

Short scientific note

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First record of the semiaquatic troglobiont millipede *Vascoblaniulus cabidochei* in Spain (Diplopoda: Julida, Blaniulidae)

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Abstract

We present the first record of *Vascoblaniulus cabidochei* Mauriès, 1967 in Spain, at Illaminako Ateak cave (Navarra). This makes a total of 15 troglobiont millipede species in the Spanish Pyrenees. *Vascoblaniulus cabidochei* is a highly modified troglobiont millipede species, previously only known from the type material was collected in the 60s of the last century in the Salle de la Verna, Pierre-Saint-Martin cave system, France, and occasional subsequent observations were made in the same cave system. Present records in wet and sprinkled stones in a different Spanish cave, and new observation near the Salle de la Verna, confirm its semi aquatic lifestyle.

Keywords: Cave species, Iberian Peninsula, Larra-Belagua massif, Myriapoda, Pyrenees, Subterranean biology

Introduction

The Iberian Peninsula and Balearic Islands harbour around 80 hypogean millipede species (Reboleira & Enghoff 2017; Salgado et al. 2022; Gilgado in press), with the highest diversity in the Baetic System and the Spanish Pyrenees, the latter comprising 14 described troglobiont cave species (*sensu* Sket 2008). Most of these troglobiont millipedes are only known from a single cave, their type locality (Gilgado in press). Thus, most Iberian cave millipede species have limited distribution areas, but with some exceptions (Reboleira & Enghoff 2017; Salgado et al. 2022; Gilgado in press). However, our knowledge on Iberian millipede distributions, including that of subterranean species, is still very incomplete (see for example Kime & Enghoff 2011, 2017, 2021). Millipedes tend to have a low dispersal ability, which is supposed to be even more accused in troglobiont species. However, cave systems, or hypogean ecosystems in general, are certainly more connected than usually assumed, as suggested by the occasional presence of troglobionts also in superficial subterranean habitats (Enghoff & Reboleira 2013; Gilgado et al. 2015), or by the evolutionary radiation of some troglobiont lineages (Faille et al. 2010, 2013).

Troglobiont millipedes tend to show similar adaptations to cave life, like a paler colour, body elongation, and elongation of femora and tarsi of walking legs, the latter being related to the larger size of the voids available in caves (Liu et al. 2017). But few troglobiont species are hydrophilous, or semi-aquatic, and thus adapted to a different microhabitat within the subterranean ecosystem. This has promoted the evolution of a particular set of morphological adaptations, like a shorter body, or modified mouthparts (Enghoff 1985; Hal'ková et al. 2022; Antić & Akkari 2023). This is the case of *Vascoblaniulus cabidochei* Mauriès, 1967, a troglobiont millipede previously only known from banks of subterranean watercourses in La Verna chamber, which is in the French part of the Pierre-Saint-Martin cave system, developed in the Larra massif on the France/Spain border (Mauriès 1967; Kime & Enghoff 2017). This species was only known from the type material collected in the 60s of the last century (Mauriès 1967), with a series of subsequent observations in this same site (Faille et al. 2015). This species exhibits modified mouthparts, which seem to be adapted to a filtering feeding habit in flowing water (Enghoff 1985, Antić et al. 2017). This morphological modification is convergent in several hydrophilous millipede species but is not present in all of them (Enghoff 1985; Hal'ková et al. 2022).

