

## Scientific Note

**First records of *Bessierus doloris* Thomas & Orth (Ephemeroptera: Leptophlebiidae) in Brazil**Primer registro de *Bessierus doloris* Thomas y Orth (Ephemeroptera: Leptophlebiidae) en BrasilJaime de Liege Gama Neto<sup>1</sup>\*, Mahedy Araujo Bastos Passos<sup>2</sup> and Miguel Pereira da Costa<sup>1</sup><sup>1</sup> Universidade Estadual de Roraima - UIERR, Coordenação de Ciências Biológicas e da Saúde, Boa Vista, RR, Brazil.<sup>2</sup> Centro Estadual de Educação Profissional Prof. Antônio de Pinho Lima (CEEP/RR), Boa Vista, RR, Brazil.

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ZooBank: urn:lsid:zoobank.org:pub: A51A5B2E-225F-4BB3-B909-B7358235ADBE

<https://doi.org/10.35249/rche.46.2.20.27>

**Abstract.** We report the first occurrence of *Bessierus doloris* in Brazil. Additionally, we provide biological and taxonomic information on this species. Male imago specimens were collected with a Pennsylvania light trap in the Apiaú region, municipality of Mucajaí, Roraima. The discovery of this species in Brazil extends its geographic distribution further west in South America, reaching about 100 meters in altitude above sea level.

**Key words:** Aquatic insects, geographic distribution, mayfly, neotropical region, taxonomy.

**Resumen.** Presentamos el primer registro de *Bessierus doloris* en Brasil. Además, se proporciona información complementaria sobre la biología y taxonomía de esta especie. Se capturaron especímenes imagos machos con una trampa de luz tipo Pennsylvania en la región de Apiaú, municipio de Mucajaí, Roraima. El descubrimiento de esta especie en Brasil extiende su distribución geográfica más al oeste dentro de América del Sur y eleva esta distribución a unos 100 m de altitud sobre el nivel del mar.

**Palabras clave:** Distribución geográfica, Ephemeroptera, insectos acuáticos, Región Neotropical, taxonomía.

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Ephemeroptera is a small order of aquatic insects, with approximately 37 families, 442 genera, and 3,269 species worldwide (Barber-James *et al.* 2013), of which 83 genera and 411 species occur in Brazil (Salles and Boldrini 2020), where it is estimated that there are 10,000 species waiting to be described (Cardoso *et al.* 2015).

This amount of undescribed species hampers conservation and management efforts for aquatic environments, limits the scope of phylogenetic and zoogeographic studies, and hinders the identification of priority areas for research and conservation planning (Cardoso *et al.* 2015). In this context, studies focused on species descriptions and the zoogeography of mayflies are important since they supply primary data useful in the development of effective conservation measures for Ephemeroptera and the aquatic ecosystems on which they depend (Cardoso *et al.* 2015).

In this paper, we aim to contribute for the understanding of Ephemeroptera distributions in South America by providing the first records of *Bessierus doloris* Thomas & Orth, 2000 in

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Received 5 June 2020 / Accepted 12 June 2020 / Published online 26 June 2020

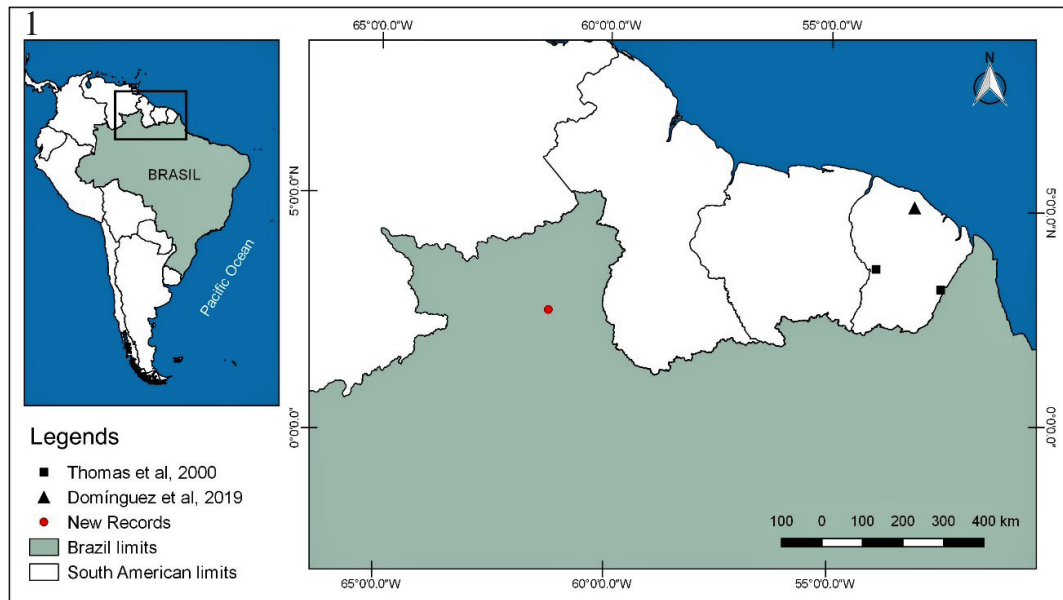
Responsible Editor: José Mondaca E.

Brazil. Additionally, we present taxonomic characters to help in the correct identification of this species.

