Basteria
JOURNAL OF THE NETHERLANDS MALACOLOGICAL SOCIETY
VOLUME 90 (2) | 27 October 2026
e-ISSN 3117-9924

A new genus of crenobiont snail (Gastropoda: Hydrobiidae) from Asturias (NW Iberian Peninsula)

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Quiñonero-Salgado, S., Raven, J.G.M., López-Soriano, J., Prieto, C. & Sánchez, O., 2026. A new genus of crenobiont snail (Gastropoda: Hydrobiidae) from Asturias (NW Iberian Peninsula). – Basteria, 90 (2): 244-252. Leiden. *Online version published 27 October 2026 (ICZN compliant).*

Keywords: Hydrobiidae, *Cachopiella*, freshwater, springs, Cantabrian Mountains, hotspot.

A new Hydrobiidae springsnail, *Cachopiella alvaroi* gen. nov. spec. nov. is described for Asturias (NW Spain) based on shell morphology, anatomy, and genetic markers. Comparison with closely related species, mainly from northern Spain, confirms its differential status. This new finding adds to an already very rich freshwater snail biodiversity, demonstrating that the Iberian Peninsula is a hotspot for this type of organisms.

urn:lsid:zoobank.org:pub:64392E57-FD4A-4BAE-A1CC-269B01FAD642
DOI: 10.5281/zenodo.23183971

INTRODUCTION

The family Hydrobiidae W. Stimpson, 1865 ranks on top of biodiversity within worldwide springsnails, with more than one thousand known species, and it is particularly rich in southern Europe (Glöer, 2022). The Iberian Peninsula is considered as a hotspot for springsnails, with dozens of species present (Arconada & Ramos, 2003; Delicado et al., 2019). In addition, many new stygobiont Hydrobiidae have been recently discovered, which further enlarges the richness of this family (López-Soriano & Quiñonero-Salgado, 2025). The reason for this richness seems to be related to this territory serving as a glacial refuge for freshwater microgastropods (Delicado et al., 2012, 2013 & 2019; Miller, 2021).

In NW Spain, a number of Hydrobiidae are known, particularly 14 species of the genus *Alzoniella* Fo. Giusti & Bodon, 1984 and one of *Navarriella* Boeters, 2000 (García-Guerrero et al., 2024), all with a turriculated/elongated shape, and a few others with valvatiform shape, some of them included in the genus *Islamia* Radoman, 1973, or recently moved to new genera, such as *Deganta* Arconada & M.A. Ramos, 2019.

Assignment of many taxa at the genus level in Hydrobiidae is very complex, due to homoplasy of the shell, so more comprehensive approaches using morphometrics, anatomy of genitalia, and molecular tools are desired to have a better picture within this family.

In the present article, we describe a new genus of valvatiform Hydrobiidae from Asturias (NW Spain). Assignment of the new species to a new genus is based on anatomical, morphological and genetic differences with other previously known genera with similar shell morphology. This finding, coupled to other previous works, confirms the Iberian Peninsula as a hotspot for springsnails.

MATERIAL & METHODS

Specimen collection and morphological analysis. — The spring was visited various times between 2024 and 2026. In the basin on the right-hand side large volumes of sand were collected and sieved. The sieved sand was dried, further sieved and inspected under a stereomicroscope to pick shells. In the sand, only old empty shells were found. In the basin on the left side no sand emerged and abundant vegetation of the liverwort *Pedinophyllum interruptum* (Nees) Kaal. was present. Living specimens were collected by scraping the concrete walls and by gently brushing the vegetation. The last procedure was the most successful.

Protoconch whorls are counted following Bouchet & Kantor (2004), i.e. the nucleus is counted as half a whorl. Type specimens were photographed under a trinocular Nexius Zoom NM1903-S stereomicroscope with a Euromex CMEX-10PRO camera. Empty shells representing the type material were mounted on an aluminium stub for Scanning Electron Microscopy (SEM) to reveal their microsculpture. SEM images were made without coating in a JEOL JSM-6480 LV using low vacuum, 10 kV voltage and 30 Pa pressure.