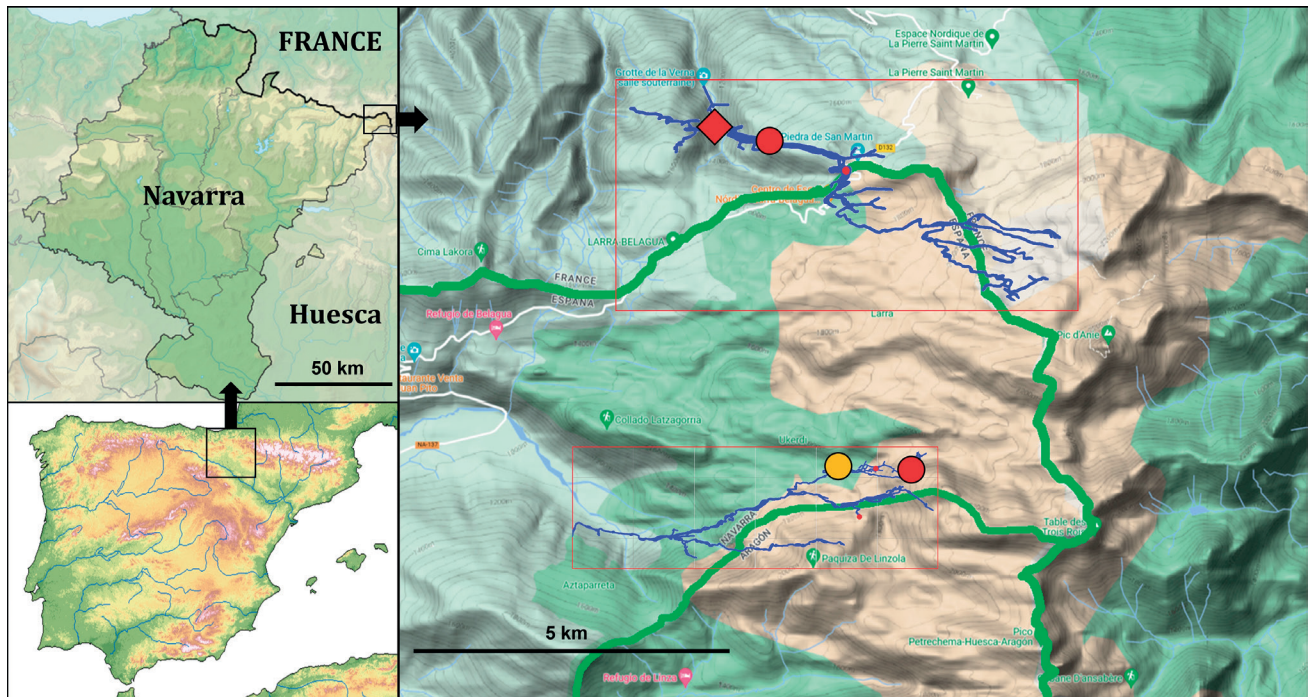


Fig. 1 – Map of the Larra Massif in the northeastern corner of Navarra and France, showing the known distribution of *Vascobraniulus cabidochei* Mauriès, 1967. Cave systems (dark blue) of the Pierre-Saint-Martin (above) and Illaminako Ateak / BU-56 (below) have been superimposed in the adequate places. Green line indicates borders, red diamond indicates the type locality; red dots indicate new records; orange dot indicates observation without collecting.

Recent samplings have led to the discovery of specimens of *Vascobraniulus cabidochei* in an additional cave in Spain, ca. 5 km away from the type locality, in the same mountain (Larra-Belagua) Massif. This new finding is discussed below.

Material and Methods

A total of 17 specimens of *Vascobraniulus cabidochei* were hand collected and stored in ethanol in the Illaminako Ateak cave system, Isaba, Navarra, Spain. In addition, two specimens were captured by the same methodology by the second author (CEP), in the same above recorded French type locality and cave, although in a slightly different location, between the Chevalier and Adélie chambers (Fig. 1). The specimens were identified with the original description (Mauriès 1967), dissected, observed and photographed with a Nikon SMZ800 stereomicroscope and a Leica DM 2500 microscope with a Nikon D5100 camera attached. Voucher specimens are stored in the collections of the University the Basque Country (col.ZUPV) and the Museo Nacional de Ciencias Naturales (MNCN) in Madrid. The remaining specimens are kept in the collection of JDG for further research.

Material examined

Spain: Navarra, Isaba, Budogia river, Illaminako Ateak cave system (up to 800 m in depth), 42.55.37.440N, 0.45.24.350W,

1980 m, 31 Jul 2013, wet or sprinkled rocks, Israel Robles leg. 2 ♂, 2 ♀ and 7 juv, collection of J.D.G.; 2 ♂, 2 ♀, same data but coll. ZUPV, 1459, 1460; 1 ♂, 1 ♀, same data but MNCN, 20.07/2103-2104. **France:** Nouvelle-Aquitaine, Pyrénées-Atlantiques, Sainte-Engrâce, Pierre-Saint-Martin cave system Saint-Martin river (between Chevalier and Adélie chambers), 42.58.45.070N, 0.47.46.400W, 1095 m, 11 Jun 2022, below the water surface, Carlos E. Prieto leg., 1 ♂, 1 subadult ♂, ZUPV-6605.

Remarks: Specimens of *Vascobraniulus cabidochei* from Illaminako Ateak were collected on wet or sprinkled rocks with a constant but shallow water, and a water temperature of 3°C. Numerous specimens of this species were observed in the cave. Specimens from Pierre-Saint-Martin were collected below the water surface in a small sandy backwater.

