

R E S E A R C H P A P E R

Description of two new species of *Lycopale* (Diptera: Syrphidae) from the northwestern Tropical Andes hotspot, with the redescription of *Lycopale magnifica*

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Abstract. *Lycopale* Hull, 1944 is a small Neotropical flower fly genus (Syrphidae: Eristalinae: Eristalini: Helophilina) with six described species. Recent surveys in the Colombian and Ecuadorian Andean Forest and Paramo ecosystems revealed the discovery of two species new to science: *Lycopale mendozai* sp. nov. and *Lycopale radioheadi* sp. nov. Simultaneously, the species *Lycopale magnifica* (Bigot, 1880) was rediscovered and is redescribed here, nearly a century after its original description, including photographs of its habitus and illustrations of the male genitalia. A new key is proposed, including illustrations of thoracic and abdominal patterns of all known species to distinguish them from the new taxa. Distributional patterns are illustrated and discussed. Mitochondrial cytochrome *c* oxidase subunit I (COI) sequences are provided for the three species, *L. magnifica*, *L. mendozai* sp. nov., and *L. radioheadi* sp. nov. The discovery of these two new species suggests that the Tropical Andes diversity of flower flies is still underestimated and many more unnamed species remain to be discovered and described from this biodiversity hotspot.

Resumen. *Lycopale* Hull, 1944 es un pequeño género neotropical de moscas de las flores (Syrphidae: Eristalinae: Eristalini: Helophilina) con seis especies descritas. Estudios recientes en los ecosistemas de Bosque Alto Andino y Páramo de Colombia y Ecuador revelaron el descubrimiento de dos nuevas especies: *Lycopale mendozai* sp. nov. y *Lycopale radioheadi* sp. nov. Simultáneamente, la especie *Lycopale magnifica* (Bigot, 1880) fue redescubierta y es redescrita aquí, casi un siglo después de su descripción original, incluyendo fotografías del hábito e ilustraciones de la genitalia masculina. Se propone una nueva clave, que incluye ilustraciones de los patrones de manchas torácicas y abdominales de las especies previamente conocidas para diferenciarlas de los nuevos taxones. Se ilustran y analizan los patrones de distribución. Se proporcionan secuencias del gen mitocondrial citocromo *c* oxidasa subunidad I (COI) para las tres especies, *L. magnifica*, *L. mendozai* sp. nov. y *L. radioheadi* sp. nov. El descubrimiento de las dos nuevas especies sugiere que la diversidad de moscas de las flores de los Andes tropicales aún está subestimada y quedan muchas especies sin nombre por descubrir y describir a partir de estos puntos calientes de biodiversidad.

Key words. Diptera, Syrphidae, Eristalinae, Eristalini, Helophilina, cloud forests, description, distribution patterns, high lands, Paramo endemic, taxonomy, Colombia, Ecuador, Neotropical Region

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Introduction

Syrphidae, also known as flower flies or hover flies, is a family of Diptera that occurs in all biogeographic regions except for Antarctica, truly arid areas, and remote oceanic islands (THOMPSON et al. 2010, PAPE & EVENHUIS 2018).

The greatest species richness occurs in the Neotropical Region, with 1560 described species (76.8% endemic), and more than half of this number is estimated to be discovered and described (THOMPSON et al. 2010, MIRANDA et al. 2020). The Colombian and Ecuadorian fauna is



composed of 413 and 201 flower fly species, respectively, with the highest diversity and endemism concentrated in the highlands of the Andes (MONTROYA 2006; MONTROYA & WOLFF 2021, 2023; MONTROYA et al. 2012, 2017, 2021; MARÍN-ARMIJOS et al. 2017).

The flower flies of the subtribe Helophilina (subfamily Eristalinae, tribe Eristalini) comprise 135 species worldwide classified into 14 genera, with more than 90 Neotropical species belonging to seven genera: *Dolichogyna* Macquart, 1842, *Habromyia* Williston, 1888, *Lejops* Rondani, 1857, *Lycopale* Hull, 1944, *Mallota* Meigen, 1822, *Ohmyia* Thompson, 1999, and *Quichuana* Knab, 1813 (THOMPSON 1999, 2000, 2012; MORAN et al. 2021).

Lycopale is currently a small Neotropical genus that includes bee-like mimics, distinctive from all other genera by the following combination of characters: 1) more brightly colored flies; 2) eye bare, sometimes pilose; 3) male eyes narrowly dichoptic to holoptic; 4) thorax and frequently abdomen pilose, with distinctive pruinose patterns, bright pale maculae and/or yellow tomentose pile usually short, sparse and scattered; 5) wing with or without dark anterior margin; 6) metafemur slightly swollen; 7) abdomen oval to slender, black gray to partly reddish, purple to yellow in background color or with pairs of white-yellowish pruinose arcuate maculae or both, with tomentose pile (THOMPSON et al. 2010, THOMPSON 2012). The genus is apparently rare in collections, with most species only known from a few specimens forming the type series. According to THOMPSON et al. (2010), larvae of *Lycopale* are saprophagous, breeding on wet decaying wood and in tree holes with decomposing organic matter, thus contributing to the soil formation and fertilization in mature forests.

Charles CURRAN (1934) provided the first key to *Lycopale*; however, it was incomplete. *Lycopale* was treated within *Habromyia*, recognized as a broad concept, by THOMPSON (1972, 1999) and THOMPSON et al. (1976). In his PhD study on the Neotropical genera of Milesinae (now Eristalinae), THOMPSON (1972) redescribed and keyed *Habromyia* together with the other eristalines. In this contribution, *Edwardsiella* Hull, 1941, *Criorthrix* Hull, 1949, and *Lycopale* were placed under *Habromyia*. His concept of *Habromyia* included species with bare eyes; ocellar triangle of normal size, small; front not very broad; frontoantennal region usually greatly produced forward, subconical to conical; wing dark on anterior margin; thorax with a scattered, not dense pile, usually with distinct pruinose stripes and bands (THOMPSON 1972: 97, fig. 21, 133, key). Despite the fact that the male genitalia of *Lycopale chrysotaenia* (Fluke, 1937) (as *Habromyia chrysotaenia*) were illustrated, the genus was not morphologically discussed or compared with related genera (THOMPSON 1972: 135, fig. 51). Consequently, based on Hull's original description (HULL 1944), THOMPSON et al. (1976: 100–101) placed *Lycopale* under *Habromyia*.

In a recent contribution, THOMPSON (2000) keyed and summarized the characters to recognize all Helophilina genera, proposing a potentially close relationship between his new genus *Austrophilus* and *Habromyia*, including a morphological discussion. Consequently, THOMPSON et

al. (2010) included *Lycopale* and *Habromyia* separately in the identification key of Central American syrphids but did not mention the revalidation of their status. Later, THOMPSON (2012) proposed to split *Habromyia sensu* THOMPSON (1972, 1999) and THOMPSON et al. (1976) into three genera: *Lejops*, *Habromyia*, and *Lycopale*, considering them morphologically and phylogenetically related. In the same publication, THOMPSON (2012) described an additional new species, *Lycopale woodi* Thompson, 2012, from middle and high elevations of Mexico and Guatemala, including a new key to the six recognized *Lycopale* species, including three manuscript species names (THOMPSON in press). Among the current species of this genus, *Lycopale rectilinea* (Hull, 1942) is exclusively distributed in low and middle elevations in Bolivia and Peru, respectively. In contrast, *Lycopale lipoflava* (Fluke, 1937) is only known from mountainous areas in Peru and Chile. *Lycopale chrysotaenia* is apparently endemic to the southeastern lowlands in Brazil. For its part, *L. lizeri* (Brèthes, 1914) is confined to middle elevations in southeastern Argentina. *Lycopale magnifica* (Bigot, 1880) was described from Colombia, but no specific type locality was provided. In 2016, the species was rediscovered and recorded based on a unique male specimen collected in the Eastern Mountain range in Colombia (MONTROYA 2016). While conducting a survey at the Tatamá National Park (located in the Western Mountain range in Colombia), three female specimens were collected, expanding its distribution, and providing material to redescribe it. In addition, when conducting intensive field surveys in high Andean pristine forest and Paramo ecosystems (Figs 1 and 11), two new species were discovered. The new species are described here, including a full redescription of *Lycopale magnifica*, with images of male and female for the first time. In order to distinguish the new taxa from the other recognized *Lycopale* species, a new identification key is proposed, including illustrations of thoracic and abdominal patterns. The discovery of these two new species represents the second and third endemic species of *Lycopale* from the Tropical Andes, suggesting that the region's diversity is still underestimated, and many more unnamed species remain to be described from this biodiversity hotspot.

Material and methods

Collecting sites. Specimens of the new species were collected using hand netting and Malaise trap in the Paramo Santa Inés Belmira, Sonsón and Las Baldías, located in the northwestern part of the Department of Antioquia in Colombia (for a complete definition of the sampling localities see MONTROYA et al. 2021: figs 1 and 11).

Terminology and examined specimens. For the morphological descriptions and diagnoses, the terminology mainly follows CUMMING & WOOD (2017). The type series of the new species is comprised of dry pinned specimens deposited in CEUA and INABIO.

The studied species of *Lycopale* are deposited in the institutions listed below with their respective acronyms following the standard of the Systema Dipterorum (PAPE & EVENHUIS 2018):

AMNH	American Museum of Natural History, Entomology, New York, USA;	-las-Casas de El Colegio de la Frontera Sur, Chiapas, México;	
BMNH	The Natural History Museum (formerly the British Museum (Natural History) Entomology), London, United Kingdom;	INABIO	Instituto Nacional de Biodiversidad, Quito, Ecuador;
CEUA	Colección Entomológica Universidad de Antioquia, Medellín, Antioquia, Colombia;	MACN	Museo Argentino de Ciencias Naturales Bernardino Rivadavia, División Entomología, Buenos Aires, Argentina;
CEUN	Colección Entomológica de la Universidad de Nariño, Pasto, Nariño, Colombia;	NMW	Naturhistorisches Museum Wien, Vienna, Austria;
CNC	Canadian National Collection of Insects, Arachnids and Nematodes, Agriculture and Agri-Food Canada, Ottawa, Canada;	OUMNH	Hope Entomological Collection in the Oxford University Museum of Natural History, Oxford, United Kingdom;
CUI	Cornell University, Cornell University Insect Collection, Department of Entomology, Ithaca, New York, USA;	UNAM	Universidad Nacional Autónoma de México, Colección Entomológica, Instituto de Biología, México, Distrito Federal, Mexico;
ECO-TAP-E	Colección Entomológica de la Unidad San-Cristóbal-de-	USNM	National Museum of Natural History (formerly United States National Museum) Smithsonian Institution, Washington, D.C., USA.



Fig. 1A–G. The type locality of *Lycopale radioheadi* sp. nov. in Paramo (above) and pristine Andean forests (middle) in Antioquia, Colombia. C – Sky Islands. H – type material of *Lycopale mendozai* sp. nov. was collected inside a forest flying around the Native Bromeliad, *Guzmania coriostachya* (Griseb.) Mez (Bromeliaceae) (below). I – habitat of *Lycopale magnifica* (Bigot, 1880) in the Western Mountain range in Colombia.

