

RESEARCH ARTICLE

A new species of *Heredius* (Hymenoptera: Braconidae: Doryctinae) from Brazilian Amazon Rainforest

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ABSTRACT. *Heredius* Marsh, 2002 is a small genus, with only three described species, recorded only in Costa Rica and Brazil. The aim of this paper was to describe a new species of *Heredius* from Brazilian Amazon Rainforest. The specimen was collected by Malaise trapping in the Adolpho Ducke Forest Reserve (02°57'S, 59°55'W), Manaus, Amazonas, Brazil. A new species, *Heredius gadelhai* sp. nov. differs from the other three known species mainly having 1.5 mm long, is entirely yellow, ocellar-ocular distance of about 3.5 times the diameter of the lateral ocellus; malar space 0.3 times the height of the eye; first flagellomere 0.8 times the length of the second flagellomere; precoxal groove present and smooth, and ovipositor 0.2 times the length of the body. We illustrate and a key to all described species of *Heredius* were provided.

KEY WORDS. Distribution, neotropical, parasitoids, taxonomy.

INTRODUCTION

Doryctinae is one of the most diverse subfamilies of Braconidae, with over 2,000 valid species described and more than 200 valid genera (Yu et al. 2016, Chen and van Achterberg 2019, Saleh and Gadallah 2024). This subfamily is mostly composed of idiobiont ectoparasitoids of Coleoptera larvae, although some species are also known to attack Lepidoptera and Hymenoptera larvae (Yu et al. 2016, Belokobylskij et al. 2023). Phytophagy has evolved in one clade of Doryctinae, mainly associated with galls clade (Zaldívar-Riverón et al. 2014). Doryctinae is considered a morphologically diverse subfamily, and the complexity of its morphology and the diversity of its biological habits continue to challenge researchers in fully understanding this group (Belokobylskij et al. 2004). Various molecular phylogenetic studies based both on Sanger and nuclear genome-wide (ultraconserved

elements) data have recovered a non-monophyletic Doryctinae, with a mainly Old World clade not related to a New World, Australian and Holcobraconini clade (Zaldívar-Riverón et al. 2008, Sharanowski et al. 2011, Jasso-Martínez et al. 2022, Castañeda-Osório et al. 2024).

Heredius Marsh, 2002 is a small genus, with only three described species, recorded only in Costa Rica (*H. laselvus* Marsh, 2002) and Brazil (*H. flavus* Castro, Nunes & Pentead-Dias, 2011, and *H. assu* Castro & Pentead-Dias, 2017). In Brazil, the genus is known to occur in the states of São Paulo (savannah area) and Rio Grande do Norte (caatinga biome) (Castro et al. 2011, Castro and Pentead-Dias 2017, Shimbóri et al. 2024), and at least one undescribed species from the state of Espírito Santo (Atlantic Forest biome) (Azevedo et al. 2015). Species of *Heredius* are rare in collections (Castro and Pentead-Dias 2017) and the biology of this neotropical genus is still unknown. It is distinguished from other mem-

bers of Doryctinae by its acinose frons, fairly small body length (up to 4.0mm), and presence of hind wing vein cu-a (Marsh 2002). In this study, we describe and illustrate the first species of *Heredius* from the Brazilian Amazon Rainforest and provide a key to its known species.

MATERIAL AND METHODS

The specimen studied was collected by Malaise trapping in the Adolpho Ducke Forest Reserve (02°57'S, 59°55'W), Manaus, Amazonas, Brazil. For more details on the sample methodology see Silva et al. (2023, 2024, 2025). The type material is deposited in the Invertebrate Collection of Instituto Nacional de Pesquisas da Amazônia (INPA), Marcio L. Oliveira, curator.

