forming an angle [fig. 54 in Rafael (1995)]; phallic guide with dorsal margin curved upward in distal half [fig. 54 in Rafael (1995)] *D. eremita* (Hardy, 1954)
 - Both surstyli with basal half thickened and distal half thin, with outer margin forming an angle (Fig. 34); phallic guide straight, slightly curved upward only in distal third (Fig. 38) *D. nigellus* (Rafael, 1991)
7. Both surstyli more thickened medially than basally and apically, with inner margins sinuous (Fig. 47); phallic guide with upper margin straight and a tuft of small setae basally (Fig. 51) *D. santainesensis* sp. nov.
 - Both surstyli thickened basally and medially, thin apically, with inner margins straight and outer margins curved (Figs 8, 21); phallic guide with upper margin sinuous and a tuft of small setae centrally (Fig. 12) or with stout and rigid lobe dorsally (Fig. 25) 8
8. Both surstyli with acute apex (Fig 8); phallic guide with upper margins sinuous and a tuft of small setae centrally (Fig. 12); phallus trifid with ejaculatory ducts distinctly separated only in distal quarter *D. colombiensis* sp. nov.
 - Left surstylus with rounded apex, right surstylus with truncated apex (Fig. 21); phallic guide with a stout and rigid lobe dorsally (Fig. 25); phallus trifid with ejaculatory ducts distinctly separated only in distal ninths *D. gibber* sp. nov.

Discussion

This paper is the first to treat the fauna of *Dasydorylas* from Colombia. Four *Dasydorylas* species are listed, including three new species described herein, thus increasing the number of Neotropical species from seven to ten, which is 30% of the Neotropical *Dasydorylas*. However, four of the ten species occur in Colombia, indicating that the country has the highest diversity of the genus in the region.

Incorrect and incomplete drawings and illustrations can make the precise identification of *Dasydorylas* species difficult. We provide a new key to the Neotropical species of *Dasydorylas*, including high-quality photographs that will facilitate identification by showing the key traits, and provide comparative discussions of diagnostic characters for their differentiation.

The distribution of *Dasydorylas* in Colombia is restricted to the highlands and Páramos of the Andean region between 2885 and 3300 meters above sea level. However, in the same region, 25 females corresponding to nine morphotypes have also been collected, which may indicate that males alone give an incorrect picture of the true species diversity. Thus, the diversity of the *Dasydorylas* species in other areas of the country, such as the Colombian Amazon region, may turn to be higher, and their distribution pattern may change when females are included.

It is important to highlight that the four species listed in the present study occur in the SFF Iguaque. This indicates that this place harbors a high species richness, and that the species are possibly endemic to the region and the country, which urgently calls for developing and prioritizing conservation and management plans by the country's governmental entities of Santuario de Fauna y Flora Iguaque as a flagship/hotspot of the species diversity, in agreement with what has been reported by Ramos-Pastrana *et al.* (2022b, 2022c).

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