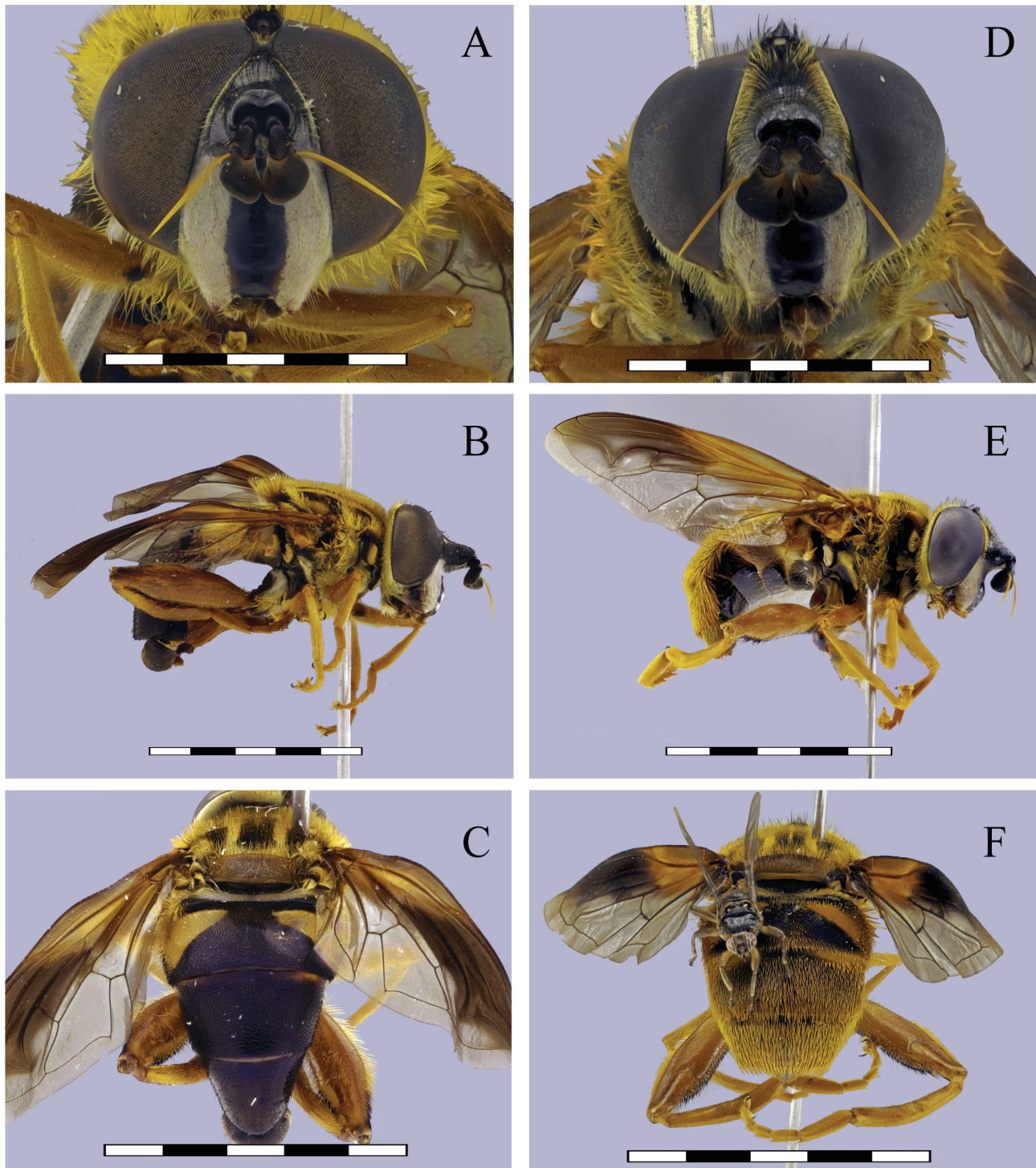


Fig. 2. *Lycopale magnifica* (Bigot, 1880). A–C – male (CEUA 69689): A – head, frontal view; B – lateral view; C – abdomen posterodorsal view. D–F – female (CEUA 92871): D – head, frontal view; E – lateral view; F – abdomen posterodorsal view, carrying a specimen of *Ornithoica vicina* (Walker, 1849) (Hippoboscidae). Scale bars: 5 mm.

Photographs of the type material of *Plagiocera magnifica* Bigot, 1880 were provided by the depository institution (OUMNH) and published here with its permission.

Observation imaging and measurement. To illustrate the morphological characteristics of the herein-described species, habitus photographs were created from a series of high-resolution pictures captured using a Canon EOS Rebel SL1 camera equipped with a MP-E 65 mm f/2.8 1–5x macro lens. Final images were stacked and processed using the Helicon Focus Pro (version 6.7.1) software® (Helicon

Soft, Ltd.). The scale bar was added in Adobe Photoshop CC according to the camera focal aperture used when the photo was taken. Editing was conducted in Photoshop, and the final image plates were prepared in Illustrator CC.

For morphological descriptions, adult body length was measured from the tip of the frontal prominence to the posterior end of the abdomen; wing length was measured from the wing insertion to the wing apex. All measurements were taken using an ocular micrometer and are given in millimeters (mm).

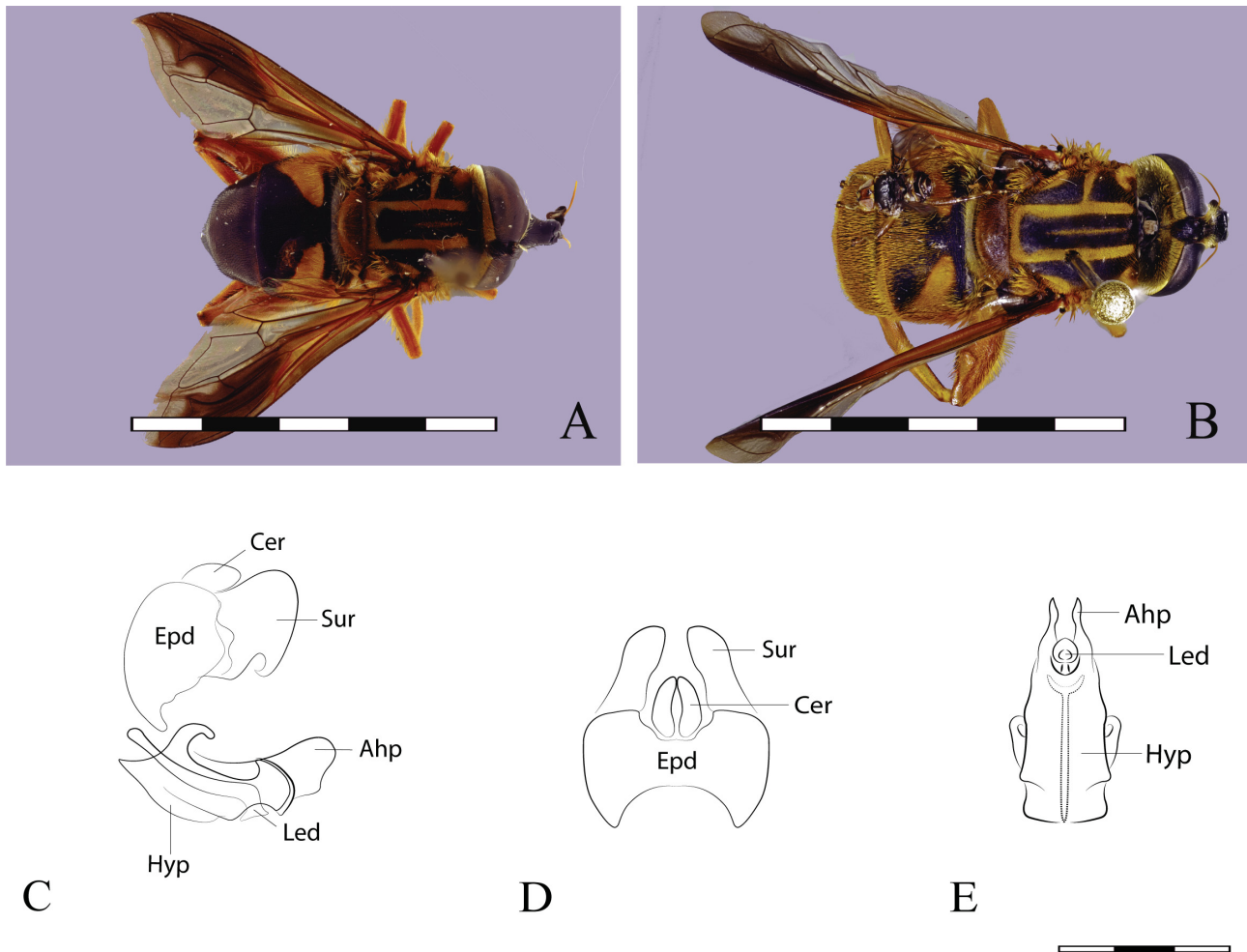


Fig. 3. *Lycopale magnifica* (Bigot, 1880). A – male, dorsal view; B – female, dorsal view. C–D – male genitalia, C – whole genitalia, lateral view; D – epandrium, dorsal view; E – hypandrium, ventral view. Scale bars: A–B – 5 mm, C–E – 1 mm.

Dissections of genitalia. For the study of the male genitalia, the structure was cleared in 10% KOH solution at 37°C for 10 to 15 minutes. The genitalia were rinsed in distilled water and the KOH neutralized with acetic acid and 70% ethanol. The dissected pieces were photographed in glycerin using an excavated slide and drawings prepared by tracing and vectorizing in Adobe Illustrator CC. All dissected parts of genitalia were stored in plastic microvials containing glycerin, pinned along with the respective specimen.

Label data and distribution maps. Distributional maps were produced using SimpleMapp (SHORTHOUSE 2010) (Figs 10–11). Ecoregion distribution follows DINERSTEIN et al. (2017).

Locality and identification labels of the type material are enclosed within double quotation marks (“ ”), and line breaks of the labels are separated by a forward slash (/).

Valid names were taken from the Nomenclator of the BioSystematic Database of World Diptera and Systema Dipterorum (EVENHUIS & PAPE 2024).

Molecular marker. Mitochondrial cytochrome *c* oxidase subunit I (COI) sequences were generated following the protocol proposed by MENGUAL et al. (2022) at the Museum Koenig Bonn, Leibniz-Institut zur Analyse des Biodiversitätswandels (Bonn, Germany). The new COI

sequences were then submitted to the online public dataset GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>). DNA voucher specimens are deposited as indicated in Table 2.

Results and systematics

Genus *Lycopale* Hull, 1944

Lycopale Hull, 1944: 129. Type species: *Meromacrus vittata* Hull (original designation) = *Helophilus lizeri* (Brèthes) (<https://www.gbif.org/occurrence/3357316408>).

Lycopale: CURRAN (1934) (first key to *Lycopale*, incomplete); THOMPSON (1972): 136–137 (Milesinae revision); THOMPSON (1975): 292 (status notes); THOMPSON et al. (1976): 100 (catalog citation); THOMPSON (1999): 329 (key to spp. and notes); 340 (key to spp. and notes); THOMPSON (2000): 376 (key); THOMPSON (2012): 1–16 (description and notes).

Lycopale magnifica (Bigot, 1880)

(Figures 2–4, 9a, 10–11)

Plagiocera magnifica Bigot, 1880: 85. Type locality: Colombia. Holotype: male (OUMNH) (Figure 4).

