

Brief communication

Confirmation of *Homoeoneuria* Eaton, 1881 (Ephemeroptera: Oligoneuriidae) record in Colombia

Confirmacion del registro de *Homoeoneuria* Eaton, 1881 (Ephemeroptera: Oligoneuriidae) en Colombia

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Abstract

Homoeoneuria Eaton, 1881 is a genus of the Oligoneuriidae family whose geographical distribution remains poorly documented, especially in the Northern region of South America. Here we confirm the record of *Homoeoneuria* in Colombia, thus extending its distribution in South America beyond the records from Brazil, Peru, and Argentina. The confirmation was done on three nymphs from the department of Cesar found on sandy-silt sediments in the transition between the Andean and Caribbean regions.

Keywords: Aquatic insects; Distribution; Taxonomy; Mayflies.

Resumen

Homoeoneuria Eaton, 1881 es un género de la familia Oligoneuriidae, cuya distribución geográfica se encuentra poco documentada, especialmente en la región norte de Suramérica. Confirmamos aquí el registro del género *Homoeoneuria* en Colombia, con lo que su distribución en Suramérica se amplía con respecto a los registros conocidos en Brasil, Perú y Argentina. La confirmación se hizo en tres ninfas del departamento del Cesar halladas sobre sedimentos limo-arenosos en la transición de las regiones Andina y Caribe.

Palabras clave: Distribución; Efémeras; Insectos acuáticos; Taxonomía.

Introduction

Ephemeroptera is considered one of the most important groups of benthic macroinvertebrates in the Neotropics (Salles, *et al.*, 2004). Besides the occupation of many available meso-habitats contributing to their biomass and diversity in freshwater ecosystems, these insects are water quality indicators and have been widely used in biomonitoring studies (Roldán-Pérez, 2003; Springer, 2010; Forero-Céspedes & Reynoso-Flórez, 2013; Castillo-Figueroa, *et al.*, 2018). Although considerable progress has been made in the study of Ephemeroptera taxonomy along the Neotropical region (Gutiérrez & Reinoso-Flórez, 2010; Gutiérrez & Dias, 2015; Marín-Eslava, *et al.*, 2021; Molineri, *et al.*, 2021), more information is still needed regarding the biogeography of this order in South America (Domínguez, *et al.*, 2006).

Over 702 species have been reported in South America (Salles, *et al.*, 2021) and roughly 123 are found in Colombia (Salinas-Jiménez, *et al.*, 2017; Granados-Martínez, *et al.*, 2018; Marulanda-López, *et al.*, 2020; Marín-Eslava, *et al.*, 2021; Dias, *et al.*, 2021) with the families Leptophlebiidae, Leptohyphidae, and Baetidae as the more representative ones (more than the 65% of the species) (Salinas-Jiménez, *et al.*, 2012, 2017). However, uncommon families remain poorly known in terms of geographical distribution, especially in the Northern region of South America.

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One of these families is Oligoneuriidae with five genera and 13 species reported (Salles, *et al.*, 2018), three of which occur in Colombia (Marulanda-López, *et al.*, 2020). One of its genera is *Homoeoneuria* Eaton 1881, a taxon mainly distributed in North and Central America (Salles, *et al.*, 2018), which has two known subgenera: *Homoeoneuria*, found in Central and North America, with a record in Brazil (Salles, *et al.*, 2009), and *Notochora* in South America with *Homoeoneuria* (*N.*) *fitzkau* (Pescador & Peters, 1980) also present in Brazil. Recently, this genus has been reported in Peru (Miñano, *et al.*, 2019) and Argentina (Ignacio, 2019), but in Colombia, there was no confirmed evidence of the genus since the only existing record lacks specimens deposited in biological collections (García-Alzate, *et al.*, 2008). Here, we confirm the record of genus *Homoeoneuria* in Colombia based on three nymphs collected in the country's Northeastern Andes, in Torcoroma creek.

Materials and methods

The nymphs were found in Torcoroma creek, San Martín municipality, department of Cesar, in the transition between the Caribbean and Andean regions of Colombia. This creek is the main tributary of the town and it is used for crop irrigation purposes. Its source is located at an elevation of 650 m and descends to 50 m (Figure 1) (Consejo Municipal de Gestión del Riesgo de Desastres - CMGRD, 2020). The sampling site (centroid of the area: 7°54'57.1"N- 73°36' 01.4"W) was located on turbid waters with moderate currents and mud on the right bank; the substrate consisted mainly of sand, herbaceous and shrub vegetation, and allochthonous material composed of sticks, branches, and roots.