Specimens were collected in November 2017 with a Pennsylvania light trap (Frost 1957) placed above a stream located in Apiaú vicinity, Mucajaí municipality, Roraima state, Brazil (Fig. 1). For species identification, wings and genitalia were dissected, mounted on slides with glycerine, and observed with both stereomicroscope or dissecting microscope. Photographs were used as templates for tracing vector graphics in Adobe Illustrator CS6® software to produce the illustrations. Maps were made using QGIS software (QGIS 2019). All collected specimens are fixed in 70% ethanol. Voucher specimens are deposited in the Aquatic Insects collection of the Universidade Estadual de Roraima (UERR), Boa Vista, state of Roraima.

The genus *Bessierus* was established for *B. doloris* Thomas & Orth, 2000, the only known species in the genus, based only on nymphs (Thomas *et al.* 2000). Domínguez *et al.* (2019) described the male imago that can be distinguished from all other Ephemeroptera species by the following combination of characters: (1) fork of vein MA of forewing asymmetrical; (2) vein ICu1 attached to vein CuA by a cross vein, and vein ICu2 attached at base to vein ICu1 by a cross vein; (3) hind wings absent; (4) tarsal claws of a pair dissimilar, one apically hooked, the other blunt; (5) forceps sockets fused; penes widely divided in apical 2/3, apex of each penis lobe with a laterally orientated broad projection; (7) forceps segment I smoothly roundly, broadened in basal 1/3.

Previously, *B. doloris* was collected only in French Guiana (Fig. 1) at an altitude ranging from 27 to 35 m above sea level (Thomas *et al.* 2000; Domínguez *et al.* 2019). The discovery of *B. doloris* in Roraima expands its geographical distribution by about 800 km further west in South America, reaching about 100 metres in altitude above sea level.



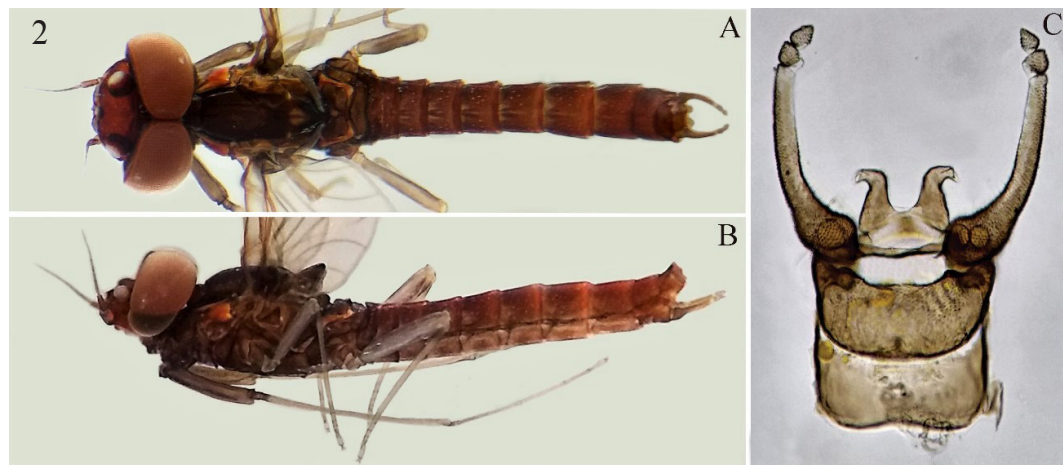
**Figure 1.** *Bessierus doloris* distribution map showing collection site in Brazil (red circle) and present distribution of *B. doloris* in South America. Black square and black triangle sites were plotted according the indication of Thomas *et al.* (2000) and Domínguez *et al.* (2019).

In French Guyana nymphs of *B. doloris* have been collected in rivers subject to high anthropogenic disturbances, in areas of low water current on the bottom gravel and in aquatic macrophytes (Thomas and Orth 2000), while adults have been collected by light trap on the banks of the streams (Domínguez *et al.* 2019). In Brazil, as well as in French Guyana, adults were collected with light traps on small, shallow, sandy bottom

streams, with scarce riparian vegetation and subject to anthropogenic disturbance. In spite of our intense searches on the aquatic substrate, no nymphs were found in Roraima.

*Bessierus doloris* remained known for a long time only by nymphs and for this reason was recorded only in French Guyana. The recent description of the male imago allowed the discovery of *B. doloris* in Brazil, reinforcing the importance of the association between nymph and imago for more accurate species identification and better use of distribution data in a wide variety of studies on Ephemeroptera (Cardoso *et al.* 2015).

The following morphological features given here (Figs. 2A-2C) supplement the diagnosis by Domínguez *et al.* (2019) in his male imago original description: (1) Frons orange; (2) Mesonotum with orange anterolateral margin; (2) Scutellum with basal V-shaped white mark; (3) Mediopostnotum with orange-ish lateral margins; (4) Terga III–VIII with a white colored medial line and a medioapical white W-shaped mark; and (5) Forceps segment I with small spines in the basal half of the inner margin.



**Figure 2.** *Bessierus doloris* male imago. (A) Dorsal view; (B) Lateral view; (C) Male imago genitalia (enlarged).

**Examined material.** BRAZIL, Roraima, Mucajaí municipality, Ipiranga stream (Sítio Dr. Jairo), 2°35'52.99" N 61°10'43.16" W, 21.xi.2017, 83 m.a.s.l, 15 male imagos, Costa, M.P., coll. (UERR - EPH022).

### Acknowledgements

We are grateful to Dr. William L. Overal for his English review and comments that improved this manuscript. This study was funded by the Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq (process 431365/2016-4). The Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) provided the collection permit (number 51228-1).

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