Plagiocera magnifica: HULL (1949): 390, fig. 24h (head); THOMPSON et al. (1976): 101 (catalog); THOMPSON (1999): 329 (key); MONTOYA (2016): 491 (catalog distribution record)

Habromyia (*Plagiocera*) *magnifica*: THOMPSON (1976: 101)

Habromyia magnifica: MONTOYA (2016: 491)

Material examined. COLOMBIA: Risaralda, Pueblo Rico, Tatamá National Park, Vereda Montebello, Cañón del Río Taiba, 5.21245, -76.092473,

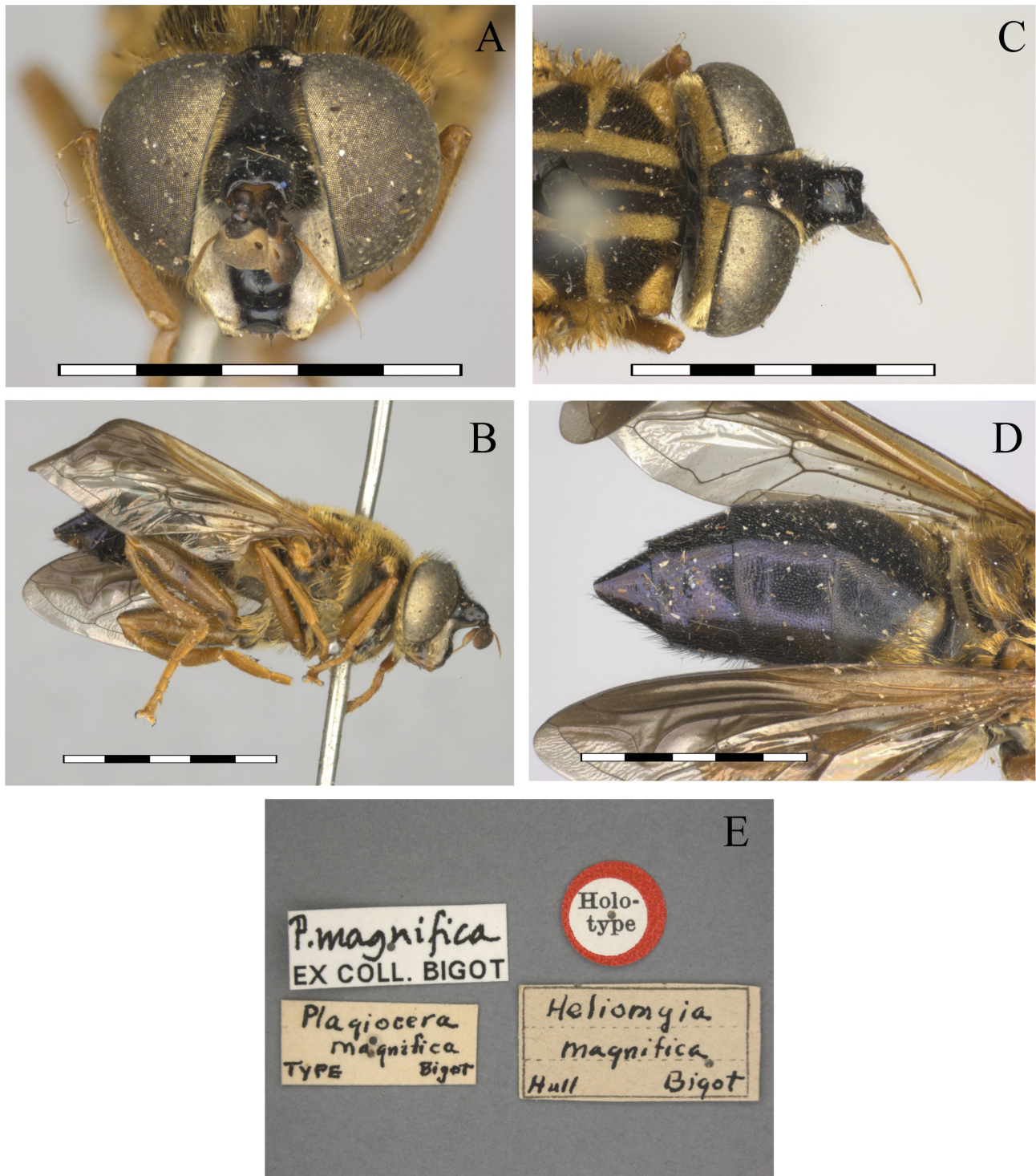


Fig. 4. *Lycopale magnifica* (Bigot, 1880), male, holotype (OUMNH): A – head, frontal view; C – lateral view; D – abdomen dorsal view; E – label.

1690–1900 meters above the sea level [m a.s.l.], Bosque, 13–20.ix.2014, leg. C. Bota-Sierra, Red Entomológica (3 ♀♀, CEUA 92869, ZFMK-DNA-FD19584777, GenBank PP979580, CEUA 92870, 92871); Santander, Carmen de Chucurí, La Bodega, 6.660277, -73.384553, 2300–2400 m, 16.viii.2001, leg. P. Duque & A. Vélez, Van Someren-Rydon trap baited by fish (1 ♂, CEUA 69689); Nariño, Pialapi, 1.053441, -77.863838, 2881 m, 21–25.iii.1996, Leg. G. Castillo (1 ♀, CEUN 14750).

Length. Body 13.2 mm; wing 10.8 mm.

Diagnosis. *Lycopale magnifica* is similar in appearance to *Lycopale rectilinea* but can be easily distinguished from it by the facial vitta black (Figs 2a, b, d, e and 4a,

b); antenna extensively black (Figs 2a, b, d, e and 4a, b); postpedicel trapezoid; scutum with a small median vitta before the transverse suture (Figs 3a, b and 4c); scutellum orange (Figs 3a, b, 9a); abdomen shiny purplish black in the background of the second tergum, with a triangular macula perpendicular to the lateral edge (Figs 2c, f, 3a, b). **Redescription. Male.** **Head** (Figs 2a–b, 3a, 4a–c). Face yellow with broad black medial vitta reaching frontal prominence, white pilose and pruinose laterally, shiny and bare on medial vitta; gena orange-brown, shiny and bare

anteriorly, white pilose and pruinose posteriorly; frontal triangle black, shiny except for very narrow grayish white pruinose vitta along eye margin, black and yellow pilose; vertical triangle black, black pilose; eyes bare, narrowly dichoptic, separated from eye margin by at least ocellus width; occiput white pruinose and pilose, except for a few black piles dorsally. Antenna: dark brown except for reddish orange basoventral 1/3 of postpedicel; postpedicel trapezoid; arista light yellow and pubescent.

Thorax (Figs 2b–c, 3a, 4a–c, 9a). Dull black; postpronotum yellowish pruinose and pilose; scutum with two submedial yellow pruinose vittae throughout entire scutum length, in addition to one median vitta reaching the 3/4 of the scutum length; transversal suture yellowish pruinose and pilose; pre-scutellum vitta yellowish pruinose, rectangular-like and confluent with two submedial longitudinal vittae; postalar callus with yellow sublateral pruinose vitta on wing base, yellow pilose; pleuron brown, whitish grey pruinose, orange pilose; scutellum orange, orange pilose, except for a few black piles on disc; calypter orange, border brown, orange pilose marginally; plumula orange; halter pedicel orange; capitulum orange.

Wing (Figs 2b–c, 3a, 4b, d). Hyaline except for orange basal 1/2, brownish black apical 1/2; microtrichose, except for bare areas on posterior half of cells cup and dm, bare also on anterior half of cell bm; alula bare basomedially; tegula and basicosta orange pilose.

Legs (Figs 2a–c, 3a, 4b). Orange, coxae and trochanters orange, orange pruinose and pilose; profemur orange, orange pilose, mesofemur orange pilose except black apicoventrally; metafemur orange, orange pilose except black pilose ventrally, in addition to some black piles on apicodorsal 1/4; hind tibia orange pilose except for some black pile on basoventral 1/3.

Abdomen (Figs 2b–c, 3a, 4d, 9a). Shiny purplish black, pile mainly orange-yellow; first tergum brown grey pruinose, orange pilose on basolateral margin; second tergum with large triangular oblique macula perpendicular to lateral edge, orange pilose, except for black pile on apicolateral margin and medially; third tergum with narrow basal yellow tomentose fasciae separated medially, orange pilose except for black pile on apicolateral margin and medially; sterna brown, orange pilose; male genitalia as in Figs 3c–e, purplish black, grey pruinose, yellow and black pilose.

Female (Figs 2d–f and 3b). Similar to male, except for normal sexual dimorphism and: on frontal triangle grayish white pruinose vitta along eye margin wider than in male, triangular oblique macula on second tergum larger than in male, terga extensively covered with orange golden pile. Body length 12.1–12.3 mm; wing length 9.3–9.8 mm.

Differential diagnosis. *Lycopale magnifica* is similar in appearance to *Lycopale rectilinea*, from which it differs in having the following combination of characters: facial vitta black (Figs 2a, b, d, e and 4a, b) (*versus* facial vitta yellow (♂) or reddish brown (♀) in *L. rectilinea*); antenna extensively black (Figs 2a, b, d, e and 4a, b) (*versus* brownish orange in *L. rectilinea*); both species with two submedial yellow pollinose vittae, confluent with a transverse vitta before scutellum base, but in *Lycopale magnifica* (Figs 3a,

b and 4c) the scutum has a small median vitta before the transverse suture (*versus* scutum without a small median vitta before transverse suture in *L. rectilinea* (Fig. 9b)); scutellum orange (Figs 3a, b, 9a) (*versus* scutellum dull brownish to shining blackish in *L. rectilinea*); abdomen shiny purplish black in the background (Figs 2c, f, 3a, b) (*versus* abdomen extensively black in the background in *L. rectilinea* (Fig. 9b)).

Distribution and natural history. MONTOYA (2016) recorded *Lycopale magnifica* from the Eastern Mountain range (Santander, Carmen de Chucurí) in Colombia and herein, it is recorded from the Western Mountain range (Risaralda, Pueblo Rico, Montezuma) for the first time (Figs 11, 10–11), inhabiting the Andean montane forest from 1690 to 2400 meters of elevation. Recently, MONTOYA & BOTA-SIERRA (2023) recorded a female specimen carrying the “louse flies”, *Ornithoica vicina* (Walker, 1849) (Hippoboscoidae: Ornithoicinae: Olfersiini) hitchhiking on the abdomen dorsum (Fig. 2f). The species is also distributed in Ecuador: Pichincha (Locality Nambillo Valley, near Mindo, -0.067991 -78.743024, 1450 m, BMNH) (Natural History Museum 2024), a locality situated about 155 km from Nariño, Píalapi, which corresponds to the most southwestern record in Colombia.

Remarks. The type material of *Plagiocera magnifica* was examined from photos (Fig. 4) provided by Amoret Spooner and Robert Douglas (OUMNH). The species was labeled as Colombia but the particular locality was not provided. The terminalia of *Lycopale magnifica* was described based on additional material since the holotype terminalia were not dissected.

Lycopale mendozai sp. nov.

(Figs 5, 6, 9g, 10–11)

Type material. HOLOTYPE: Adult ♂, pinned. Original label: “COLOMBIA, Antioquia, Belmira, Cabaña Cabildo Verde, El Morro-Alto de La Gallina” / “6,634233, -75,658654, 2966–3020 m” / “2–13.xii.2017, A. L. Montoya” “HOLOTYPE / *Lycopale mendozai* sp. nov. / Montoya 2023” [red, handwritten except first line] (CEUA 103237, dissected). PARATYPES: COLOMBIA: Antioquia, Belmira, Cabaña Cabildo Verde, El Morro-Alto de La Gallina, 6.634233, -75.658654, 2966–3020 m, Bosque, Red entomológica [Net], 4–14.xii.2016, A. L. Montoya; J. Torres; J. D. Carmona (1 ♀, CEUA 103271); Antioquia, Belmira, Cabaña Cabildo Verde, El Morro-Alto de La Gallina, 6.634233, -75.658654, 2966–3020 m, Paramo, Net, ex *Gaidendron punctatum* (Ruiz & Pav.) G. Don, 25.iii.–5.iv.2017, A. L. Montoya; C. Rodríguez; J. D. Carmona (1 ♀, CEUA 97946, ZFMK-DNA-FD19584738, GenBank PP979581); Antioquia, Belmira, Vereda Río Arriba, Sector Laguna de Sabanas, 6.640931, -75.665335, 2850–2950 m, Forest, Red entomológica [Net], flying around the Bromeliad species, *Guzmania coriostachya* (Griseb.) Mez (Bromeliaceae Juss.), 16.–27.ix.2017, A. L. Montoya (2 ♂♂, CEUA 95141–95142); Sonsón, Vereda Nori Cerro Nori, 5.809667, -75.269028, 2840–2853 m, Bosque, Red entomológica [Net], 25.xi.–5.xii.2018, A.L. Montoya; A.M. Echeverry (1 ♀, CEUA 114201).

