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RESEARCH ARTICLE

Three new species, first country records, and a key to South American *Cylloceria* (Hymenoptera: Ichneumonidae) from the Northern Andes

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ABSTRACT. Three new species of *Cylloceria* Schiødte, 1838 (Ichneumonidae: Cylloceriinae) from the Northern Andes are described, representing the first records of the genus for Colombia and Ecuador. This study aims to advance the understanding of Neotropical Cylloceriinae diversity and biogeography. Specimens were collected in high Andean forests in both countries using Malaise traps and were examined using stereomicroscopy. The newly described species—*C. andesilvana* sp. nov. from Ecuador, along with *C. jaramilloi* sp. nov. and *C. murrayblumi* sp. nov. from Colombia—are fully described and illustrated, and an identification key to all South American species of *Cylloceria* is provided. These findings increase the number of known Neotropical species of the genus to 12 and underscore the ecological relevance of Andean montane ecosystems as reservoirs of undocumented ichneumonid diversity.

KEYWORDS. Andean forests, biodiversity, Neotropical region, parasitoid wasps, species description, taxonomy.

INTRODUCTION

Ichneumonidae, or Darwin wasps (Klopfstein et al. 2019), are parasitoid wasps considered one of the largest families in the animal kingdom, acting as natural enemies of a wide range of holometabolous insects and spiders (Broad et al. 2018). Recently, 96 new species have been recorded from Colombia, increasing the country's total to 276 (Fernandes et al. 2023, Nascimento et al. 2024, Lima et al. 2024). In Ecuador, at least 287 species are currently known (Bordera et al. 2016a, 2016b, Yu et al. 2016, Bordera et al. 2019, Di Giovanni et al. 2021, Mazón and Bordera 2023, Bordera and Mazón 2024, Mazón et al. 2024).

Cylloceriinae Schiødte, 1839 comprises four genera: *Allomacrus* Förster, 1869 (five species), *Cylloceria* Schiødte, 1838 (34 species), *Hyperacmus* Holmgren, 1858 (five species), and *Rossemia* Humala, 1997 (one species) (Choi and Lee 2016, Yu et al. 2016, Khalaim et al. 2017, Liu and Reshchikov 2019). *Cylloceria* is a cosmopolitan genus, and only nine species are currently known from the Neotropical region: *Cylloceria alvaradoi* Gauld, 1991 (Mexico [Oaxaca, Veracruz], Honduras, Costa Rica, and Panama); *Cylloceria arizonica* Dasch, 1992 (USA and Mexico); *Cylloceria barbouraki* Gauld, 1991 (Costa Rica); *Cylloceria mexicana* Kasparyan & Ruíz-Cancino, 2003 (Mexico); *Cylloceria morelia* Humala & Khalaim, 2017 (Mexico); *Cylloceria tincochacae* Viereck, 1913 (Peru); *Cylloceria trishae* Gauld, 1991 (Costa Rica); *Cylloceria tropicana* Humala, 2012 (Mexico); and *Cylloceria ugaldevi* Gauld, 1991 (Costa Rica) (Yu et al. 2016, Khalaim et al. 2017).

Cylloceria is characterized by the presence of glymmae on the first metasomal tergite; short sternite distinctly separated from the tergite, usually only reaching the level of spiracles; absence of the basal transverse carina on the propodeum; and the specific location and shape of tyloids on the male flagellomeres, starting from the third segment (Varga and Kostro-Ambroziak 2021).

The biology of Cylloceriinae remains poorly understood, with only a few reliable host records available. Species of *Cylloceria* have been reared from the larvae of crane flies (Diptera: Tipulidae) collected in decaying wood (Broad et al. 2018). Prior to this study, no species of this subfamily had been recorded from Colombia or Ecuador. Here, we describe three new Neotropical species: two from Colombia and one from Ecuador. In addition, illustrations and an identification key to all South American species of *Cylloceria* are provided.

MATERIAL AND METHODS

The specimens examined in this study were deposited in three institutional collections: Entomological Collection of the Universidad de Antioquia (CEUA), Medellín, Colombia (curator M. Wolff), under the "ANLA collection permit of specimens of biological diversity"; Collection of the Universidad Nacional de Loja (LOUNAZ), Loja, Ecuador (curator A. Paucar-Cabrera); and the National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C., United States (curator S. Brady).

Terminology used in the species descriptions follows Broad et al. (2018), ensuring consistency with recent taxonomic treatments of Ichneumonidae.

Digital images, morphometric data, and proportions of the Colombian specimens were obtained using a Leica DMC4500 digital camera attached to a Leica M205A stereomicroscope, with image stacking performed using Leica Application Suite software (version 4.10.0). All images were processed and finalized using Adobe Photoshop.

Photographs and measurements of the Ecuadorian specimens were taken at the Natural History Museum, London (NHMUK), employing a Canon EOS 5DSR digital camera coupled with a Canon MP-E 65 mm macro lens, mounted on a StackShot Macro Rail system. Image acquisition and post-processing were conducted using Helicon Remote and Helicon Focus software (version 3.6.6).

The section "Type material" transcribes the details provided on the specimen labels. The distribution map showing the collection localities was generated using the online platform SimpleMappr (Shorthouse 2010).

TAXONOMY

Cylloceria Schiødte, 1838

Cylloceria Schiødte, 1838: 140. Type species: *Phytodietus caligatus* Gravenhorst, 1829.
Chalinocerus Ratzeburg, 1852: 130. Type species: *Chalinocerus longicornis* Ratzeburg, 1852.
Asphragis Förster, 1869: 166. Type species: *Lissonota occupator* Gravenhorst, 1829.

Cylloceria andesilvana Mazón, sp. nov.

