

First record of *Philoscia muscorum* (Scopoli, 1763) (Isopoda: Oniscidea: Philosciidae) in the Central Iberian Plateau: discovery of a population in the Province of Guadalajara (Castilla-La Mancha, Spain)

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Abstract

Philoscia muscorum (Scopoli, 1763) is a terrestrial isopod of the family Philosciidae widely distributed across Europe. In the Iberian Peninsula, *P. muscorum* has previously been reported only in the northern part of Spain and in western Portugal. The present record extends its known distribution range towards the Iberian Central Plateau and constitutes the first record of this species in the Province of Guadalajara and in Castilla-La Mancha.

Key words: Woodlice, Iberian fauna, distribution, riparian habitats, new records.

Resumen

Philoscia muscorum (Scopoli, 1763) es un isópodo terrestre de la familia Philosciidae con una amplia distribución a nivel europeo. En la Península Ibérica, *P. muscorum* ha sido citada previamente solo en el norte de España y en el oeste de Portugal. Este registro amplía su rango de distribución conocido hacia la Meseta Central Ibérica y constituye, además, la primera cita de esta especie en la provincia de Guadalajara y en Castilla-La Mancha.

Palabras clave: Cochinillas de la humedad, fauna ibérica, distribución, hábitats riparios, nuevas citas.

Introduction

Terrestrial isopods (Crustacea: Isopoda: Oniscidea) of the family Philosciidae represent one of the most speciose and widely distributed groups, mainly in tropical regions around the world (Schmalfuss, 2003). These isopods are typically associated with moist environments, showing a preference for soils rich in organic matter, leaf litter, and riparian microhabitats, where they play a significant role in decomposition processes and nutrient recycling (Garcia *et al.*, 2021). They are also very diverse in subterranean environments (Taiti, 2004).

Currently, the genus *Philoscia* includes 10 species and several subspecies, although only *P. muscorum muscorum* (Scopoli, 1763) and *P. affinis affinis* Verhoeff, 1908 (both preferentially, and in this article, represented as *P. muscorum* and *P. affinis*, respectively) have a wide distribution in Western Europe, even reaching North Africa (Algeria) in the case of *P. affinis* (Schmalfuss, 2003).

Philoscia muscorum (Scopoli, 1763) is one of the most widely distributed species in Europe, occurring from Atlantic and central European regions to more northerly areas of the continent (Schmalfuss, 2003). However, on the Iberian Peninsula its known distribution is markedly more restricted, with records concentrated primarily in the northern and western parts of the peninsula, especially in regions under Atlantic influence and in mountainous areas characterized by high ambient humidity (Garcia *et al.*, 2021).

To date, *P. muscorum* had not been recorded in the province of Guadalajara nor within the territorial scope of Castilla-La Mancha, which placed the southernmost known limit of its distribution in Spain, considerably further north. The present study reports a new locality for the species in central Iberia, constituting the only known record in an area far removed from Atlantic influence. This suggests that it could be a disjunct population associated with a riparian habitat in the Henares River valley.

This new record substantially expands the known distributional range of *P. muscorum* on the Iberian Peninsula and underscores the importance of detailed faunal surveys in apparently well-known habitats, particularly in biogeographical transition zones where relict or isolated populations of species with more northerly affinities may persist.

We also updated the map presented by Garcia *et al.* (2021), which depicted all records of *P. muscorum* in Spain, by incorporating the new record from Guadalajara.

Material & methods

Sampling of *P. muscorum* was carried out on 16-17 January 2026 in Moratilla de Henares (Municipality of Sigüenza, Guadalajara), within a 421 m² plot located adjacent to the Henares River.

The plot exhibits high faunal (Oniscidea, Araneae, Opiliones, Pseudoscorpionida, Trombidiformes, Ixodida, Chilopoda, Diplopoda, Symphyla, Collembola, Psocoptera, Coleoptera, Hemiptera, Hymenoptera, Mantodea, Lepidoptera, Diptera, Orthoptera, Gastropoda, Olygochaeta) and floral diversity (Asteraceae, Poaceae, *Malus*, *Cydonia*, *Prunus*, *Laurus*, *Rubus*, *Ulmus*). Fungi and Cyanobacteria (such as *Nostoc*) are also present.

Specimens were collected manually from beneath wood debris, stones, and within leaf litter. Additional individuals were obtained using pitfall traps. Once captured, all specimens were preserved in 70% ethanol.

Figure 1 was taken in the plot with an EOS 2000D camera equipped with a Tamron SP 90mm F/2.8 Di MACRO 1:1 VC USD macro lens. Figure 2 was taken with a digital microscope (Dino-Lite AM4113T). Drawings were made with the aid of a *camera lucida* (Olympus DA) mounted on an Olympus CH30 compound microscope. Map was generated with QGIS LTR 3.40.