DNA extraction, PCR amplification and sequencing. — The DNA was extracted from the foot tissue of two individuals of the new species using the E.Z.N.A. Mollusc DNA Kit (Omega Bio-Tek, Norcross, GA, USA). The mitochondrial cytochrome c oxidase subunit I (COI) gene fragment was amplified by polymerase chain reaction (PCR) in a total volume of 30 µL, using LCO1490/ COR722 as primers (Folmer et al., 1994; Davis et al., 1998). PCR conditions and mixture composition were prepared according to Martín-Álvarez et al. (2024). The PCR product was checked via horizontal electrophoresis (1% agarose gel). Finally, the samples were sent for forward and reverse sequencing at MACROGEN (Madrid, Spain), using the standard Sanger sequencing method (Sanger & Coulson, 1975).

Genetic analysis. — The forward and reverse sequences obtained by Sanger sequencing were edited for quality trimming, primer removal and manual correction to check any possible wrong base calling using Geneious Prime 2025.0.1 (https://www.geneious.com) and then aligned using ClustalW under default parameters. After alignment and corrections, a consensus sequence was generated with the default parameters. A phylogenetic analysis was conducted using two new sequences of *Cachopiella alvaroi* spec. nov., as well as another 59 available sequences of Iberian Hydrobiidae species retrieved from GenBank plus one sequence of *Mercuria balearica* (Paladilhe, 1869) used as an outgroup. The sequences were deposited in GenBank with the accession numbers PZ575977-PZ575978.

The test software IQ-TREE v3.1.1. (Minh et al., 2020) was used to predict the nucleotide substitution model showing the best AICC and BIC scores deploying ModelFinder options (Kalyaanamoorthy et al., 2017). A Maximum-Likelihood tree was performed in IQ-TREE v3.1.1. using Ultrafast Bootstrap options (1,000 bootstrap replicates) (Minh et al., 2013) and a search was conducted for the best scoring tree using the TN+F+I+R3 model.

Anatomical analyses. — For the anatomical studies, the shells of the adult specimens were first removed using a decalcifying aqueous solution of saturated ethylenediaminetetraacetic acid (EDTA) prior to the dissection of the soft bodies. Specimens were dissected in distilled water in a Petri dish containing a paraffin-wax-charcoal layer. The specimens were examined and dissected using an Optika SZM-2 stereomicroscope (0.7-4.5 x). To expose the penis, the mantle was withdrawn with the help of two tungsten pins.

Abbreviations. — Naturalis: Naturalis Biodiversity Center (Leiden); RMNH: Rijksmuseum van Natuurlijke Historie, now part of Naturalis; SEM: Scanning Electron Microscopy; a.s.l.: above sea level; s: shell.

SYSTEMATICS

Class Gastropoda Cuvier, 1795
Superfamily Truncatelloidea J. E. Gray, 1840
Family Hydrobiidae W. Stimpson, 1865

Genus *Cachopiella* gen. nov.
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Type species: *Cachopiella alvaroi* spec. nov.

Derivatio nominis. — The genus name refers to the "*cachopo*", a famous local dish in Asturias, the autonomous region in which the genus was found. Gender feminine.

Diagnosis. — Shell elongated ovate, small (approximately 1.9 mm in length and 1.4 mm in width), globose whorls, sutures very deep, creating a marked furrow between the whorls. Protoconch with irregular microsculpture of polygonal microdepressions of 3-5 µm diameter, in each of which one or several micropores are present. Teleoconch sculpture prosocline, very fine irregular axial riblets, with numerous micropores in the interspaces. Aperture slightly ovate, umbilicus very narrow (Figs 1-12).

Anatomy. — Same as for the type species.

Species included. — *Cachopiella alvaroi* spec. nov.

Remarks. — DNA analysis clusters this genus with another crenobiont genus, *Deganta* Arconada & M.A. Ramos, 2019, a monospecific genus also living in Asturias, but about 100 km further west. The next nearest relatives are in a cluster formed by genera only known from the eastern part of the Iberian Peninsula: *Siuraniella* Quiñonero-Salgado, López-Soriano, Raven, Pascual, G. García, Solé & O. Sánchez, 2025; *Kulyiella* Martín Álvarez, López-Soriano, Raven, O. Sánchez &