Figs 1A–C, 6

https://zoobank.org/6F3A9769-C82B-4F92-AC24-BEE171F9BB7B

Type material. Holotype female: ECUADOR • ♀; Zamora Chinchipe province, Tapichalaca Reserve, degraded area, Malaise trap, 4°29'20.8"S 79°07'34.1"W, 2574 masl, 31.III-15.IV.2018, Leg. M. Mazón (LOUNAZ). Paratypes ECUADOR • 7 ♀♀; same locality and date as holotype (1 female, LOUNAZ); same locality as holotype, 15–29.IV.2018 (1 female, LOUNAZ); Loja province, Madrigal del Podocarpus Reserve, secondary forest, Malaise trap, 4°30'50.0"S 79°10'30.7"W, 2519 masl, 21.XII.2015–8.I.2016 (1 female, LOUNAZ); same locality, area under ecological restoration, Malaise trap, 02–21.XII.2015 (1 female - LOUNAZ); same locality and same ecosystem, 08–21.I.2016. All leg. M. Mazón, (3 females - LOUNAZ).

Diagnosis. *Cylloceria andesilvana* sp. nov. can be distinguished from other Neotropical species by the following combination of characters: 1) head about 2.0 × wider than long; 2) frons smooth; 3) fore wing with nervellus antefurcal; 4) wings hyaline; 5) tergite I about 2.0 × longer than wide, rugulose, with indistinct dorso-median carinae in basal half; 6) ovipositor sheath about 1.5 × longer than hind tibia.

Description. Female (Holotype). Body length 10.8 mm, fore wing length 10.2 mm. Head about 2.0 × wider than long. Antenna long and slender, with 28 flagellomeres; first flagellomere about 13.0 × longer than centrally broad. Gena relatively short, slightly and roundly narrowed behind eye, with setiferous punctures on a shiny background. Ocelli of moderate size, distance between lateral ocellus and eye as long as ocellar diameter; ocelli surrounded by a thin carina, separated from the occipital carina by a distance greater than the ocellar diameter. Occipital carina complete. Face about 2.0 × wider than high and about 0.5 × as wide as head, with parallel sides, rugose in the middle, densely punctured at sides, only smooth and polished along a narrow band by facial orbits; central part of the face slightly convex and limited by two shallow vertical grooves that divide face into three areas of approximately the same width. Frons

Figure 1. Holotype and paratype of *Cylloceria andesilvana* sp. nov., female: (A) Habitus, holotype; (B) head, frontal view, (paratype); (C) head, mesosoma and tergite I, dorsal view, paratype. Scale bars: 1.0 mm.

smooth, only sparsely punctate, slightly concave. Clypeus polished, narrowly convex along anterior margin, remainder flattened, separated from face by a distinct groove, about 2.5 × wider than long, with posterior margin truncate. Malar space strongly granulate, about 1.0 × as long as width of the mandibular base, with subocular sulcus present. Mandible robust, upper tooth more than twice as wide as lower one; anterior half of mandible with rough setiferous punctures, posterior half smooth and polished (Fig. 1B). Mesosoma about 1.5 × longer than high in lateral view. Mesoscutum about 1.0 × longer than wide, in profile abruptly rounded; notauli deep, converging and meeting posteriorly on a

strongly strigose-rugulose area, the rest of the surface densely punctate on a shiny background (Fig. 1C). Epomia present; propleurum smooth and polished, with some wrinkles parallel to epomia. Scutellum convex, with lateral carinae only at its anterior part. Mesopleuron smooth, somewhat rugose posteriorly, with scattered punctures bearing rather long white setae; epicnemial carina complete, reaching anterior margin of mesopleuron. Metapleuron coarsely rugulose. Propodeum coarsely rugulose, with lateromedian longitudinal carinae subparallel, slightly converging towards posterior part; propodeal spiracle ovoid, pleural carina thin and complete. Legs with hind femur about 5.5 × longer than wide; tarsus I of hind leg about 0.5 × as long as the hind tibia. Fore wing with nervellus antefurcal; 2rs-m about 0.5 × longer than abscissa of M between 2rs-m and 2m-cu. Hind wing nervellus intercepted in the middle by second abscissa of CU. Metasoma with tergite I about 2.0 × longer than wide, rugulose, with indistinct dorso-median carinae in basal half; spiracle at anterior 0.5 of tergite. Glymma present. Sternite I separated from tergite, with sclerotized part reaching about 0.5 × length of tergite (in center) and posterior margin roundly incised. Tergite II about 1.0 × longer than wide, mostly unpolished and granulate, only polished on posterior 0.1 of its length, with some scattered setiferous punctures along the tergite. Remaining tergites subpolished, with denser setiferous punctures. Ovipositor sheath moderately long, about 1.5 × longer than hind tibia, with dorsal subapical notch.

Coloration. Body predominantly black; second and following metasomal tergites with a fine posterior line and thyridium reddish-brown; annellus and mandible teeth, reddish-brown; palpi brown; tegula dark brown; legs, except black coxae and brown trochantera, yellow; wings hyaline, with a light golden tone, veins and pterostigma brown to dark brown (Fig. 1A).

Variation. Some of the paratypes from Loja province are smaller, body length from 7.5 to 10.8 mm, and fore wing length from 6.5 to 9.5 mm. One of the paratypes has 27 flagellomeres. Grooves in face might be more or less conspicuous. Lateral longitudinal carina of propodeum is sometimes more or less developed.

Male. Unknown.

Distribution. Ecuador (Loja and Zamora Chinchipe provinces) (Fig. 6).

Etymology. The specific epithet refers to the ecosystem type where the type material was collected: Andean forests. The name is derived from the Latin *silvana*, meaning "from the forest", combined with *andes*.

Biology. Host unknown. Specimens were collected at elevations between 2,519–2,574 m a.s.l.