Length. Body 8.2–9.1 mm; wing 8.4–8.8 mm.

Diagnosis. *Lycopale mendozai* is similar in appearance to *Lycopale lipoflava*, but can be separated from it by eye pilose (Figs 6a–b, 4a–c); scutum dull black, with two submedial whitish grey pruinose vittae in the basal half (Fig. 9g); pre-scutellum without vitta or tomentose hairs (Fig. 9g); wing hyaline except for brown on anterior margin (Fig. 9g); abdomen shiny black, second to fourth terga with yellow apical margin (Figs 6b–c, 7a, 9g).

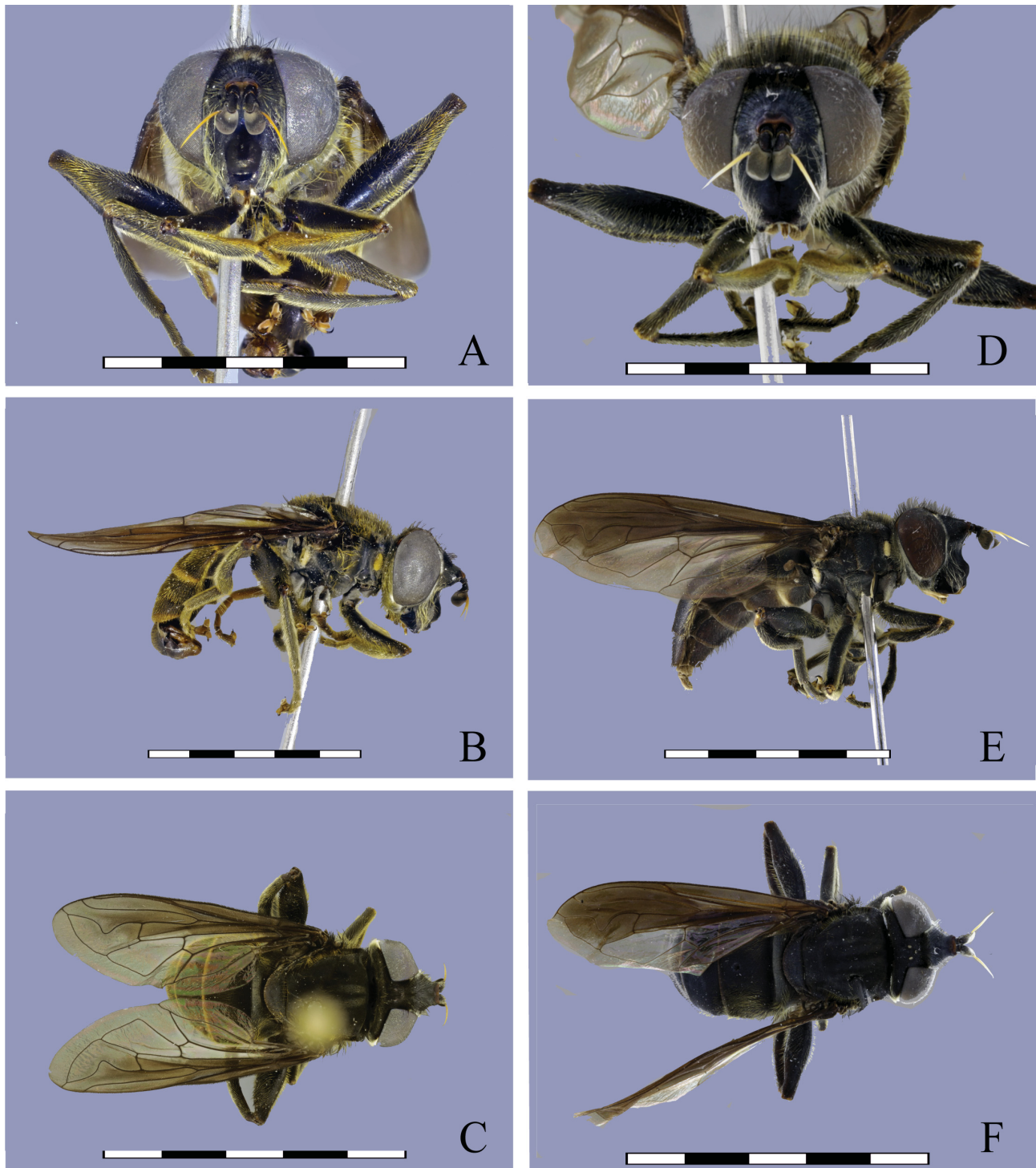


Fig. 5. *Lycopale mendozai* sp. nov. A–C – male, holotype (CEUA 95142): A – head, frontal view; B – dorsal view; C – lateral view. D–F – female (CEUA 114201): D – head, frontal view; E – lateral view; F – abdomen posterodorsal view. Scale bars: 5 mm.

Description. Male. Head (Figs 6a–b, 4a–c). Face black, facial vitta black, white pruinose before frontal prominence; gena black, yellow whitish pilose and pruinose; frontal triangle white, white and black pilose; vertical triangle black, grey pruinose, black pilose; eyes pilose, narrowly dichoptic, separated from eye margin by more than ocellus width; occiput black pruinose and pilose on dorsal 1/4 and white pruinose and pilose on ventral 3/4. Antenna: black; arista light yellow and pubescent.

Thorax (Figs 6b–d, 7c, 9g). Scutum dull blue-black pruinose and pilose; postpronotum black pruinose and pilose; scutum with two submedial whitish grey pruinose vittae from base, reaching 3/4 of scutum length; transversal suture without vitta or tomentose pile; pre-scutellum extensively black, without vitta or tomentose pile; postalar callus black and golden pilose; pleuron dark blue, grey white pruinose, white pilose, except for black pile on posterior anepisternon and anterior anepimeron dorsally; scutellum black, black

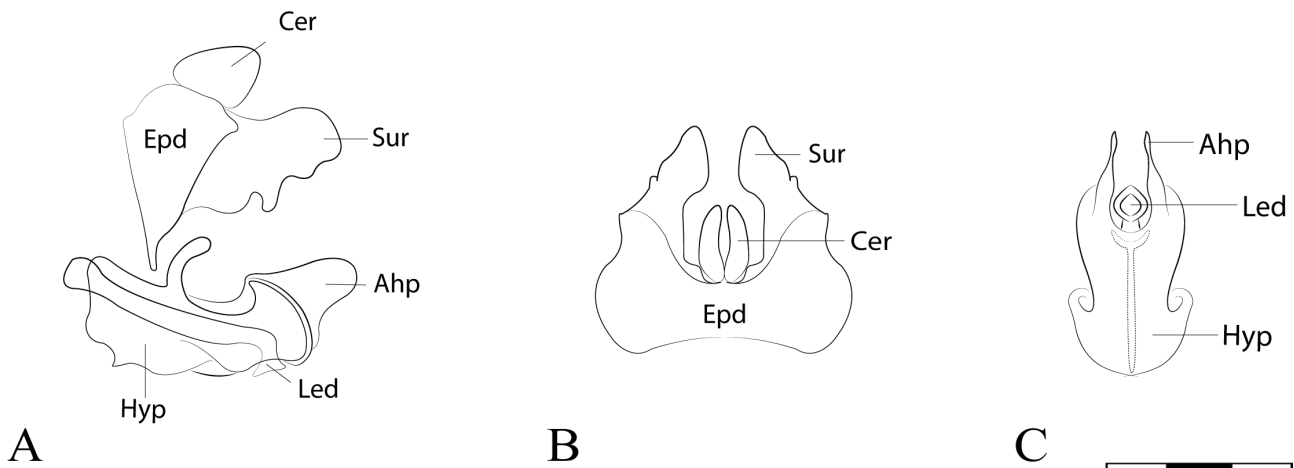


Fig. 6. *Lycopale mendozai* sp. nov., male genitalia, A—whole genitalia, lateral view; B—epandrium, dorsal view; C—hypandrium, ventral view. Scale bars: 1 mm.

pilose; calypter black, black pilose marginally; plumula white; halter pedicel dark brown; capitulum dark brown.

Wing (Figs 6b–e, 7b–d). Hyaline except for brown anterior half; microtrichose, except for bare areas on posterior half of cells cup and dm, bare extensively on cell bm; alula bare basomedially; tegula black pilose and basicosta orange pilose.

Legs (Figs 6a–b, 7a). Black, golden pilose, metafemur with some black pile on apicodorsal 1/4.

Abdomen (Figs 6b–c, 7a, 9g). Shiny yellowish white pilose; first tergum grey pruinose, with long yellowish-white pile; second to fourth terga black, narrowly yellow on apical margin, yellowish white pilose; male genitalia as Fig. 6.

Female (Figs 5d–f). Similar to the male, except for normal sexual dimorphism and: the brown anterior half of the wing is darker than in male, abdomen mostly covered with black pile. Body length 7.3–8.1 mm; wing length 8.0–8.6.

Differential diagnosis. *Lycopale mendozai* sp. nov. keys out to *Lycopale lipoflava* in the keys of THOMPSON (2012). *Lycopale mendozai* sp. nov. can be separated from *Lycopale lipoflava* by eye pilose (*versus* eye bare in *L. lipoflava*); scutum dull black, with two submedial whitish grey pruinose vittae in the basal half, Fig. 9g (*versus* scutum without pruinose maculae in *L. lipoflava*, Fig. 9f); transverse suture without vitta or tomentose pile, Fig. 9g (*versus* transverse suture with a row of short yellow tomentose pile in *L. lipoflava*, Fig. 9f); pre-scutellum without vitta or tomentose hairs, Fig. 9g (*versus* pre-scutellum with vitta and a prominent patch of golden tomentose hairs in *L. lipoflava*, figure 9f); wing hyaline except for brown anterior part (*versus* wing hyaline in *L. lipoflava*).

Etymology. The specific epithet “*mendezai*” is given in honor of the Colombian writer, Mario Mendoza Zambrano, one of the greatest exponents of the new Latin-American narrative. His visceral writing narrates everyday stories in brutal, ruthless, fast, sarcastic, critical and direct literature. His writings describe misty cities and their gloomy, enigmatic and mad characters throughout the crime, mystic, underground and prophetic surrealism into agile and concise prose of fantastic novels. His writings are aimed

primarily at young people, inviting them to learn to think about complexities, becoming a true pleasure to read, characterized by its rhythm and hyperrealistic aesthetic. The dark colors and yellow tints of the new species evoke the magnificent black mood and colored sarcasm that is highlighted in the stories of his dark, gloomy, mysterious, and enigmatic characters. This beautiful flower fly species that inhabits the Colombian pristine forest and Paramo ecosystems was named after him in gratitude and recognition of his legacy for future generations.

Distribution and natural history. *Lycopale mendozai* sp. nov. occurs in sympatry with *L. radioheadi* sp. nov. in the Magdalena Valley montane forests in northwestern Colombia. Part of the type material of *Lycopale mendozai* sp. nov. was collected inside a forest flying around the native bromeliad, *Guzmania coriostachya* (Griseb.) Mez (Bromeliaceae) (Fig. 1H).

Lycopale radioheadi sp. nov.