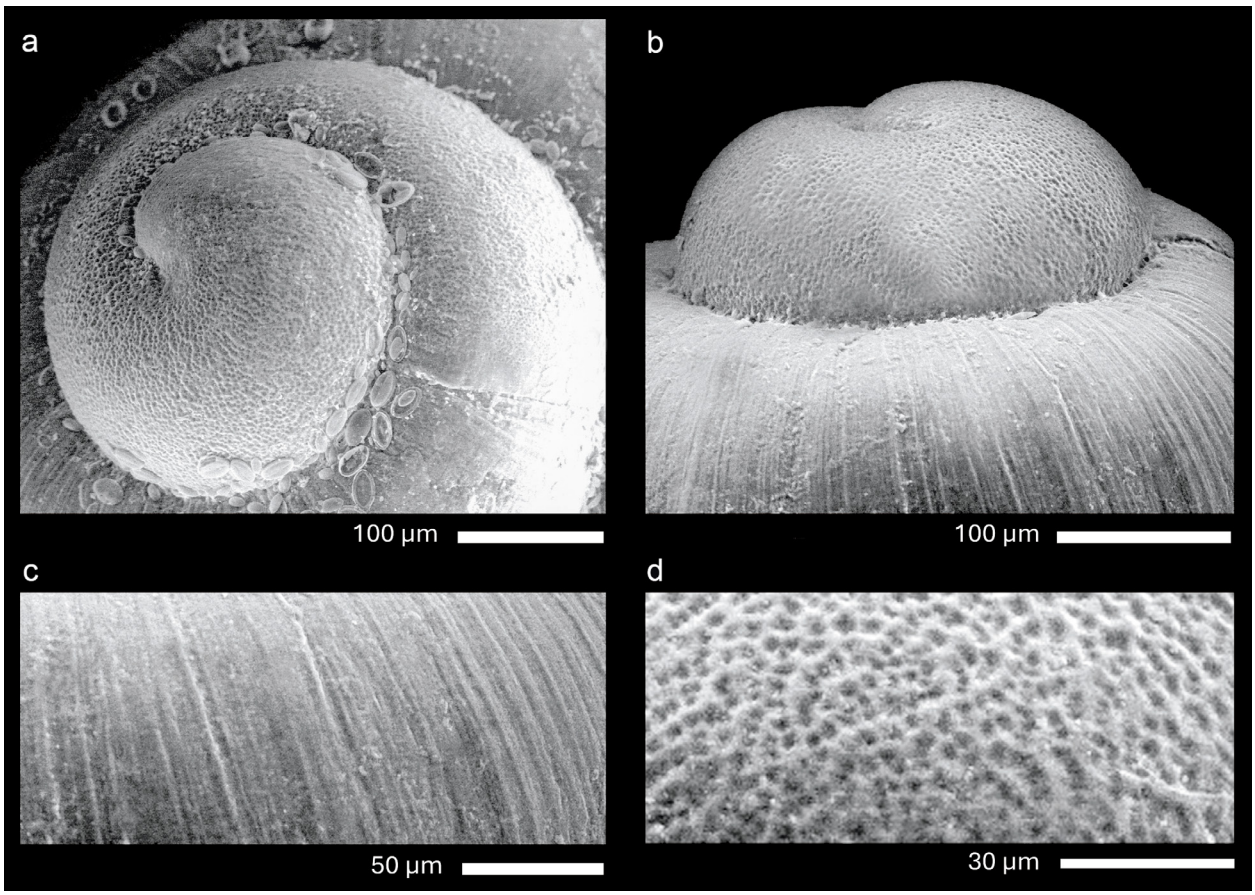


Fig 1. SEM images of a paratype of *Cachopiella alvaroi* gen. nov. spec. nov. (SQS2647). **a.** Apical view of the protoconch. **b.** Lateral view of the protoconch. **c.** Detail of the first teleoconch whorl. **d.** Detail of the protoconch.

Quiñonero-Salgado, 2026; *Tarraconia* M.A. Ramos & Arconada, 2000 and *Spathogyna* Arconada & M.A. Ramos, 2002.

Distribution. — Only known from the type locality in eastern Asturias, NW Spain.

***Cachopiella alvaroi* gen. nov. spec. nov.**

Figs 1-12

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Type locality. — L'Oyu'l Riu Calabres resurgence, source of the river Calabres (called Arroyo de La Bola in IGN cartography), 0.3 km SW of Piedra (municipality of Llanes, Asturias, Spain). 40 m a.s.l., spring with two basins with concrete walls, 4.iv.2024, SQS *leg.*, 43°24'42.8"N 4°50'55.1"W / 30 T 350322 4808215 (Fig. 11).

Holotype. — 1.85 mm high and 1.41 mm wide. RMNH.MOL.666970 (Fig. 2).