Specimens were preserved in 70 % ethanol and deposited at the *Museo Javeriano de Historia Natural* in *Pontificia Universidad Javeriana* (Bogotá, Colombia) (MPUJ_ENT 0071132-0071123). For the taxonomic identification, we used a revision of the genus

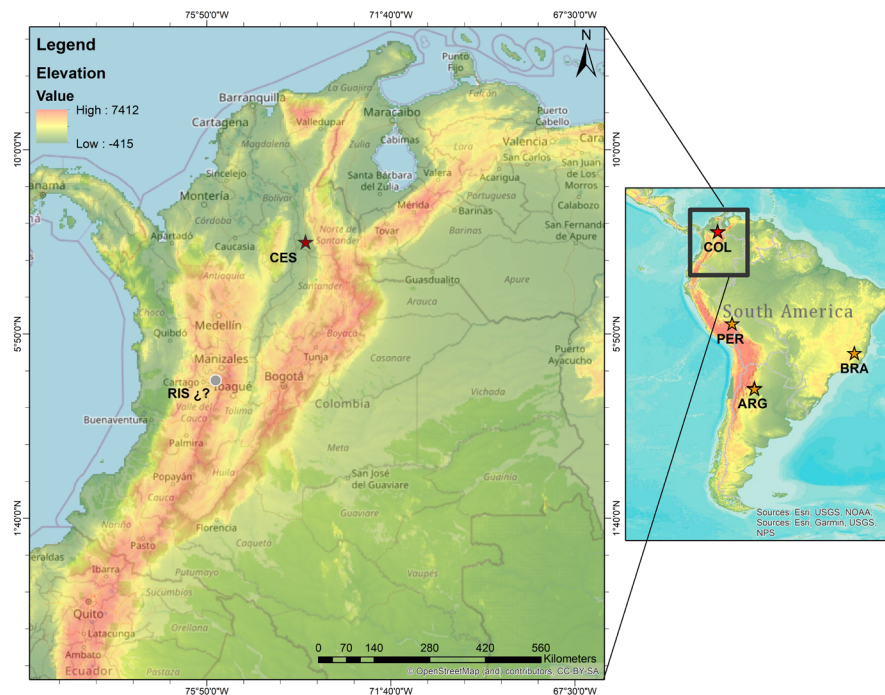


Figure 1. Record of *Homoeoneuria* in Colombia. Red star represents the new record of the genus in Cesar (Colombia) presented in this paper. Grey circle shows the dubious record in Risaralda reported by García-Alzate, *et al.* (2008) with no evidence. Orange stars indicate confirmed records of *Homoeoneuria* in South America

CES: Cesar (Colombia); RIS (Risaralda, Colombia); ARG: Argentina; BRA: Brasil; PER: Peru