Remarks. *Cylloceria andesilvana* sp. nov. is similar to *C. alvaradoi* mainly by the metapleuron centrally rugulose; the narrow malar space about 1.0 × as long as width of the mandibular base; mesopleuron smooth, somewhat rugose posteriorly, with scattered punctures bearing rather long whitish setae; and the black coloration of the body except for the yellow legs. In *C. andesilvana* sp. nov., fore wing with nervellus antefurcal; hind wing nervellus intercepted in the middle by second abscissa of CU; propodeum coarsely rugulose, with lateromedian longitudinal carinae subparallel, slightly converging towards posterior part, pleural carina thin and complete; metasoma with tergite I rugulose; ovipositor sheath moderately long, about 1.5 × longer than hind tibia, with dorsal subapical notch. In contrast, in *C. alvaradoi* fore wing with nervellus interstitial; hind wing nervellus intercepted below the middle inclivous by second abscissa of CU; propodeum dorsally coriaceous between longitudinal carinae; metasoma with tergite I finely coriaceous; ovipositor sheath moderately long, in all 1.9–2.0 × as long as hind tibia.

Cylloceria jaramilloi Fernandes, Nascimento & Pádua, sp. nov.

Figs 2 A–E, 4 C–D, 6

https://zoobank.org/B167719A-E2BA-49BF-99A7-492E9CC71AFC

Type material. Holotype female: COLOMBIA • ♀; Mcpio [Municipio] Andes, Antioquia, Mesenia-Paramillo Nature Reserve, Malaise trap 3, 5°29'55.5"N 75°54'14.0"W, 2501 msnm, IX.2020, col. L. Mazariegos (CEUA). Paratypes COLOMBIA • 6 ♀♀; Mcpio [Municipio] Andes, Antióquia, Mesenia-Paramillo Nature Reserve, Malaise trap 3, 5°29'55.5"N 75°54'14.0"W, 2501 msnm, II-III.2021, col. L. Mazariegos (3 females - CEUA); same data but, I.2021, col. L. Mazariegos (1 female - CEUA); same data but, V.2021, col. L. Mazariegos (1 female - CEUA); same data but, IX.2021, col. L. Mazariegos (1 female - CEUA).

Diagnosis. *Cylloceria jaramilloi* sp. nov. can be distinguished from other Neotropical species by the following combination of characters: 1) Head about 1.5 × wider than long; 2) frons slightly rugose; 3) fore wing with nervellus interstitial; 4) wings brown iridescent; 5) tergite I about 2.5 × longer than wide, polished and granulate on anterior and slightly granulate posteriorly; and 6) ovipositor sheath about 1.5 × longer than hind tibia.

Description. Female (Holotype). Body length 8.2 mm, fore wing length 6.9 mm. Head about 1.5 × wider than long. Antenna long and slender with 44 flagellomeres; first

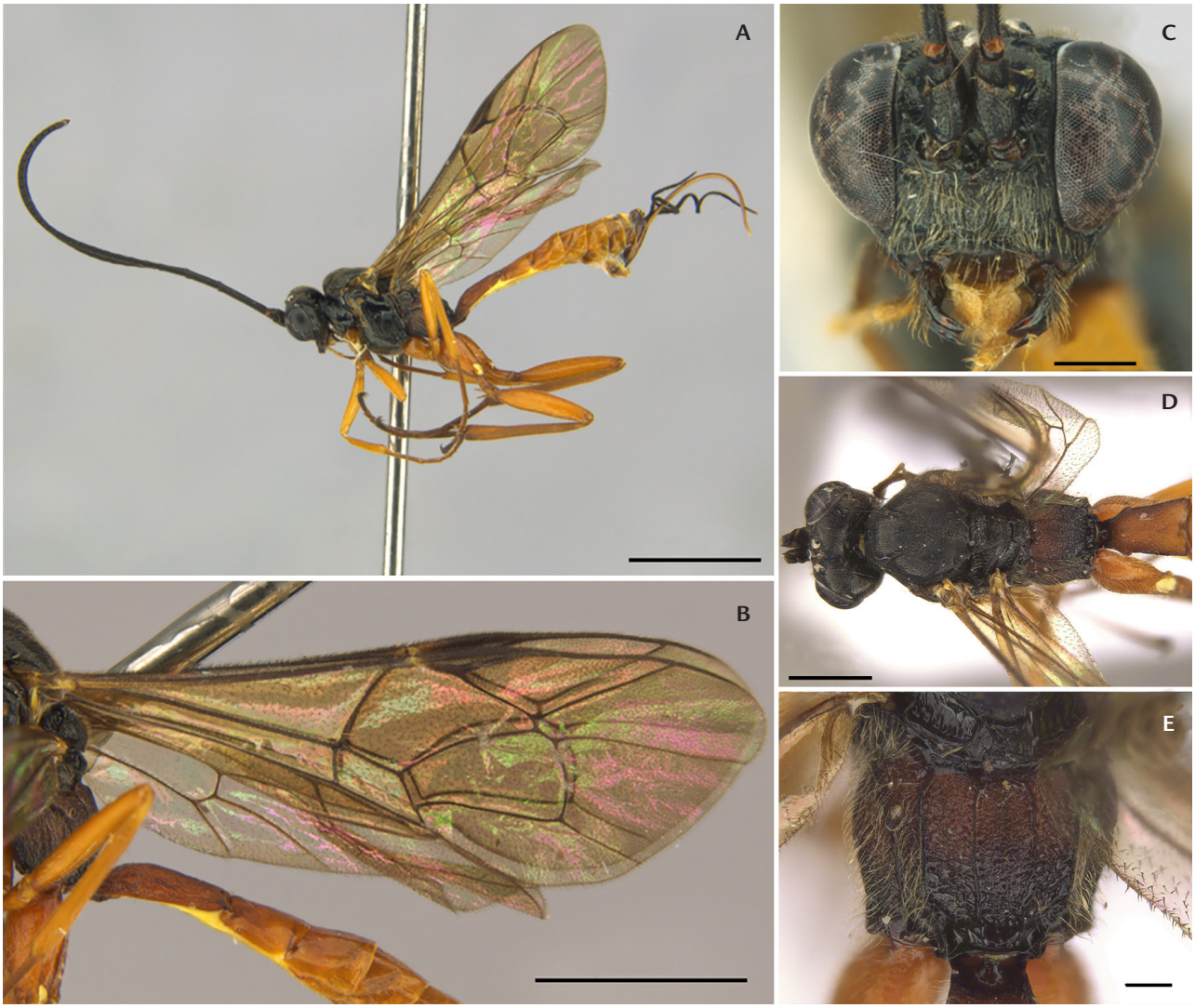

Figure 2. Holotype of *Cylloceria jaramilloi* sp. nov., female: (A) Habitus; (B) wings; (C) head, frontal view; (D) mesosoma, dorsal view; (E) propodeum, dorsal view. Scale bars: A–B = 2.0 mm, C = 0.5 mm, D = 1.0 mm, E = 0.2 mm.