Results

Systematics

Crustacea: Oniscidea Latreille, 1802

Family Philosciidae Kinahan, 1857

Genus *Philoscia* Latreille, 1804

***Philoscia muscorum* (Scopoli, 1763)**

Material examined: Spain, Guadalajara, Sigüenza, Moratilla de Henares; 16-I-2026; 1 male, 6 females; collected under stones and wood; leg. Jaime Gálvez-Barrado and Lucía Gallardo-Madrigal. Same locality; 17-I-2026; 8 males, 9 females, under wood. Same locality and date as the preceding, 1 male, 1 female; collected in leaf litter; leg. Jaime Gálvez-Barrado and Lucía Gallardo-Madrigal.

Identification remarks: In addition to the typical coloration pattern (Figure 1 and Figure 2) (Vandel, 1962; Sutton, 1972), our identification has been based on the male secondary sexual characteristics (Vandel, 1962; Boreave *et al.*, 2017; Garcia *et al.*, 2021) (Figure 3). The shape of male first pleopods, widely used in the systematics of Oniscidea (Shultz, 2018), are very similar to those of *P. affinis*, also present in the Ibero-Balearic fauna, although there are differences in the distal armature of the endopod of the first pleopod and in the genital papilla (see Vandel, 1962). To facilitate future identifications, habitus and sexual characters of studied specimens have been illustrated again (Figure 3).



Figure 1: Photograph of *P. muscorum* taken in the plot. Photography by Javier Sánchez Álvarez.



Figure 2: *Philoscia muscorum*, Spain, Guadalajara, Moratilla de Henares. Habitus of two female specimens (preserved).