(Figs 7–8, 9h, 10–11)

Type material. HOLOTYPE: Adult ♂, pinned. Original label: “COLOMBIA, Antioquia, Sonsón, Vereda Nori Cerro Nori ” / “ 5,812861, -75,268444, 3022–3045 m[eters], Paramo, Red entomológica [Net] ” / “1–12.ix.2018, A.M. Echeverry; A.L. Montoya”. “HOLOTYPE / *Lycopale radioheadi* sp. nov. / Montoya 2023” [red, handwritten except the first line] (CEUA 103529, dissected). PARATYPES: **COLOMBIA:** Antioquia, Belmira, Paramo Santa Inés, Vereda Río Arriba, Sector Laguna de Sabanas, 6.640931, -75.665335, 2850–2950 m, Bosque, Red entomológica [Net], 16–27.ix.2017, A. L. Montoya (1 ♂, CEUA 103258); ... Paramo, flying around *Taraxacum officinale* (L.) Weber ex F.H.Wigg., Prim. Fl. Holsat., 25.iii.–5.iv.2017, A. L. Montoya; C. Rodríguez; J. D. Carmona (1 ♂, CEUA 93560); Cabaña Cabildo Verde, El Morro-Alto de La Gallina, 6.632639, -75.645267, 3170–3200 m, Paramo, Trampa de Emergencia [Emergency trap], Decomposing wood log, 12–14.iv.2016, A. L. Montoya; J. Torres; J. D. Carmona (1 ♀, CEUA 95143); Bello, San Félix, Las Baldías, 6.33931, -75.60801, 2950–3150 m, Paramo, Red entomológica [Net], 17.ii.2013, A. L. Montoya (1 ♂, CEUA 73227); Bello, San Félix, Las Baldías, 6.33931, -75.60801, 2950–3150 m, Paramo, Red entomológica [Net], 23.v.2015 (1 ♂, CEUA 87185); Sonsón, Vereda Nori Cerro Nori, 5.809667, -75.269028, 2840–2853 m, Bosque, Trampa malaise suelo [Malaise trap ground], 31.iii.–7.vii.2018, A.L. Montoya; J. P. Carmona (1 ♀, CEUA 103427); Sonsón, Vereda San Francisco, Cerro Las Palomas A, 5.725443, -75.263638, 2927–2980 m, Potrero, Red entomológica [Net], 2–19.ii.2019, J. Saucedo; I. Ceballos; M.I. Salinas; D. Uchima & A. Mejía (1 ♂, CEUA 114094, ZFMK-DNA-FD119585551, GenBank PP979582. **ECUADOR:** Napo Province, Reserva Ecológica Antisana, Jumandy Inca



Fig. 7. *Lycopale radioheadi* sp. nov. A–C – male, holotype (CEUA 103529): A – head, frontal view; B – lateral view; C – abdomen posterodorsal view. D–F – female, paratype (CEUA 103427): D – head, frontal view; E – lateral view; F – abdomen posterodorsal view. Scale bars: 5 mm.

trail, from Virgen de Guacamayos to Sector Sarayacu, from -0.625461, -77.841658 to -0.692165, -77.820256, 1305–2260m, 2.ix.2019, leg. X. Mengual (1 ♀, ZFMK-DIP-00068601, INABIO).

Length. Body 10.2–10.6 mm; wing 7.4–10.8 mm.

Diagnosis. *Lycopale radioheadi* sp. nov. is similar to *Lycopale lizeri* but can be separated from it by facial vitta and gena yellow (Figs 7a–b, 8a); antenna orange, except for dorsally brown postpedicel (Figs 7a–b, 8a); postpronotum black pruinose (Figs 7b–c, 8a, 9h); scutum with two submedial and one medial grayish white vittae reaching

3/4 of scutum length (Figs 7b–c, 8a, 9h); pre-scutellum extensively black, without vitta (Fig. 9h); wing hyaline, except for light orange brown anteriorly (Figs 7b–c, 8a); metafemur bright orange, except for light reddish brown on apical 1/2 (Figs 7a–c, 8a); second tergum orange, with basal maculae occupying the full lateral width and extending medially into a triangular basomedial black vitta (Figs 7b–c, 8a, 9h).

Description. Male. *Head* (Figs 7a–b, 8a). Face orange yellow with broad orange medial vitta, yellow pilose; gena

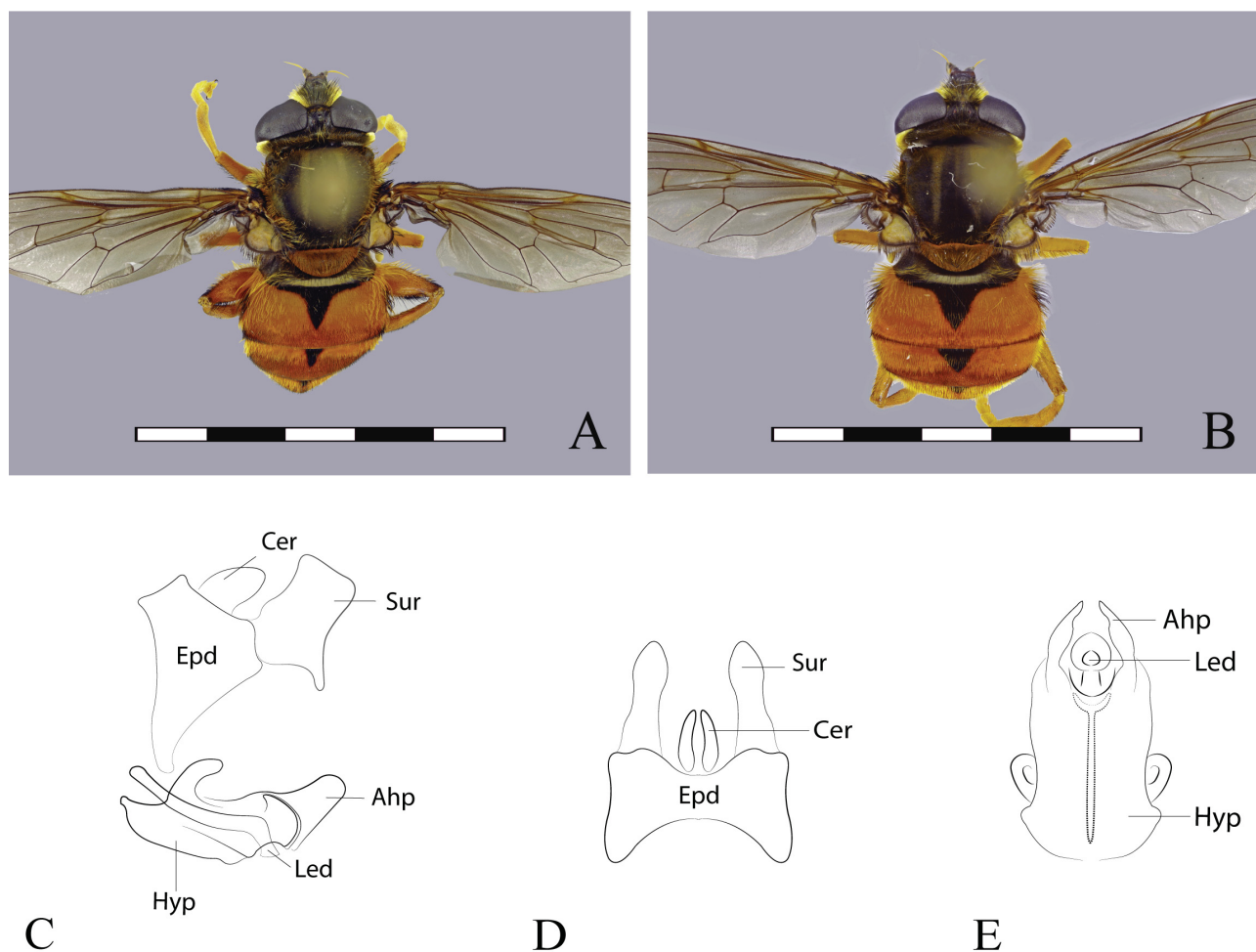


Fig. 8. *Lycopale radioheadi* sp. nov. A – male, dorsal view; B – female, dorsal view. C–E – male genitalia: C – whole genitalia, lateral view; D – epanandrium, dorsal view; E – hypandrium, ventral view. Scale bars: 1 mm.

orange, yellow pilose and pruinose; frontal triangle brown, black and yellow pilose; vertical triangle black, black pilose; eyes bare, narrowly dichoptic, separated from eye margin by at least ocellus width; occiput white pruinose and pilose, except for a few black piles dorsally. Antenna: orange, except for postpedicel brown on dorsal 1/3; arista light yellow and pubescent.

Thorax (Figs 7b–c, 8a, 9h). Dull black; postpronotum yellowish pilose; scutum with two submedial and one medial grayish white vitta from base, reaching 3/4 scutum length, yellow and black pile intermixed; pleuron dark grey pruinose, yellow pilose, except for dorsally black pilose posterior anepisternum; scutellum orange, black pilose; calypter white, border brown, brown pilose marginally; plumula orange; halter pedicel white; capitulum white.

Wing (Figs 7b–c, 8a). Hyaline except for light orange brownish anteriorly; extensively microtrichose; tegula black pilose, basicosta orange pilose.

Legs (Figs 7a–c, 8a). Orange, orange pilose, coxae and trochanters dark grey pruinose and golden pilose; pro- and mesofemur golden pilose, except for black pilose on posterodorsal margin; metafemur bright orange, orange pilose, except for black pile ventrally, in addition to some black pile on apicodorsal 1/4; hind tibia with some black

pile on basoventral 1/3.

Abdomen (Figs 7b–c, 8a, 9h). Orange, orange and black pilose; first tergum black, grey pruinose, long orange pilose; second tergum orange, with basal maculae occupying full lateral width and extending medially into triangular basomedial black vitta, orange pilose, except for black pile on apicolateral margin and medially; third to fourth terga with orange, with triangular diamond-shape basomedial black vitta, orange pilose, except for black pile on apicolateral margin and medially; fifth tergum orange, orange pilose; sterna orange, orange pilose; male genitalia as Figs 8c–e, orange to brown, grayish pruinose and orange golden pilose.

Female (Figs 7d–f, 8b). Similar to male, except for normal sexual dimorphism and the following: antennae darker than in male; abdominal maculae triangular, approximately equilateral, comparatively shorter than in male; fifth tergum with triangular macula. Body length 9.7–10.1 mm; wing 7.3–9.9 mm.

Differential diagnosis. *Lycopale radioheadi* sp. nov. keys out to *Lycopale lizeri* in the keys of THOMPSON (2012). *Lycopale radioheadi* sp. nov. can be separated from *L. lizeri* by facial vitta and gena yellow (*versus* facial vitta and gena black in *L. lizeri*); antenna orange, except for

dorsally brown postpedicel (*versus* antenna ferruginous, yellowish in *L. lizeri*); postpronotum black pruinose, Fig. 9h (*versus* postpronotum yellow pruinose in *L. lizeri*, Fig. 9e); scutum with two submedial and one medial grayish white vittae from base, reaching 3/4 scutum length, Fig. 9h (*versus* scutum with three submedial golden pruinose vittae throughout the entire scutum length, confluent with a transverse vitta before scutellum base in *L. lizeri*, Fig. 9e); pre-scutellum extensively black, without vitta, Fig. 9h (*versus* pre-scutellum orange, rectangular and confluent with longitudinal vittae in *L. lizeri*, Fig. 9e); wing hyaline, except for light orange brown anteriorly (*versus* wing hyaline in *L. lizeri*); metafemur bright orange, except for light reddish brown on apical 1/2 (*versus* metafemur brownish basally and orange on apical 1/2 or more in *L. lizeri*); second tergum orange, with basal maculae occupying the full lateral width and extending medially into a triangular basomedial black vitta (*versus* second tergum black grey, covered with a deeply black pubescence except for a transverse median line which widens on the edges and in the midline in *L. lizeri*).

Etymology. The specific epithet *radioheadi* is given in honor of the English rock band Radiohead (formed in 1985), for their extraordinary music, considered one of the most influential bands in contemporary alternative rock. Radiohead is an environmental activist band that raises awareness of climate change and socio-political issues. Their melodies were a source of inspiration and an excellent company while conducting this study. The species name is a masculine noun in the genitive case.