flagellomere about 7.0 × longer than centrally broad. Gena relatively short, slightly and roundly narrowed behind eye, with setiferous punctures on a shiny background. Ocelli of moderate size, distance between lateral ocellus and eye as long as ocellar diameter; ocelli surrounded by a thin carina, separated from the occipital carina by a distance greater than the ocellar diameter. Occipital carina complete. Face about 2.0 × wider than high and about 0.5 × as wide as head, with parallel sides, rugose in the middle, densely punctured, only smooth and polished along a narrow band by facial orbits; central part of the face slightly convex and limited by two shallow vertical grooves that divide face into three areas of approximately the same width. Frons slightly rugose, sparsely punctate, slightly concave. Clypeus polished, narrowly convex along anterior margin, remainder flattened, separated from face by a distinct groove, about 5.0 × wider than long, with posterior margin truncate. Malar space strongly granulate, about 2.0 × longer than the width of the mandibular base, with subocular sulcus present. Mandible robust, upper tooth more than twice as wide as lower one; basal half of mandible with rough setiferous punctures, apical half smooth and polished (Fig. 2C). Mesosoma about 1.5 × longer than high in lateral view. Mesoscutum about 1.0 × longer than wide, in profile abruptly rounded; notauli

deep, converging and meeting posteriorly on a strongly strigose-rugulose area, the rest of the surface densely punctate on a polished background (Fig. 2D). Epomia present; propleurum smooth and polished, with some wrinkles parallel to epomia. Scutellum convex, with lateral carinae only at its anterior part (Fig. 2D). Mesopleuron smooth, somewhat rugose posteriorly, with scattered punctures bearing rather long white setae; epicnemial carina complete, reaching anterior margin of mesopleuron. Metapleuron coarsely rugulose (Fig. 4C). Propodeum coarsely rugulose, with lateromedian longitudinal carinae subparallel, slightly converging towards posterior part; propodeal spiracle ovoid, pleural carina thin and complete (Figs 2E, 4D). Legs with hind femur about 5.0 × longer than wide; tarsus I of hind leg about 0.5 × as long as the hind tibia. Fore wing with nervellus interstitial; 2rs-m about 0.5 × longer than abscissa of M between 2rs-m and 2m-cu. Hind wing nervellus intercepted in the middle by second abscissa of CU (Fig. 2B). Metasoma with tergite I about 2.5 × longer than wide, rugulose, with indistinct dorso-median carinae in basal half; spiracle at anterior 0.5 of tergite; tergite I with two latero-median carinae. Glymma present. Sternite I separated from tergite, with sclerotized part reaching about 0.2 × length of tergite (in center) and posterior margin roundly incised. Tergite II about 0.75 × longer than wide, polished, and granulate on anterior and slightly granulate posteriorly, T3+ polished with some setiferous punctures. Ovipositor sheath moderately long, about 1.5 × longer than hind tibia, ovipositor tip with dorsal subapical notch.

Coloration. Head black with labial palp brown and maxillary palp yellow; mesosoma predominantly black with the anterior part of propodeum reddish-brown to black; wings brown iridescent, veins and pterostigma brown to dark brown; legs orangish-red with infuscate tarsus; metasoma orangish-red with TI infuscate (Fig. 2A).

Variation. Body length 6.6–8.4 mm. Fore wing length 6.8–7.0 mm.

Male. Unknown.

Distribution. Antioquia (Colombia) (Fig. 6).

Etymology. The specific epithet *jaramilloi* pays tribute to Jorge Jaramillo Jaramillo, a native of La Mesenia village and a dedicated park ranger at the Mesenia-Paramillo Nature Reserve. Jorge's invaluable contributions extend far beyond his role as a ranger; his expertise has significantly advanced our understanding of the biodiversity of Hymenoptera within the reserve.

Biology. Host unknown. Specimens were collected at 2,501 m a.s.l.

Remarks. *Cylloceria jaramilloi* sp. nov. is similar to *C. mexicana* mainly in color pattern, having body black and metasoma with TI blackish and TII+ reddish brown; occipital carina complete; epomia present; epicnemial carina complete; metapleuron coarsely rugulose; 2rs-m about 0.5 × longer than abscissa of M between 2rs-m and 2m-cu; ovipositor sheath moderately long, about 1.5 × longer than hind tibia, with dorsal subapical notch. In *C. jaramilloi* sp. nov. legs orangish red with infuscate tarsus; malar space strongly granulate, about 2.0 × longer than the width of the mandibular base, with subocular sulcus present; mesopleuron smooth, somewhat rugose posteriorly, with scattered punctures bearing rather long white setae; propodeum coarsely rugulose, with lateromedian longitudinal carinae subparallel, slightly converging towards posterior part; propodeal spiracle ovoid, pleural carina thin and complete; fore wing with nervellus interstitial; and metasoma with tergite I about 2.5 × longer than wide. In contrast, in *C. mexicana* all coxae and trochanters black, femora reddish, all tibiae, spurs, front and middle tarsi brownish red, hind femur at extreme apex and hind tibia at basal 0.08 blackish, and hind tarsus blackish or dark brown; malar space 0.9–1.0 × as long as basal width of mandible; mesopleuron usually matt, predominantly rugulose with punctures; propodeum coarsely rugulose with all longitudinal carinae of propodeum distinct to hind margin of propodeum, apical transverse carina present, apical area very short, subpolished, partly crossed by longitudinal carina; fore wing with nervellus antefurcal; and metasoma with tergite I about 1.7 × longer than wide.