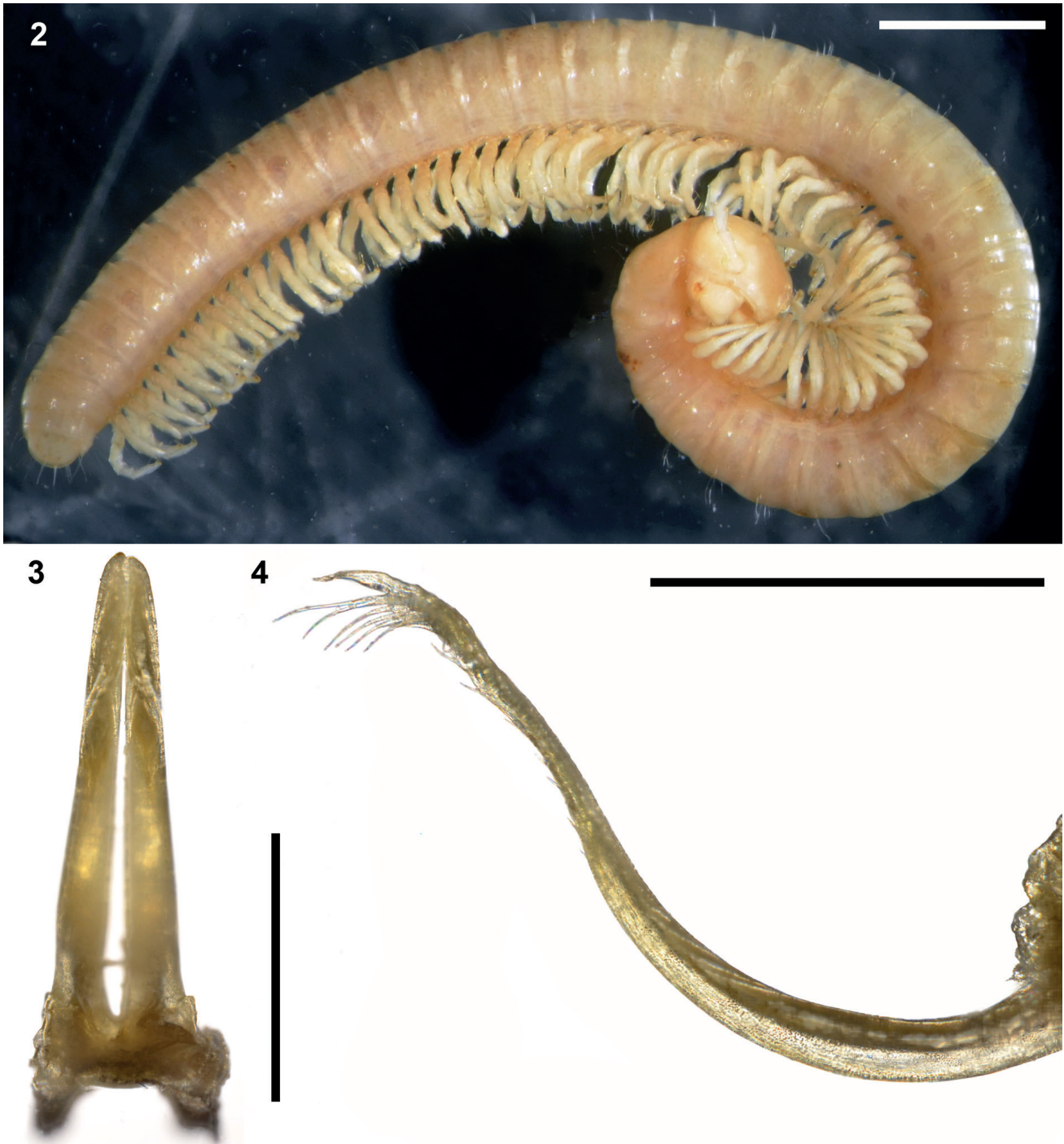
Discussion

The new record of *Vascobraniulus cabidochei* allows to reach the number of 15 troglobiont millipede species known in the Spanish Pyrenees (Gilgado in press) and adds a remarkable species to the Spanish fauna. The present records of the species in wet rocks, or directly under the water surface also confirm its semi aquatic lifestyle. This new record also extends its known distribution to further caves in the same mountain massif, so the species is no longer a possible micro-endemism of one single room in one single

cave. Recently, La Verna chamber was open for touristic activities, and their potential impact on troglobiont fauna was evaluated using three beetle species during a time span of three years (Faille et al. 2015). The results of Faille et al. (2015) indicated that there is only a weak impact of these activities on the troglobiont fauna. These same authors also regularly observed specimens of *Vascoblaniulus cabidochei*, but its abundance was not quantified. Present

new records suggest that the species may also be present in other caves of the region, which makes it less vulnerable to potential habitat perturbances.

The present discovery also suggests that the checklist of Iberian subterranean millipedes seems to be far from being complete, and further research is needed to better define their distribution, biology, ecology, and conservation status.



Figs 2-4 – *Vascoblaniulus cabidochei* Mauriès, 1967 from the Illaminako Ateak cave system. **2**, ♂ specimen *in toto*; **3**, anterior gonopods in posterior view; **4**, posterior gonopod in lateral view. Scale bars: 2 mm (Fig. 2); 0.5 mm (Figs 3-4).

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