Taxonomic concepts and identification. Specimens assigned to *Heredius* were identified using Marsh (2002). The specimen was compared with the other species, using Castro et al. (2011), Marsh (2002), and Castro and Penteado-Dias (2017). Identification at species level was conducted using the key to species provided by Castro and Penteado-Dias (2017). Morphological terminology mostly follows Sharkey and Wharton (1997), except for the term “precoxal sulcus” which replaces “sternaulus” (Wharton 2006). Surface sculpture nomenclature follows Harris (1979).

Digital images were taken using a Leica DMC4500 digital camera attached to a Leica M205A stereomicroscope and combined using the Leica Application Suite V4.10.0 software. The final images were edited in Adobe Photoshop. The distribution map was created using SimpleMappr software (Shorthouse 2010).

TAXONOMY

Heredius gadelhai sp. nov.

Figs 1, 2

<https://zoobank.org/B485A265-30D0-4FE1-B1F9-E25B3709E1ED>

Diagnosis. This is the smallest species of the genus at 1.5 mm (other species > 2.7 mm), with fewer antennal segments and the shorter ovipositor (both in relative and absolute terms), and may be distinguished from all other known members of the genus by the following combination of characters: body length 1.5 mm and entirely yellow, ocell-ocular distance about 3.5 times diameter of lateral ocellus; malar space 0.3 times eye height, antenna with 14 flagellomeres, first flagellomere is 0.8 times the length of the second flagellomere, precoxal sulcus smooth; ovipositor, 0.2 times the body length.

Type material. Holotype female: Brazil, Amazonas, Manaus, Reserva Ducke, 2°57'S 59°55'W, L6-3500, Malaise 2, Período 48 hours, X-2014, Azevedo, S.S. leg. (INPA). Holotype condition: Hind legs missing.

Description. Female. Body length 1.5 mm. (Fig. 1)

Head. Face, front, vertex and temple acinose (Fig. 1C–D); head width 1.4 times median length (dorsal view), 1.4 times width of mesoscutum. Transverse diameter of eye 3.9 times longer than temple in lateral view. Ocell-ocular distance about 3.5 times diameter of lateral ocellus. Ocelli arranged in an isosceles triangle. POL 1.0 times to OD, 0.3 times to OOL. Eye glabrous, 0.7 times wider than high. Height of malar space around 0.3 times height of eye. Hypoclypeal depression rounded, 1.9 times wider than height. Occipital carina complete, ventrally joined with hypostomal carina. Antenna with 16 antennomeres. Scape 1.6 times longer than its maximum width, first flagellar segment straight, 4.9 times longer than apical width, 0.8 times longer than second segment.

Mesosoma. Length of mesosoma 1.6 times its height (Fig. 1A–B, E). Pronotum, propleuron, and mesopleuron acinose. Mesoscutum 0.8 times longer than wide (dorsal view). Notauli scrobiculate (1F–G); precoxal sulcus smooth and nearly complete (Fig. 1B). Propodeum mostly rugose and acinose, areolate area slightly rugose and extending across the entire propodeum, forming a diamond shape. Wings (Fig. 1H): Fore wing 3.2 times longer than its maximum width. Pterostigma large, 3.6 times longer than wide. Vein r arising slightly after middle of pterostigma. Marginal cell length 3.3 times maximum width. Vein R1 1.6 times longer than pterostigma. Vein r 0.7 times as long as maximum width of pterostigma. Vein 3RSa straight in its length, 2.1 times longer than vein r, 0.8 times longer than vein 2RS. Vein 2RS 2.7 times longer than vein r, 2.6 times longer than vein m-cu. Vein m-cu in line with vein 2RS. Vein (RS+M) slightly curved. First discal cell 1.4 times longer than width. Veins 1M parallel to m-cu. Vein 1M 2.2 times longer than vein 1RS, 2.6 times longer than vein m-cu. Vein cu-a straight and short, 0.2 times the length of vein 1M. Vein M+CU straight. Hind wing 5.6 times longer than wide; vein cu-a straight. Legs: Hind legs broken/missing; fore tibia with a row of five spines arranged more or less in a line.