Distribution and natural history. *Lycopale radioheadi* sp. nov. is only known from the type localities in the Magdalena Valley and Eastern Mountain range Real Montane Forests ecoregions. The species is restricted to pristine forests and Paramo ecosystems (sky islands) in the Paramo complexes of Santa Ines Belmira and Sonsón at elevations between 2840 and 3020 m in isolated areas in northwestern Central Mountain range in Colombia and eastern slope of Eastern Mountain range in Ecuador (Figs 10–11). The habitats where the specimens were collected are covered mainly by shrubby plants and inhabited by endemic species (Figs 1a–g).

Addendum to the identification key of *Lycopale* by THOMPSON (2012)

To facilitate the identification of the newly described species of *Lycopale*, the most recent key provided by THOMPSON (2012) is updated. A comparison of morphological characters is provided in Table 1.

- 1 Second tergum with a diagonal yellow fascia or large triangular yellow macula, either of tomentose pile or ground color. 5
- Second abdominal tergum without such fascia or macula. 2
- 2 Metafemur black on dorsal 1/2 and reddish brown ventrally or dark reddish brown on basal 4/5, orange laterally on apical 1/5, black dorsoapically, or erect white pilose; scutellum black. 4

- Metafemur orange on basal 1/2 or more, appressed black or orange pilose; scutellum orange. 3
- 3. Facial vitta and gena yellow; postpronotum black pollinose; scutum with three submedial grayish white vitta from the base, reaching 3/4 of scutum length; anepimeron yellow pilose; third to fourth abdominal terga orange, with triangular diamond-shaped basomedial black vitta (Figs 7, 9h).
..... *L. radioheadi* sp. nov. [Colombia and Ecuador]
- Facial vitta and gena black; postpronotum yellow pollinose; scutum with three submedial golden pollinose vittae throughout the entire scutum length, confluent with a transverse vitta before scutellum base; anepimeron black pilose; third to fourth abdominal terga blackish basally and ferruginous apically, yellow apical margin (Fig. 9e). *L. lizeri* (Brèthes, 1914) [Argentina]
- 4 Eyes bare; scutum without pollinose maculae, yellow tomentose pile along transverse suture and anterior to scutellum (Fig. 9f); alula microtrichose; scutellum extensively long white pilose; third to fourth abdominal terga shiny bluish black, without pale maculae nor tomentum or without pale maculae (see BARAHONA et al. 2021: fig. 50), except in female.
..... *L. lipoflava* (Fluke, 1937) [Chile and Peru]
- Eye pilose; scutum with two submedial whitish grey pollinose vittae in the basal half, but without tomentose pile along transverse suture and anterior to scutellum; alula bare basomedially; scutellum extensively long black pilose; third to fourth abdominal terga shiny black, narrowly yellow on apical margin (Figs 5, 9g). *L. mendozai* sp. nov. [Colombia]
- 5 Eye sparsely but distinctly pilose; antenna extensively black; gena black; facial vitta black (THOMPSON 2012: fig. 5b); wing hyaline, except for light brown anterior part; alula bare basomedially, extensively microtrichose apically; scutum with two submedial grayish white vittae reaching 3/4 of scutum length (THOMPSON 2012: fig. 5a); pre-scutellar pollinose vitta grayish white; scutellum brownish yellow except for narrowly black basal part, orange apical part; protibia and tarsus black; abdomen with three yellow pollinose fasciae (Fig. 9d). *L. woodi* Thompson, 2012 [Guatemala, Mexico and Nicaragua]
- Eye bare, other character combination variable. 6
- 6 Mesonotum with two submedial yellow pollinose vittae, confluent with a transverse vitta before scutellum base; facial vitta yellow (♂) or reddish brown (♀); gena black; antenna orange; pre-scutellar pollinose vitta orange, rectangular-like and confluent with longitudinal vittae; scutellum dull brownish to shining blackish, yellow-orange apically; wing hyaline, except for brown anterior part; abdominal terga with extensive appressed black pile (Fig. 9b).
..... *L. rectilinea* (Hull, 1942) [Bolivia and Peru]
- Mesonotum with a medial and two submedial yellow pollinose vittae; facial vitta black; gena yellow orange; antenna extensively black. 7
- 7 Alula bare basomedially; gena yellow; facial vitta yellow or black; legs bright orange except for metafe-

mur which may be light reddish brown on apical 1/2, if so, facial vitta yellow; basoflagellomere trapezoid; scutum with two submedial yellow pollinose vittae throughout the entire scutum length, in addition to a small median vitta before transverse suture; postpronotum yellow pollinose; wing basal 2/3 orange, apical 1/3 brownish black; abdomen shiny purplish black beyond second tergum, with pile not obscuring ground color (Figs 2, 4, 9a).

... *L. magnifica* (Bigot, 1880) [Colombia and Ecuador]

- Alula microtrichose; gena black; facial vitta black; legs with at least metafemur black or brownish-black on basal 2/3 or dorsal 1/2, all black legs; basoflagellomere non trapezoid, of normal size; scutum with two brownish to golden pollinose vittae throughout the entire scutum length; postpronotum black pollinose (Fig. 9c); wing hyaline, except for light brown anterior part; abdomen with large V-shaped pale maculae on second tergum, with narrow basal yellow tomentose fasciae on third to fourth terga (FLUKE 1937: fig. 15).

..... *L. chrysotaenia* (Fluke, 1937) [Brazil]

Species checklist

Lycopale chrysotaenia (Fluke, 1937)

Habromyia chrysotaenia Fluke, 1937: 12. Type locality: Brazil: Santa Catarina, Nova Teutônia. Holotype: ♂ (AMNH). Paratypes: 7 ♂♂ 11 ♀♀, same data.

Habromyia chrysotaenia: THOMPSON et al. (1976: 100).

Lycopale chrysotaenia. THOMPSON (2012): 13 (key).

References. FLUKE (1937): 12, fig. 15 (abdomen, dorsal view), 17 (head, lateral view, male); THOMPSON (1972): 135, fig. 51 (male genitalia); THOMPSON et al. (2010): 768, fig. 17 (male head, lateral view).

Distribution. Southeastern Brazil: Paraná (-31.741222, -60.511178, 66 m), Rio Grande do Sul (-29.364644, -51.665771, 412 m), Santa Catarina (Nova Teutônia, -27.161084, -52.428271, 401 m) (THOMPSON et al. 1976; THOMPSON et al. 2006; MORALES & MARINONI 2024).

Altitudinal distribution. 66–412 m.

Remarks. Photos of the holotype of *Habromyia chrysotaenia* are available on the AMNH website: <https://emu-prod.amnh.org/imulive/iz/iz.html?#details=ecatalogue.10020970>. Additional photos are available at: <https://syrphidae.myspecies.info/taxonomy/term/983/media>. Thoracic and abdominal patterns are illustrated in Fig. 9c.

Lycopale lipoflava (Fluke, 1937)

Habromyia lipoflava Fluke, 1937: 13. Type locality: Peru: Yura. Holotype: ♂ (AMNH, accession 27465). Paratypes: 4 ♂♂, same data.

Habromyia lipoflava: THOMPSON et al. (1976: 100).

Habromyia lipoflava: BARAHONA et al. (2021): 42 (catalog and distribution in Chile).

Habromyia floccula Hull, 1944: 47. Type locality: Peru. Matucana. Holotype: ♀ (CUI).

Lycopale lipoflava. THOMPSON (2012): 13 (key).

References. FLUKE (1937): 13 (description); ETCHEVERRY (1951): 355 (catalog); ETCHEVERRY (1952): 308 (catalog); ETCHEVERRY (1963): 48 (catalog); ETCHEVERRY (1970): 96 (catalog); FLUKE 1957: 126 (catalog); THOMPSON et al. (1976): 100 (catalog); ARROYO et al. (1982): 93 (pollina-

tion study); THOMPSON (2012b): 13 (key); BARAHONA et al. (2021): 42–43, fig. 50 (dorsal habitus).

Distribution. Perú: Arequipa province (Yura, -16.252244, -71.683583, 2587 m), Huarochirí (Lima, Matucana, -11.840734, -76.379643, 2425 m) to Chile: Arica y Parinacota (Murmutani, -18.353522, -69.55256, 3529 m, Copaquilla, -18.393592, -69.641787, 3005 m, Chapiquiña, -18.395544, -69.537426, 3325 m, Timar, -18.750998, -69.692427, 2453 m), Atacama (Quebrada Vizcachas, -27.303387, -69.273441, 4229 m), Metropolitana (Farellones, -33.329131, -70.245461, 2016 m), O'Higgins (Cerro La Rancagua, -18.119722, -69.37000, 4792 m), Tarapacá (Tamarugal, Miñe-Miñe, -20.206514, -69.287144, 2063 m), Tapacá (Tamarugal, Camiña, -19.311066, -69.427000, 2508 m, Tamarugal, Parca, -20.011878, -69.202960, 2838 m, Tamarugal, Mamiña, -20.074215, -69.216777, 2737 m) (THOMPSON et al. 1976, 2006; BARAHONA et al. 2021). **Altitudinal distribution.** 2016–4792 m.

Remarks. Photos of the holotype of *Habromyia lipoflava* are available on the AMNH website: <https://emu-prod.amnh.org/imulive/iz/iz.html?#details=ecatalogue.10022475>. Thoracic and abdominal patterns are illustrated in Fig. 9f. BARAHONA et al. (2021: fig. 50: 43) provide an additional photo of a male specimen.

Lycopale lizeri (Brèthes, 1914)

Helophilus lizeri Brèthes, 1914: 97. Type locality: Argentina: Córdoba, La Cumbre. Holotype: ♂ (MACN).

Habromyia (Helophilus) lizeri: THOMPSON et al. (1976: 101)

Meromacrus vittata Hull, 1937: 170. Type locality: Argentina: Villa Nougés. Holotype: ♀ (USNM, catalog number 51366).

Habromyia (Meromacrus) vittata: THOMPSON et al. (1976: 101).

Lycopale lizeri. THOMPSON (2012): 13 (key); MAZA et al. (2023): 344 (distributional record).

References. NAVARRO et al. (2007) (https://ri.conicet.gov.ar/bitstream/handle/11336/75002/CONICET_Digital_Nro.323d5e84-52c0-4aab-8f2f-ca08123f5a47_A.pdf?sequence=2&isAllowed=y, as *Lycopale vittata*).

Distribution. Argentina: Córdoba (Punilla, La Cumbre, -30.709764, -64.571589, 1144 m), Lules (Tucumán province, Villa Nougés, -26.852556, -65.380939, 1408 m), Mendoza (Las Heras, -32.621772, -69.36653, 1832 m), Yungas (Montane Forest, 600–1500 m) (THOMPSON et al. 1976; THOMPSON et al. 2006). MAZA et al. (2023) also recorded the species in the provinces of Córdoba and Tucumán. **Altitudinal distribution.** 600–1144 m.

Remarks. Thoracic and abdominal patterns are illustrated in Fig. 9e. Photos of the holotype of *Meromacrus vittata* housed in the USNM are available on the website: <http://n2t.net/ark:/65665/34bdbd2df-449d-4a11-b5d-5-8663d45267c6>.

Lycopale rectilinea (Hull, 1942)

Habromyia rectilinea Hull, 1942: 19. Type locality: Bolivia. La Paz, Pedro Domingo Murillo province, Río Songo = [Río Zongo] Ost, Tropical Zone Los Yungas, 800 m, Fassi (NMW). Syntypes: ♀♀ (USNM ENT 00022471 & CNC).

Lycopale rectilinea: THOMPSON (2012): 13 (key).

References. DENNER (2017): 112. Lectotype designation by THOMPSON (1977, including taxonomic remarks).