Cylloceria murrayblumi Fernandes, Nascimento & Pádua, sp. nov.

Figs 3 A–E, 4 A–B, 6

https://zoobank.org/89E7D0F3-3602-49AB-830E-5C7774631AC1

Type material. Holotype female: COLOMBIA • ♀; Mcpio [Municipio] Andes, Antióquia, Mesenia-Paramillo Nature Reserve, Malaise [trap] 3, 5°29'55.5"N 75°54'14.0"W, 2501 msnm, VII.2020, col. L. Mazariegos (1 female - CEUA). Paratype: COLOMBIA • ♀; Mcpio [Municipio] Andes, Antióquia, Mesenia-Paramillo Nature Reserve, Malaise [trap] 1, 5°29'57.7"N 75°54'00.3"W, 2389 msnm, IX.2021, col. L. Mazariegos (CEUA).

Diagnosis. *Cylloceria murrayblumi* sp. nov. can be distinguished from other Neotropical species by the following combination of characters: 1) Head about 2.0 × wider than long; 2) frons slightly rugose; 3) fore wing with nervellus interstitial; 4) wings brown iridescent; 5) tergite I about 2.0 × longer than wide, rugulose, with indistinct dorso-median

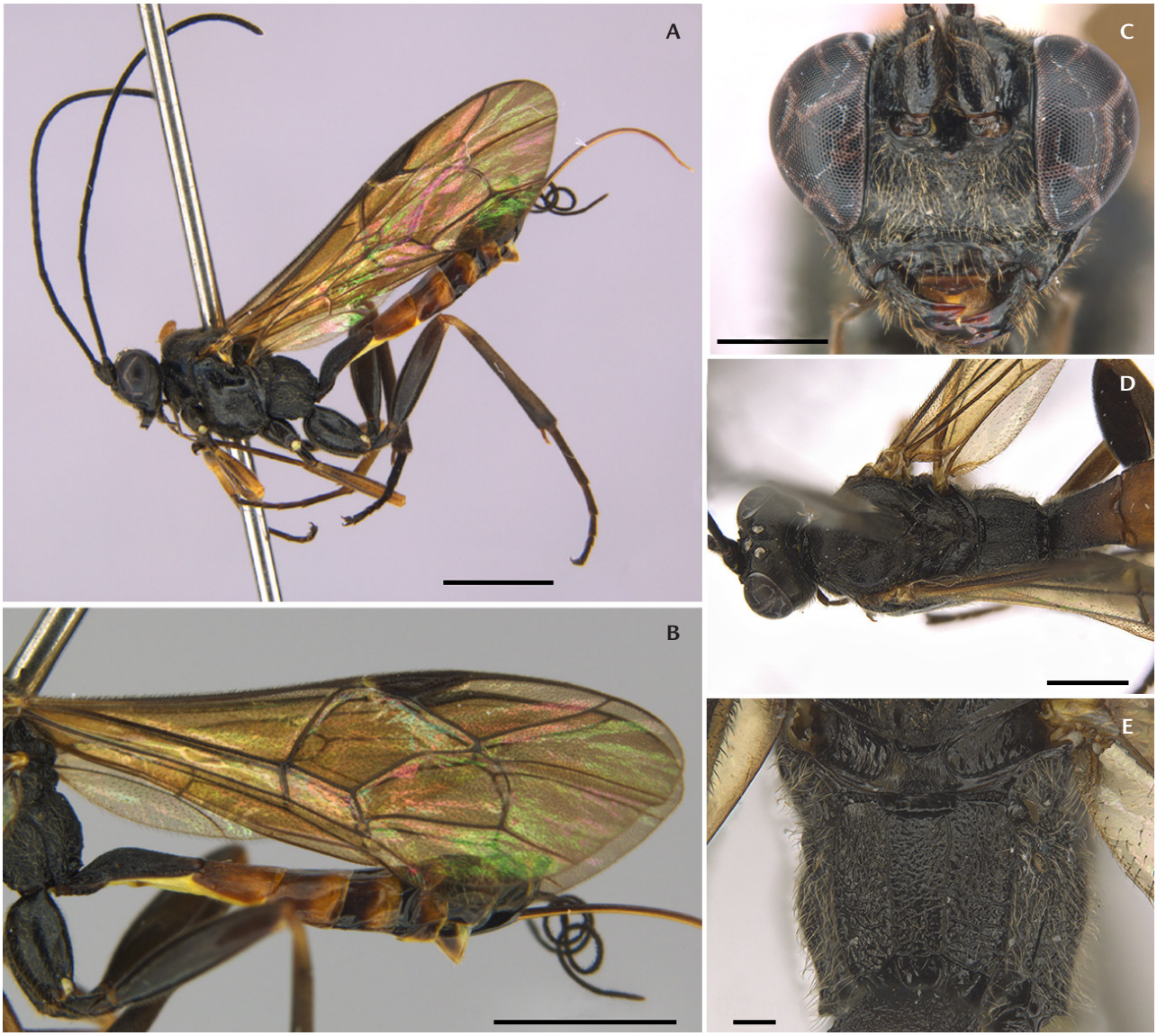

Figure 3. Holotype of *Cylloceria murrayblumi* sp. nov., female: (A) Habitus; (B) wings; (C) head, frontal view; (D) mesosoma, dorsal view; (E) propodeum, dorsal view. Scale bars: A–B = 2.0 mm, C = 0.5 mm, D = 1.0 mm, E = 0.2 mm.

carinae in basal half; and 6) ovipositor sheath about 1.0 × longer than hind tibia.