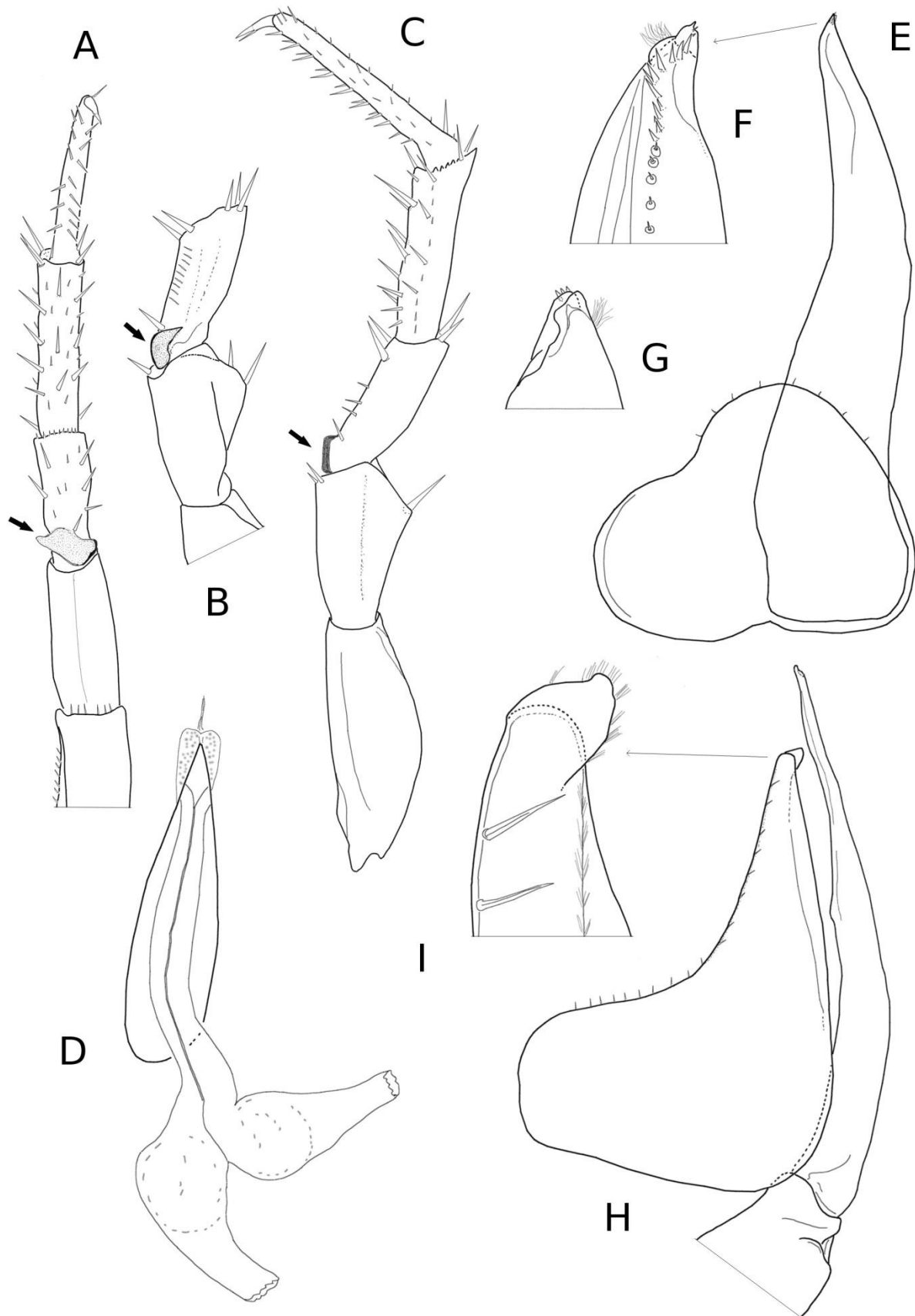


Figure 3: *Philoscia muscorum*, Spain, Guadalajara, Moratilla de Henares. Male sexual characteristics. A-C, pereopod-7 (A, sternal view; B, lateral view, posterior; C, lateral view, anterior. Merus ventral protrusion arrowed). D, genital papilla. E, pleopod-1. F-G, apical portion of pleopod-1 endopod (F, posterior, G, anterior). H, pleopod-2. I, apical portion of pleopod-2 exopod.

Comparison remarks: *P. muscorum* and *P. affinis*, which may be sympatric in some areas (Garcia *et al.*, 2021), have been confused in the past, both in the Iberian Peninsula and in other parts of Western Europe (Boerave *et al.*, 2017; Segers *et al.*, 2018; Gregory, 2020).

Although the morphological differences between the two species are well established in the literature (see Vandel, 1962; Gruner, 1965), identifications based only on habitus (coloration) are unreliable, since there are populations of *P. muscorum* with a pattern very similar to that of *P. affinis* (Vandel, 1962). Therefore, accurate identifications must be based on adult male specimens, which are not always available.

The main characteristic that allows these two species to be distinguished is the shape and orientation of the ventral protrusion of the merus of the seventh male pereopods. Viewed from an anterior lateral perspective, this protrusion is perpendicular to the longitudinal axis of the appendage in *P. affinis*, while in *P. muscorum* it is bent towards the sternal and posterior part of the appendage (Figure 3A and 3B). Therefore, in anterior lateral view (Figure 3C), only a flattened protuberance is visible instead of a prominent triangular tooth (see Vandel 1962; Boerave *et al.*, 2017; Garcia *et al.*, 2021).

Accompanying woodlice fauna: In the study area, four other species of terrestrial isopods have been collected, all of them common and previously recorded in Guadalajara (see Pollo-Zorita, 1985): *Chaetophiloscia elongata*, *Oniscus asellus*, *Armadillidium vulgare* and *Armadillo officinalis*. *C. elongata* is the most abundant, representing 55.42% of the total number of specimens collected. The second most abundant species was *P. muscorum* (31.32%).

Distribution: Points plotted on the map (Figure 4) indicate recorded occurrences of *P. muscorum* in Spain, after Garcia *et al.* (2021) and updated with the new record from Guadalajara. *P. muscorum* has been recorded in Lugo, Asturias, Álava, Navarra, and Guadalajara. The latter representing its southernmost record in Spain.

Conclusions

The discovery of *Philoscia muscorum* in Moratilla de Henares constitutes the first record of the species for the province of Guadalajara and for Castilla-La Mancha, thereby substantially extending the southernmost known limit of its distribution on the Iberian Peninsula. This apparently disjunct population suggests the existence of local refugia capable of sustaining species typically associated with more northerly, humid regions, underscoring the importance of riparian microhabitats and soils rich in organic matter for the persistence of epigeal terrestrial isopods. However, given that Moratilla de Henares and the surrounding villages encompassed extensive areas for cultivation and the transport of goods, it cannot be ruled out that it isn't a native population but the result of an involuntary human-caused introduction. Favourable local conditions would have allowed the establishment of this population far removed from others known on the Iberian Peninsula.

Moreover, this record demonstrates that faunal surveys in seemingly well-studied areas can reveal previously unrecorded populations, underscoring the importance of detailed sampling in biogeographical transition zones. Regarding Castilla-La Mancha, and specifically in the province of Guadalajara, there is little prior data on the terrestrial isopod fauna compared to other regions of Spain. One of the few existing faunistic surveys (Pollo-Zorita, 1983; 1985) includes numerous locations in the province of Guadalajara, even with description of new species (Pollo-Zorita & Dalens, 1984), but did not record the presence of *P. muscorum*. Another study carried out in the central plateau (Garcia & Cabanillas, 2021) focused solely on a seminatural area around Madrid and failed to record this species. The presence of *P. muscorum* in a riparian environment of the Henares River valley expands our knowledge of the species' ecology and biogeography, providing valuable data for future studies on dispersal, conservation, and the distribution of terrestrial isopods on the Iberian Peninsula.



Figure 4: Iberian Peninsula map with recorded occurrences of *Philoscia muscorum* in Spain. Red points indicate old occurrences, and the red star, the new one from Guadalajara.

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