Table 1. Comparison of main diagnostic characters of *Lycopale* species.

Character	<i>L. magnifica</i>	<i>L. rectilinea</i>	<i>L. chrysoaenia</i>	<i>L. woodi</i>	<i>L. lizeri</i>	<i>L. tipoflava</i>	<i>L. mendozai</i> sp. nov.	<i>L. radioheadi</i> sp. nov.
Eye pile pattern	Bare	Bare	Bare	Pilose	Bare	Bare	Pilose	Bare
Male eyes	Dichoptic	?	Holoptic	Dichoptic	Dichoptic	Dichoptic	Dichoptic	Dichoptic
Facial vitta	Black	Yellow to reddish brown	Black	Black	Black	Black	Black	Yellow
Gena	Yellow	Orange	Black	Black	Black	Black	Black	Yellow orange
Antennae	Black	Brownish orange	Black	Black	Ferruginous, yellowish	Black	Black	Orange, except baso-flagellomere brown dorsally
Postpronotum pollinosity	Yellow	Yellow	Black	Yellow	Yellow	Brownish	Black	Black
Scutum	Two submedial yellow pollinose vittae throughout the entire scutum length, in addition to small median vitta before transverse suture	Two submedial yellow pollinose vittae, confluent with transverse vitta before scutellum base	Two brownish to golden pollinose vittae throughout the entire scutum length	Two submedial grayish white vittae reaching 3/4 of scutum length	Three submedial golden pollinose vittae throughout the entire scutum length, confluent with transverse vitta before scutellum base	Extensively dull black, without pollinose maculae, yellow tomentose pile along transverse suture and anterior to scutellum	Extensively dull black, with two submedial whitish grey pollinose vittae in basal half	Three submedial grayish-white vittae from base, reaching 3/4 scutum length
Transverse suture vitta	Yellow sublateral vitta on wing base	With row of short yellow tomentose pile	Faint pollinose stripe reaching the median vitta	Without vitta or tomentose pile	Without vitta or tomentose pile	With row of short yellow tomentose pile	Without vitta or tomentose pile	Without vitta or tomentose pile
Pre-scutellum pollinose vitta	Orange, rectangular-like and confluent with longitudinal vittae	Orange, rectangular-like and confluent with longitudinal vittae	Yellowish orange	Grayish white	Orange, rectangular-like and confluent with longitudinal vittae	Yellowish orange	Extensively black, without vitta	Extensively black, without vitta
Scutellum	Orange	Dull brownish to shining blackish, yellow-orange apically	Dull black, slightly yellow-orange apically	Brownish yellow except narrowly black basally, orange apically	Orange	Black	Black	Orange
Alula	Bare basomedially	Bare basomedially	Microtrichose	Bare basomedially	Microtrichose	Microtrichose	Bare basomedially	Microtrichose
Wing coloration pattern	Basal 2/3 orange, apical 1/3 brownish black	Hyaline, except brown anteriorly	Hyaline, except light brown anteriorly	Hyaline, except light brown anteriorly	Hyaline	Hyaline	Hyaline, except brown anterior half	Hyaline, except light orange brown anteriorly
Metafemur	Black on dorsal 1/2 and brownish ventrally or dark reddish on basal 4/5	Reddish brown	Black or brownish black on basal 2/3 or dorsal 1/2	Orange except broadly black on medial 1/3	Brownish basally and orange on apically 1/2 or more	Black	Black	Bright orange, except light reddish brown on apical 1/2
Second abdominal tergum	Shiny purplish black to purple metallic, with triangular macula perpendicular to the lateral edge	Transverse, oblique, subbasal, orange maculae narrowly separated in the middle	One pair of large oblique V-shaped pale maculae	With oblique fascia, narrowly separated medially but broadly connected to lateral orange area and at mid-length of tergum	Black grey, covered with deeply black pubescence except for transverse median line which widens on edges and in midline	Shiny bluish-black, slightly whitish on apical margin	Shiny black, narrowly yellow on apical margin	Orange, with basal maculae occupying full lateral width and extending medially into triangular basomedial black vitta
Third to fourth abdominal terga	With narrow basal yellow tomentose fasciae separated medially	Black, with two pairs of red-brown maculae narrowly separated medially	With narrow basal yellow tomentose fasciae separated medially	With three yellow pollinose fasciae restricted to apical edge	Blackish basally and ferruginous apically, yellow apical margin	Shiny bluish-black without pale maculae nor tomentum or pale maculae, except in female	Shiny black, narrowly yellow on apical margin	Orange, with triangular diamond-shaped basomedial black vitta

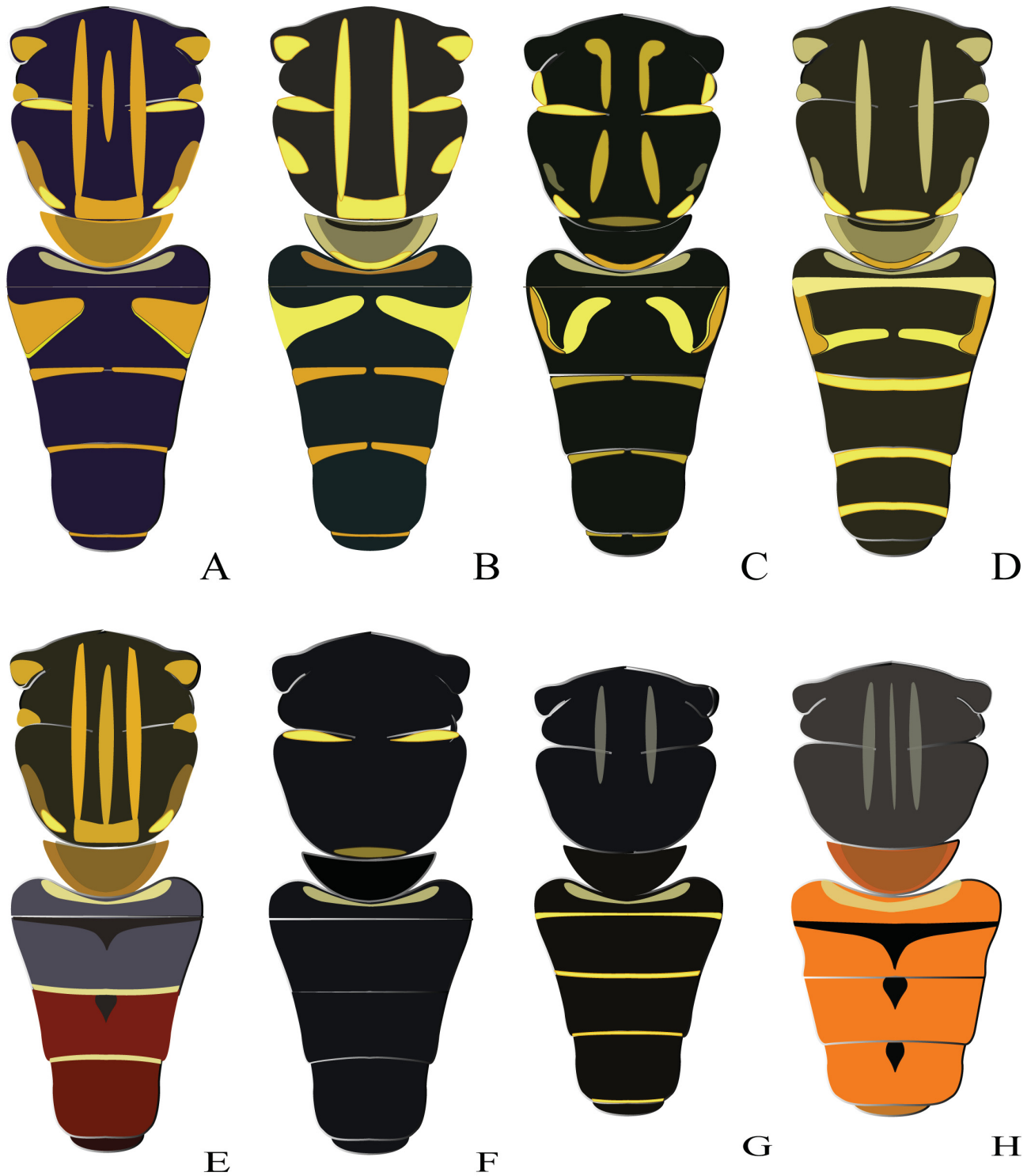


Fig. 9. *Lycopale* thoracic and abdominal patterns, dorsal view: A – *Lycopale magnifica* (Bigot, 1880); B – *L. rectilinea* (Hull, 1942); C – *L. chrysotaenia* (Fluke, 1937); D – *L. woodi* Thompson, 2012; E – *L. lizeri* (Brèthes, 1914); F – *L. lipoflava* (Fluke, 1937); G – *L. mendozai* sp. nov.; H – *L. radioheadi* sp. nov. The pile has been omitted.

Distribution. Peru: Huanoabamba (-5.238991, -79.450699, 1938 m) and Chanchamayo (-11.062010, -75.334893, 750 m) to Bolivia: Río Songo [Zongo] Ost (-15.716472, -67.676000, 530 m), La Paz (Pedro Domingo Murillo, -15.716744, -67.678122, 507 m) (THOMPSON et al. 1976, 2006).

Altitudinal distribution. 507–1938 m.

Remarks. Information regarding the syntype and cotype specimens in the CNC is available in COOPER & CUMMING (1993), BROOKS et al. (2003) and DENNER (2017). Photos of the syntype of *Habromyia rectilinea* are available on the CNC website: <https://www.cnc.agr.gc.ca/taxonomy/Specimen.php?id=740928>. The thoracic and abdominal patterns are illustrated in Fig. 9b.

***Lycopale woodi* Thompson, 2012**

Lycopale woodi Thompson, 2012: 12. Type locality: Mexico, Hidalgo, km 170 Pachuca–Tampico, Tlalchinol.

References. THOMPSON (2012: 12, figs 5a–c).

Distribution. Mexico: Hidalgo (Tlalchinol, km 1 Pachuca–Tampico Road, 20.858790, -98.833682, 1415 m, USNM), Chiapas (Huitepec, 5 km west San Cristobal, 2750 m, San Cristobal de las Casas, Huitepec, 16.845374, -92.841545, 2300 m, ECO-TAP-E), Guatemala: Zacapa (road to Plateau, north of San Lorenzo, trail beyond campsite, hill in Cloud Forest, 15.002647, -90.114863, 2218 m) (THOMPSON 2012). Additional record from Nicaragua (<https://inaturalist.lu/observations/116767289>).

Altitudinal distribution. 1400–2300 m.

Remarks. Thoracic and abdominal patterns are illustrated in figure 9d.

Molecular diagnostics

To facilitate the identification of future specimens and to enlarge the current database of DNA barcodes for Syrphidae, sequences of the barcoding region (cox1; 658 bp) were generated for *Lycopale magnifica*, *Lycopale mendozai* sp. nov., and *Lycopale radioheadi* sp. nov. COI sequences were kindly provided by Ximo Mengual and are available on the public database GenBank (SUB14580327) under the accession numbers indicated in Table 2. These new sequences will constitute an invaluable supply for future studies on the biodiversity of Neotropical hoverflies.

Comments on ecoregion distribution and conservation perspectives

Lycopale is extended from the northernmost point at 20.858790, -98.833682 in Central America in southeastern Mexico (1415–2300 m, 1 sp.) to Guatemala (2218 m, 1 sp.) and Nicaragua (500 m, 1 sp.), extended to Tropical Andes hotspots in Colombia (1690–3200 m, 3 spp.), Ecuador (1305–2260 m, 2 spp.), Peru (1938–2587 m, 2 spp.), Bolivia (507 m, 1 sp.), reaching the Atlantic forest in southeastern Brazil (66–412 m, 1 sp.), in addition to the Chilean Winter Rainfall-Valdivian Forests in its southernmost distribution record in southwestern Chile (2016–4792 m, 1 sp.) and north Argentina (600–1408 m, 1 sp.) at -26.852556, -65.380939 (Figs 10–11) (THOMPSON 1976, 2000, 2012; THOMPSON et al. 2010; MONTOYA 2016; BARAHONA et al. 2021).