Description. Female (Holotype). Body length 9.3 mm, fore wing length 7.5 mm. Head about 2.0 × wider than long. Antenna long and slender, with 27 flagellomeres; first flagellomere about 12.0 × longer than centrally broad. Gena relatively short, slightly and roundly narrowed behind eye, with setiferous punctures on a shiny background. Ocelli of moderate size, distance between lateral ocellus and eye as long as ocellar diameter; ocelli surrounded by a thin carina, separated from the occipital carina by a distance greater than the ocellar diameter. Occipital carina complete. Face about 2.0 × wider than high and about 0.5 × as wide as head, with parallel sides, rugose in the middle, densely punctured at sides, only smooth and polished along a narrow band by facial orbits; central part of the face slightly convex and limited by two shallow vertical grooves that divide face into three areas of approximately the same width. Frons slightly rugose, sparsely punctate, slightly concave. Clypeus polished, narrowly convex along anterior margin, remainder

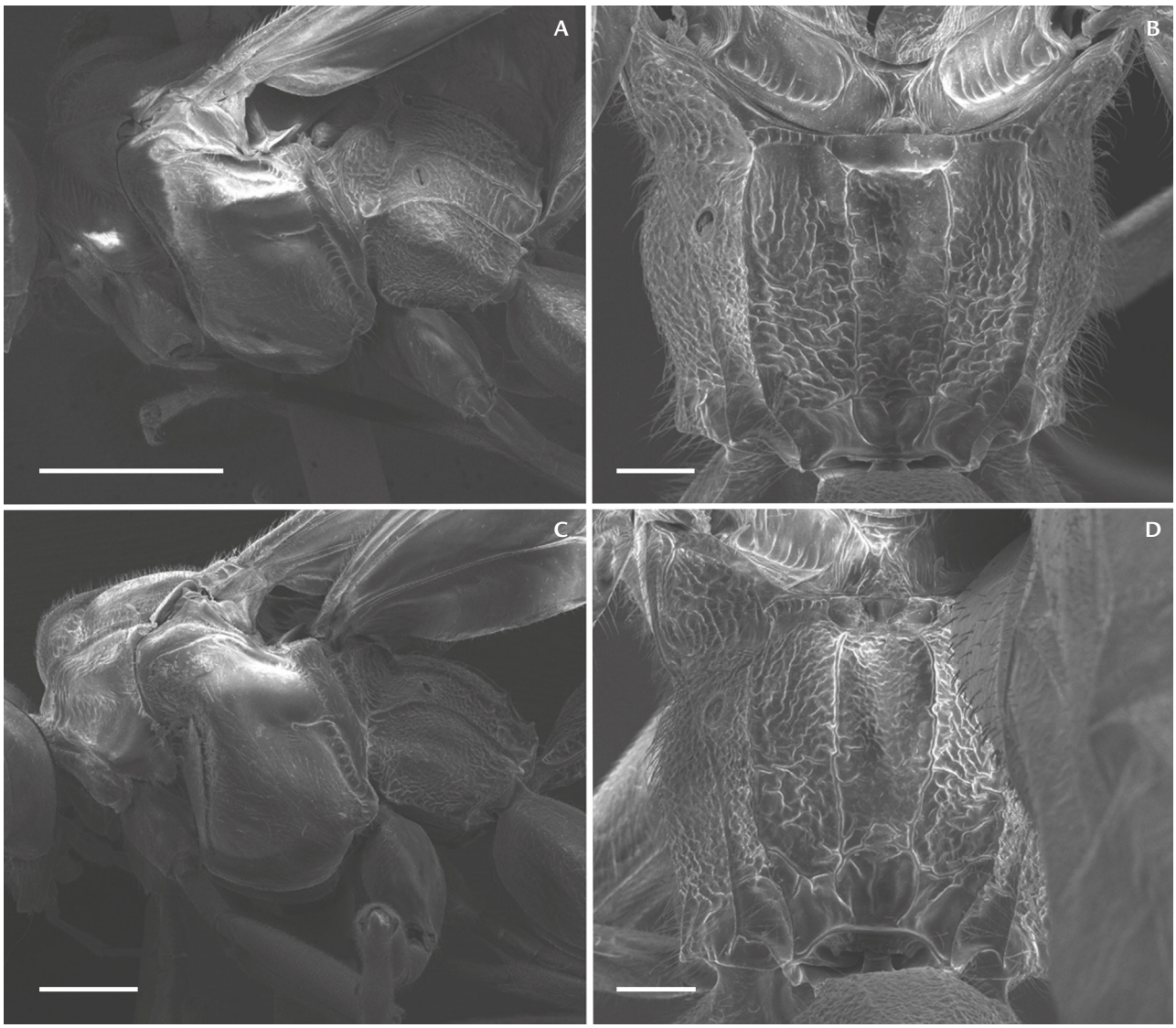

Figure 4. *Cylloceria* spp. in a scanning electron microscope: (A–B) Holotype of *Cylloceria murrayblumi* sp. nov., female: (A) mesosoma, lateral view; (B) propodeum, dorsal view. (C–D) Holotype of *Cylloceria jaramilloi* sp. nov., female: (C) mesosoma, lateral view; (D) propodeum, dorsal view. Scale bars: A = 1.0 mm, B = 0.2 mm, C = 0.2 mm, D = 0.2 mm.