Metasoma. Metasoma 1.2 times longer than head and mesosoma combined. Maximum width of first tergite 1.7 times its minimum width; length 0.6 times longer than apical width, 0.6 times length of propodeum. First metasomal tergite rugulose, second metasomal tergite lacunose basally (Fig. 1G, I). Remaining tergites smooth with few setae. Median



Figure 1. *Hereditus gadelhai* sp. nov., holotype female: (A) lateral habitus; (B) body, lateral view; (C) head, dorsal view; (D) head, front view; (E) head and mesosoma, lateral; (F) mesoscutum, dorsal; (G) body, dorsal; (H) fore wings; (I) propodeum and metasoma, dorsal. Scale bars: = A, B, E, G, H, I = 0.5 mm, C, D, F = 0.1 mm.



Figure 2. Geographic distribution of species of *Heredius* in the world. Costa Rica and Brazilian state record is highlighted in gray. The red circle represents the specimens *Heredius laselvus*. Red star *Heredius flavus*, red triangle *Heredius assu* and blue square *Heredius gadelhai* sp. nov.

length of second tergite about 1.2 times its basal width, 2.1 times length of third tergite. Combined length of second and third tergites 0.9 times their maximum width. Ovipositor 0.4 times as long as metasoma, 0.6 times longer than mesosoma, 0.2 times as long as body, 0.2 times as long as fore wing.

Color. Body entirely light yellow (Fig. 1), except for light brown apical flagellomeres and forewing stigma, ovipositor black at the apex, sheaths light brown; palpi, coxae, trochanter, and trochantellus yellowish white; wings hyaline.

Male. Unknown.

Distribution. Amazonas (Brazil) (Fig. 2).

Biology. Host unknown.

Etymology. The new species is named in honor of our colleague and friend Sian Gadelha, a taxonomist who

specialized in braconid wasps and greatly contributed to the knowledge of the systematics of the Doryctinae.

Remarks. The new species is similar to *H. flavus* Castro, Nunes & Penteado-Dias, 2011 (Castro et al. 2011), in having the body entirely yellow, small ocelli, head and mesosoma mainly acinose, notauli scrobiculate, and first tergite with basal width 0.6 times the apical width. It differs from *H. flavus* in having a body length of 1.5 mm (4.0 mm in *H. flavus*), antenna with 14 flagellomeres (30 in *H. flavus*), precoxal sulcus smooth (finely scrobiculate in *H. flavus*), and ovipositor short, 0.2 times the body length (ovipositor as long as the body in *H. flavus*). Despite the apparent rarity of *Heredius* specimens in collections, the genus is widely distributed in the Neotropical region, as each of the four described species occurs in four

distinct locations (one in Costa Rica and three in Brazil) (Fig. 2), in different vegetations and biomes. Therefore, its actual species richness is likely to be underestimated.

Key to species of *Heredius*

1. Body entirely yellow, ocell-ocular distance about 3.5–4.0 times diameter of lateral ocellus..... 2
- 1'. Body mostly brown or black; ocell-ocular distance 2.0–2.7 times diameter of lateral ocellus..... 3
2. Body length 4.0 mm, malar space 0.5 times eye height, antenna with 30 flagellomeres, ovipositor as long as body ...
.....*Heredius flavus* Castro, Nunes & Penteado-Dias, 2011
- 2'. Body length 1.5 mm, malar space 0.3 times eye height, antenna with 14 flagellomeres, ovipositor short, 0.2x the body length
.....*Heredius gadelhai* Silva, Shimbori & Fernandes sp. nov.
3. Antenna mostly dark brown with basal segments yellow; ovipositor 0.4 times longer than body (0.7 times metasoma); scutellum acinose
.....*Heredius assu* Castro & Penteado-Dias, 2017
- 3'. Antenna with apical 8–9 segments white; ovipositor nearly as long as body (1.5 times as long as metasoma)*Heredius laselvus* Marsh, 2002

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