Lycopale woodi is exclusively known and widely distri-

buted in low and middle elevations in the Central American Pine-Oak Forests ecoregion in Mexico (1415–2300 m), Guatemala (2218 m) and Nicaragua (1500 m). *Lycopale rectilinea* is exclusively distributed in the Tropical Andes hotspots in the Eastern Mountain range Real Montane Forests and Bolivian Yungas ecoregions at middle and low elevations in Peru (1938 m) and Bolivia (507 m), respectively. *Lycopale lipoflava* is only known from the Sechura Desert in Peru (2425–2587 m) and the Atacama Desert discontinuously extending to the Chilean Matorral ecoregion at middle and high elevations in Western Mountain range in Chile (2016–4792 m). *Lycopale chrysotaenia* is endemic to the Cerrado, Alto Paraná Atlantic Forests and Araucaria Moist Forests ecoregions in the lowlands of southeastern Brazil (66–412 m). For his part, *L. lizeri* has only been recorded from the Southern Andean Yungas and Dry Chaco ecoregions in the eastern slopes of the Andes at low and middle elevations in Argentina (600–1144 m).

Lycopale magnifica is endemic to the Tropical Andes hotspots, occurring from the Northwest Andean and Magdalena Valley Montane Forests ecoregions in the eastern slope of the Western and Eastern Mountain ranges at middle and high elevations (1690–2400 m) in Colombia. The species is present in Ecuador (NATURAL HISTORY MUSEUM 2024) in the Northwest Andean Montane Forests on the western slope of Western Mountain range at middle elevations (1450 m).

The new species, *Lycopale mendozai* sp. nov. and *L. radioheadi* sp. nov. are known from their type localities in two out of the 34 Paramo complexes in Colombia (see MONTOYA et al. 2021) and *L. radioheadi* sp. nov. is also present in a forest area in Ecuador. The species are restricted to well-conserved high Andean Forest and Paramo ecosystems in the northwestern Tropical Andes hotspots (Figs 10–11), region that concentrated one of the highest syrphids diversity and endemism in very isolated and small areas in the mountain tops (HIPPA & THOMPSON 1983, 1994; MENGUAL & THOMPSON 2008; MORALES et al. 2013; MONTOYA 2016; MARÍN-ARMIJOS et al. 2017; MONTOYA et al. 2012, 2017, 2021; MONTOYA & WOLFF 2020, 2023). These areas are among the most threatened by global warming and anthropogenic pressures, suffering extensive deforestation mainly due to agricultural monocultures, as well as livestock and mining advancement.

In the last decade, several flower fly species have been described from the northwestern Tropical Andes hotspots (HIPPA & THOMPSON 1983, 1994; MENGUAL & THOMPSON

Table 2. Mitochondrial cytochrome c oxidase subunit I (COI) barcode sequences, including GenBank accession numbers (SUB14580327).

Taxon name	Sample ID	Lab code	GenBank number
<i>Lycopale magnifica</i>	CEUA 92869	ZFMK-DNA-FD19584777	PP979580
<i>Lycopale mendozai</i> sp. nov.	CEUA 97946	ZFMK-DNA-FD19584738	PP979581
<i>Lycopale radioheadi</i> sp. nov.	CEUA 114094	ZFMK-DNA-FD19585551	PP979582

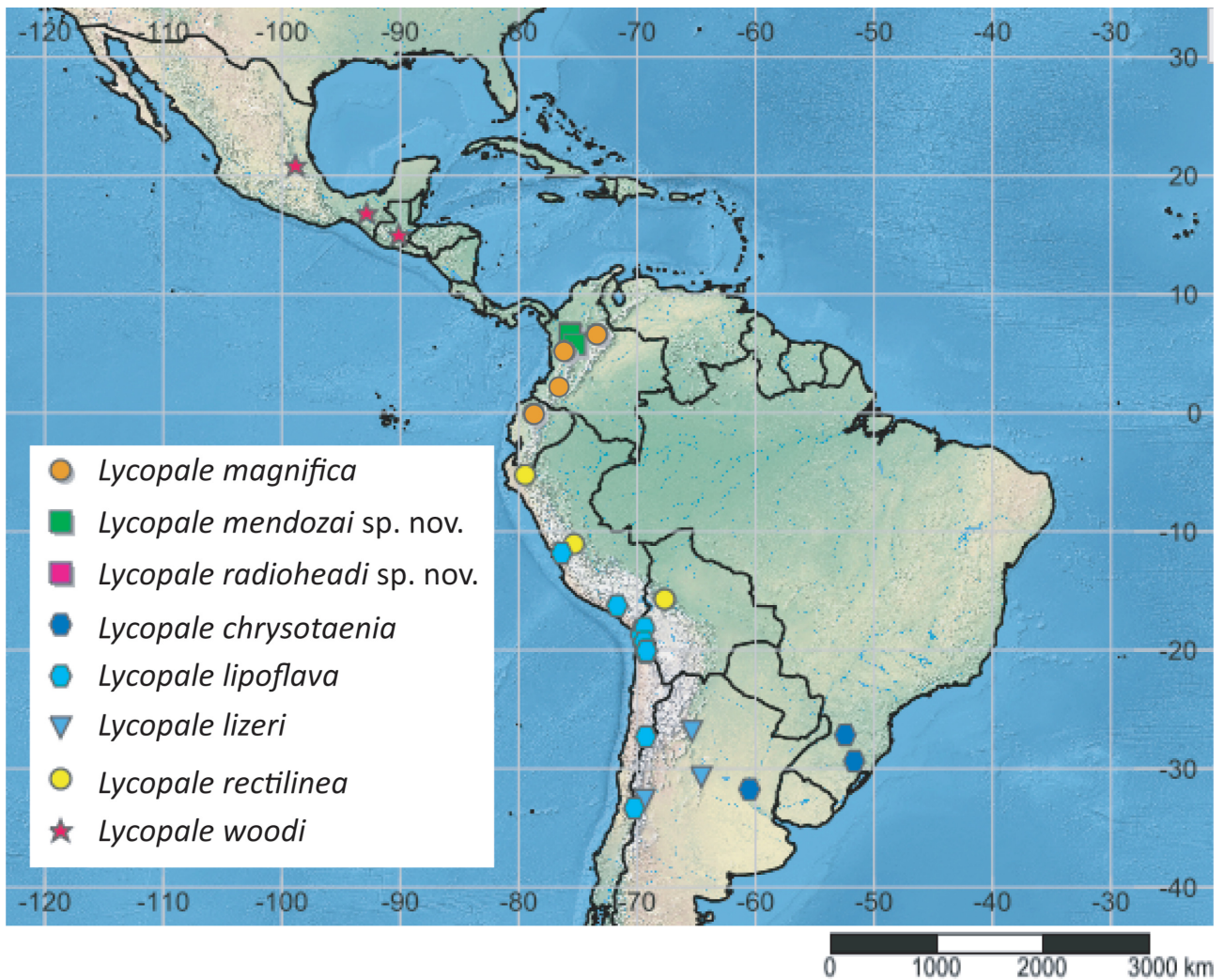


Fig. 10. Distributional map of *Lycopale* species.

2008; MORALES et al. 2013; MONTOYA 2016; MONTOYA et al. 2012, 2017, 2021; MONTOYA & WOLFF 2020, 2023). Most of these restricted species have been described based on a few specimens and/or exclusively known from the type material, in such a way that the local abundance of the species could be low, or the species could appear rare due to the difficulty of sampling in the isolated and difficult-to-access landscape where they occur, or even their preferred microhabitat has not been well explored and documented.

Therefore, the discovery of the two new species here described from the Colombian and Ecuadorian Tropical Andes hotspots highlights the underestimated diversity and high probability of finding additional unnamed species that remain to be described from this fragile, threatened, and unique ecosystem, which constitute also water reservoir for human supply. The above is a strong argument for considering new long-term research that evaluates population parameters and establish their threats level, by designing conservation actions to face the effect of climatic change as well as the growing and overflowed anthropic advance.

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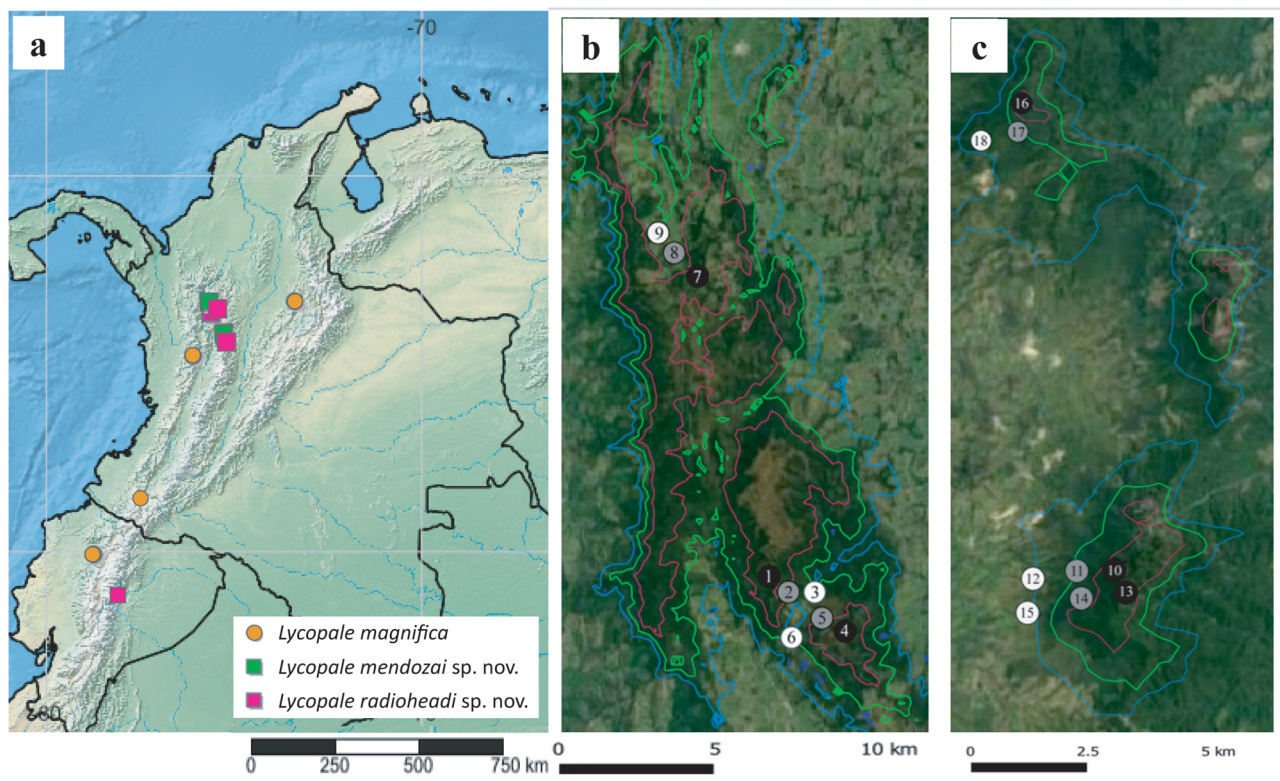


Fig. 11. A – detail of distributional map of *Lycopale* in Colombia and Ecuador. B–C – study area in: B – Paramo Santa Inés Belmira; C – Paramo Sonsón. Sampling sites where the type material of the new species was collected (see MONTROYA et al. 2021).

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