Paratypes. — As type locality (RMNH.MOL.666971, 5 sp.; Álvaro Alonso Suárez collection, 12 s; Sergio Quiñonero-Salgado collection, SQS2647, 5 s 5 s; Han Raven collection Z0491, 22 s).

Derivatio nominis. — Named after Álvaro Alonso Suárez, who is a great source of inspiration for anything related to molluscs and who took us to the type locality.

Description. — Shell small, elongated ovate, pale straw colour. Protoconch with 1¾ whorls, about 350 µm diameter, and a nucleus of about 120 µm (Figs 1a-b). An irregular microsculpture can be seen only at high magnification, formed by abundant polygonal microdepressions of 3-5 µm diameter, in each of which one or several micropores (with a diameter of 1 µm or less) are present (Fig. 1d). Three globose teleoconch whorls with deep sutures. Shell width is somewhat variable, but not related to sexual dimorphism. Teleoconch sculpture of irregular very slightly prosocline growth lines, and microsculpture formed by very fine irregular axial riblets, with numerous micropores in the interspaces (Fig. 1c). Aperture slightly ovate, weakly angled at the top. Umbilicus very narrow.

Anatomy. — Head and body unpigmented, except for the eyes located at the base of the tentacles; presence of small and white spots of refringent colour behind the eyes. Buccal bulb pink, seen by transparency. The rectum with a



Figs 2-10. Specimens of *Cachopiella alvaroi* gen. nov. spec. nov. from the type locality. **2.** Different views of the holotype (RMNH. MOL.666970). **3-10.** Eight paratypes (SQS2647) in frontal view, showing the variation in shape and size. Scale: 1 mm.

pronounced S-shape. Male genitalia with an unpigmented penis with a well-developed basal lobe with a pearly white colour, without an evident glandular origin. Penis gradually tapering to an acutely pointed distal end. Penial duct straight, following the convex edge of the penis. Two out of ten examined males presented a small black blotch near the distal end of the penis (Fig. 12).

Dimensions. — See Table 1 (the shell was measured as in Fig. 14).

Habitat. — Possibly crenobiont, since it has eyes and some red and white pigments. However, it cannot be discarded that it has stygophile behaviour.

Differentiating characteristics. — The shell of *Deganta azarum* (Boeters & Rolán, 1988) is remarkably similar,



Fig. 11. Animal and habitat of Cachopiella *alvaroi* gen. nov. spec. nov. **a.** Living specimen. **b-d.** Type locality of the newly described species, showing a building covering much of the spring, at the right a square pool where much sand emerges, at the left a square pool with hard walls on which liverwort (*Pedinophyllum interruptum*) grows, on which *Cachopiella alvaroi* lives.

***Cachopiella alvaroi* spec. nov. n = 30**	**SH**	**SW**	**LWH**	**PH**	**PW**
Holotype	1.85	1.41	1.51	0.88	0.81
MEAN	1.96	1.44	1.57	0.92	0.81
MIN	1.67	1.23	1.32	0.76	0.67
MAX	2.35	1.84	1.89	1.11	0.94
ST DEV	0.183	0.150	0.154	0.096	0.077

Table 1. Shell measurements (in mm) of *Cachopiella alvaroi* gen. nov. spec. nov. from the type locality (n = 30). SH: shell height; SW: shell width; LWH: last whorl height; PH: aperture height; PW: aperture width; MIN: minimum; MAX: maximum; ST DEV: standard deviation.

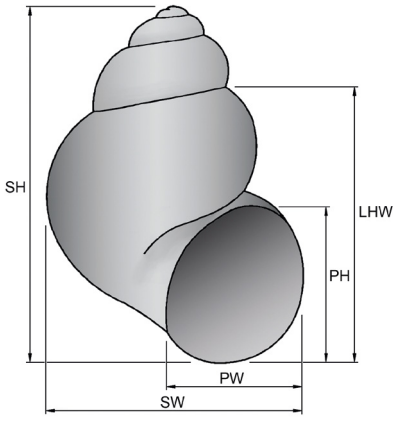


Fig. 14. Shell measurements used in this work. SH: shell height; SW: shell width; LWH: last whorl height; PH: aperture height; PW: aperture width.