flattened, separated from face by a distinct groove, about 3.0 × wider than long, with posterior margin truncate. Malar space strongly granulate, about 0.1 × as long as width of the mandibular base, with subocular sulcus present. Mandible robust, upper tooth more than twice as wide as lower one; basal half of mandible with rough setiferous punctures, apical half smooth and polished (Fig. 3C). Mesosoma about 1.5 × longer than high in lateral view. Mesoscutum about 1.0 × longer than wide, in profile abruptly rounded; notauli deep, converging and meeting posteriorly on a strongly strigose-rugulose area, the rest of the surface densely punctate on a polished background. Epomia present; propleurum smooth and polished, with some wrinkles parallel to epomia. Scutellum convex, with lateral carinae only at its anterior part (Fig. 3D). Mesopleuron smooth, somewhat rugose posteriorly, with scattered punctures bearing rather long white setae; epicnemial carina complete, reaching anterior margin of mesopleuron. Metapleuron coarsely rugulose (Fig. 4A). Propodeum coarsely rugulose, with lateromedian longitudinal carinae subparallel, slightly converging towards

posterior part; propodeal spiracle ovoid, pleural carina thin and complete (Figs 3E, 4B). Legs with hind femur about 4.5 × longer than wide; tarsus I of hind leg about 2.0 × as long as the hind tibia. Fore wing with nervellus interstitial; 2rs-m about 0.5 × longer than abscissa of M between 2rs-m and 2m-cu. Hind wing nervellus intercepted in the middle by second abscissa of CU (Fig. 3B). Metasoma with tergite I about 2.0 × longer than wide, rugulose, with indistinct dorso-median carinae in basal half; spiracle at anterior 0.5 of tergite; tergite I without two latero-median carinae. Glymma present. Sternite I separated from tergite, with sclerotized part reaching about 0.3 × length of tergite (in center) and posterior margin roundly incised. Tergite II about 1.0 × longer than wide, polished, and granulate anteriorly and polished posteriorly, with some scattered setiferous punctures along the tergite. Remaining tergites subpolished, with denser setiferous punctures. Ovipositor sheath moderately long, about 1.0 × longer than hind tibia, ovipositor tip with dorsal subapical notch.

Coloration. Body black with labial palp and maxillary palp brown; mesosoma predominantly black; fore and mid legs with femur yellowish-orange and infuscate mark, tibia yellowish-orange, and tarsus dark brown; hind leg with basal part of tibia infuscate; wings brown iridescent, veins and pterostigma dark brown; metasoma black with apical margin tergites II–V reddish (Fig. 3A).

Variation. Body length 9.0–9.5 mm; flagellomeres 27–29. Fore wing length 7.5–7.9 mm.

Male. Unknown.

Distribution. Antioquia (Colombia) (Fig. 6).

Etymology. Named in honor of Murray Blum (1929–2015), an American pioneering entomologist recognized for his research in chemical ecology and his innovative studies on chemical communication by insects. Blum served as a research professor at the University of Georgia for three decades and was highly decorated for his significant contributions to the field, including authoring over 300 papers.

Biology. Host unknown. Specimens collected at elevations between 2,389–2,501 m a.s.l.

Remarks. *Cylloceria murrayblumi* sp. nov. is similar to *C. arizonica* and *C. morelia* mainly by having black body with tergites II–V with apical margin reddish or brownish; mesosoma about 1.5 × longer than high in lateral view; propodeum coarsely rugulose; glymma present; epomia present; scutellum convex, with lateral carinae only at its anterior part; epicnemial carina complete, reaching anterior margin of mesopleuron; and metapleuron coarsely rugulose. In *C. murrayblumi* sp. nov. fore and mid legs with femur yellowish orange and infuscate mark, tibia yellowish orange, and tarsus dark brown, and hind leg with basal part of tibia infuscate; clypeus polished, narrowly convex along anterior margin, remainder flattened, separated from face by a distinct groove, about 3.0 × wider than long, with posterior margin truncate; propodeum with lateromedian longitudinal carinae subparallel, slightly converging towards posterior part, pleural carina thin and complete; fore wing with nervellus interstitial; and ovipositor sheath moderately long, about 1.0 × longer than hind tibia, with dorsal subapical notch. In contrast, in *C. arizonica* rufous on legs except more dusky apically on tarsus; clypeus slightly raised at base, then flattened to apex, apex truncate; propodeum with carinae largely lacking except for faint portions of median and lateral longitudinal carinae, and stronger transverse carina around petiolar area, petiolar area mostly polished; fore wing with nervellus interstitial; and ovipositor short, stout, and curved, about 1.6 × length of hind tibia. In contrast, in *C. morelia* fore and mid legs dark brown with coxae black and trochanters mostly whitish, and hind leg predominantly black with spurs brown and trochantellus ventrally with white strip; clypeus convex along upper margin, remainder flattened, separated from face by distinct groove, 2.7 × as wide as high, with apical margin truncate; propodeum with dorsal longitudinal carinae subparallel and posterior transverse carina more or less developed centrally; fore wing with nervellus antefurcal; and ovipositor moderately long, 1.8 × as long as hind tibia, with subapical dorsal notch.

Cylloceria tincochacae Viereck, 1913

Figs 5A–C

Type material. Holotype male: PERU • ♂; Cusco, Tincochaca, 7000ft.[2134m], 8.VIII.1911, YalePeruvExp [Yale Peruvian Expedition], USNMENT01520905, studied by photographs [EZID: http://n2t.net/ark:/65665/3ae40ffe1-bb94-4d75-9a66-d97f3dc03f5e] (digital image analyzed).

Diagnosis. According to the original description by Viereck (1913), this species can be distinguished by the following combination of characters: 1) frons slightly rugose; 2) wings hyaline; 3) propodeum with median longitudinal carinae converging posteriorly; 4) tergite I with the presence of two longitudinal carinae between the spiracles and the base of the segment; 5) body black, with all femurs, tibiae, and tarsi brownish orange, except hind tibia and tarsus brownish.

Female. Unknown.

Distribution. Peru (Cusco) (Fig. 6).

Biology. Host unknown. Specimens collected at 2,133.6 m a.s.l.