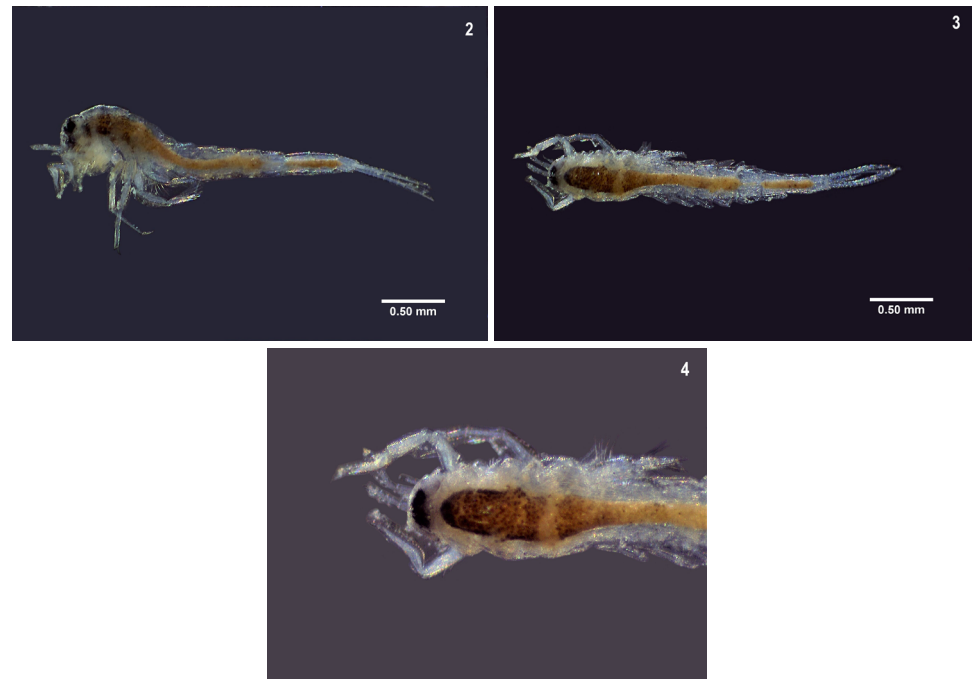
(Pescador & Peters, 1980), a recent key (Salles, *et al.*, 2018), and the confirmation of one expert in mayflies. The specimens were in the early stages (immature nymph), so identification at the species level was not possible. Measurements of body length and caudal filaments length were taken with the Image J software, v 1.8.0 (<https://imagej.nih.gov/ij/>) and the photographs with a Moticam camera attached to a stereomicroscope Motic SMZ-168TL. We registered means (\bar{x}), standard deviation (SD), and the minimum (Min) and maximum (Max) values for body length, caudal filaments, and total length of the three nymphs.

Results and discussion

We collected three specimens between November 2020 and January 2021 from sandy-silt sediments. This genus is commonly found on sandy substrates and warm rivers where it is well-adapted due to its modified middle and hind legs for digging, buried in small sand dunes in areas with river currents (Flowers & De La Rosa, 2010; Giberson, 2018).

We registered the following measurements for the specimens: total length: \bar{x} = 2.601, SD = 0.571, Min = 1.958, Max = 3.048 mm; body length: \bar{x} = 1.982, SD = 0.436, Min = 1.491, Max = 2.325 mm; caudal filaments length: \bar{x} = 0.618, SD = 0.134, Min = 0.467, Max = 0.723 mm. According to Salles, *et al.* (2018), *Homoeoneuria* can be recognized by its hypognathous head, abdominal segments with posterolateral projections restricted to segments VIII to IX, compound eyes almost contiguous, lanceolate, narrow gills, and enlarged mid and hind coxae. All these characters were observed in the specimens we found (Figures 2-4).

The confirmation of the Colombian record for *Homoeoneuria* updates the distribution of the genus in South America where most of the species have been reported in the North and Southeastern of Brazil (Salles, *et al.*, 2009) and recently, in Argentina (Ignacio, 2019) and Peru (Miñano, *et al.*, 2019). As the larvae we found were not at the last stage, we were not able to identify the species. It is also possible that they represent a new *Homoeoneuria* species since no adult-larvae relationship has been described before



Figures 2-4. *Homoeoneuria* larvae from San Martín, Cesar. 2. Lateral view; 3. Dorsal view; 4. Dorsal view of compound eyes. Pictures taken from the same specimen

in Colombian mayflies. Although **García-Alzate, et al.** (2008) reported this genus in a biological and physicochemical characterization of Otún River in the Cauca watershed (department of Risaralda) (**Figure 1**), there is no voucher deposited in biological collections nor photographs or any evidence of *Homoeoneuria* presented in their work. Moreover, as their research was focused on ecological relationships and biomonitoring, the taxonomic determination was not rigorous as the keys employed were inadequate for the identification of this genus, and the report was not confirmed by experts, which casts doubt about the scientific validity of the *Homoeoneuria* record in that study. In this sense, we encourage researchers to save specimens of new records in biological collections to preserve evidence to validate empirically the species found in our freshwater ecosystems. Previously, **Zúñiga, et al.** (2004) had suggested the possible presence of *Homoeoneuria* in Colombia based on existing South American records, which was now confirmed in Torcoroma creek. However, considering the substrate characteristics where this genus inhabits, we readily acknowledge that its occurrence in other regions of the country is highly possible.

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Author contributions

LGS: identified the specimens, wrote the paper, prepared figures, and reviewed drafts of the paper; DCF: wrote the paper and reviewed its drafts; HAG: reviewed the drafts of the paper.

Conflicts of interest

The authors declare no conflict of interests.

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