Key to South American species of *Cylloceria* Schiødte, 1838

The female of *C. tincochacae* and the males of *C. andesilvana* sp. nov., *C. jaramilloi* sp. nov., and *C. murrayblumi* sp. nov. are unknown

1. Frons slightly rugose 2
1'. Frons smooth ... *Cylloceria andesilvana* Mazón, sp. nov.
2. Wings brown iridescent; metasoma not entirely black 3
2'. Wings hyaline; metasoma entirely black .... *C. tincochacae* Viereck, 1913
3. Head about 1.5 × wider than long; tergite II about 0.75 × longer than wide, polished and granulate on anterior and slightly granulate posteriorly; metasoma orangish-red ..... *C. jaramilloi* Fernandes, Nascimento & Pádua, sp. nov.
3'. Head about 2.0 × wider than long; tergite I about 2.0 × longer than wide, rugulose; metasoma black with apical margins tergites II–V reddish ..... *C. murrayblumi* Fernandes, Nascimento & Pádua, sp. nov.

DISCUSSION

Eight species of *Cylloceria* are currently known from the Neotropical part of Mexico southwards to Costa Rica and Panama, and together with the four species known from South America, i.e., *C. tincochacae* from Peru and the three new species described herein: *Cylloceria jaramilloi* sp. nov., and *Cylloceria murrayblumi* sp. nov. from Colombia; and *Cylloceria andesilvana* sp. nov. from Ecuador, it brings the total number of described species of this genus to 12 for the Neotropical Region. All South American species were collected at high

Figure 5. Holotype of *Cylloceria tincochacae*, male: (A) Habitus, lateral view; (B) habitus, dorsal view; (C) head, frontal view. Photos: Natasha Young. Scale bars: A–B = 2.0 mm, C = 1.0 mm.

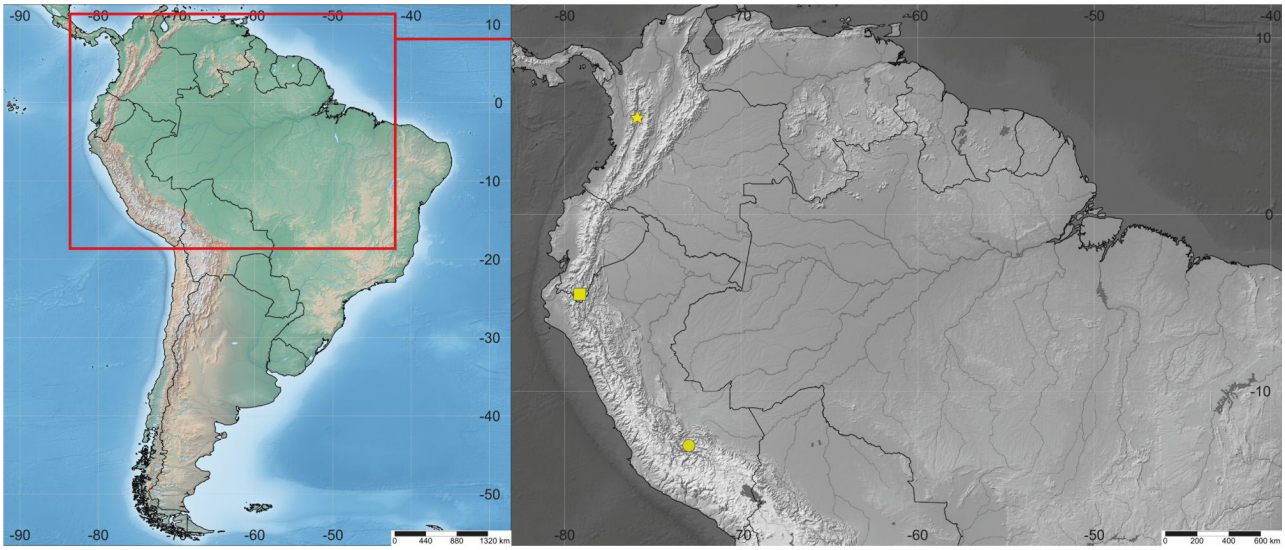

Figure 6. Geographical distribution of South American *Cylloceria*. Yellow star: *Cylloceria murrayblumi* sp. nov. and *Cylloceria jaramilloi* sp. nov.; Yellow circle: *Cylloceria tincochacae*; Yellow square: *Cylloceria andesilvana* sp. nov.

elevations, approximately between 2,134 and 2,574 m a.s.l. The other neotropical species of *Cylloceria* were collected above 2,000-2,500 m (Gauld 1991, Dasch 1992, Kasparyan and Ruíz-Cancino 2003, Humala 2012, Khalaim et al. 2017) except *C. alvaradoi* (1,200–1,800 m in Costa Rica and Honduras) (Gauld 1991, Humala 2012) and *C. arizonica* with some specimens collected below 1,800 m (Dasch 1992, Humala 2012).

Probably, the distribution of this subfamily is wider in this region, but the lack of samples and specialists of this subfamily is an obstacle to the study of this group of Darwin wasps. In recent years, 30 species of Ichneumonidae have been recorded for the Mesenia-Paramillo Nature Reserve, thirteen being new to science, which demonstrates a notable gap in knowledge of Darwin wasps in this region (as well as in Colombia as a whole). However, this reserve can still contribute considerably to the knowledge of Colombian species in the coming years, as sampling efforts in this area are still quite recent (2017–2022) (see Pádua et al. 2019, 2020, 2023, Araujo et al. 2020, Araujo et al. 2022, Fernandes et al. 2023, Nascimento et al. 2024, Lima et al. 2024).

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DRRF: Conceptualization, Investigation, Writing – original draft. ACN: Investigation, Writing – review & editing. DGP: Conceptualization, Investigation, Writing – review & editing. ROA: Project administration, Conceptualization, Investigation, Writing – review & editing. LAM: Resources, Data curation, Writing – review & editing. MM: Investigation, Writing – original draft, Writing – review & editing.

Competing Interests

The authors have declared that no competing interests exist.

Data Availability Statement

All data generated and/or analyzed are included in this article.

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Ethical Statement

Not applicable. This study was based exclusively on specimens deposited in scientific collections and did not involve field collection or handling of live vertebrate animals.

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