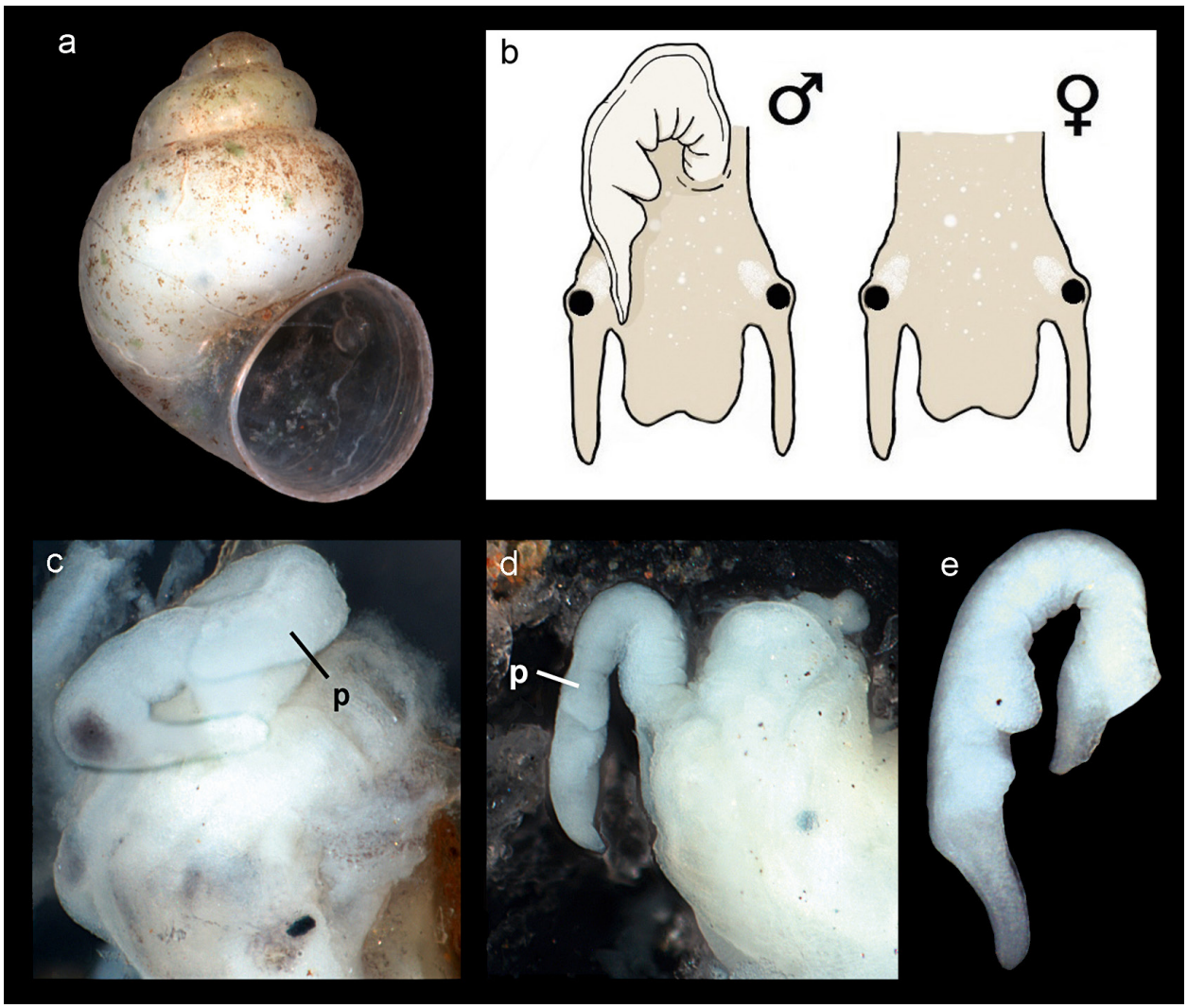


Fig. 12. Shell and anatomy of *Cachopiella alvaroi* spec. nov. **a.** Shell of a preserved adult specimen (sacrificed to extract animal). **b.** Schematic drawings of the head of male and female specimens in dorsal view, showing the eyes at the base of the tentacles and the penis in the male. **c-d.** Male specimens showing the penis (p) in situ. **e.** Detail of the penis after dissection.

except for the much lower spire. Like *Cachopiella* gen. nov., the shells of the genera in the cluster *Siuraniella, Kulyiella, Tarraconia* and *Spathogyna* all have globose whorls and deep sutures, but even lower spires than *Deganta*, resulting in flatter shells with much wider umbilicus in which (part of) the previous whorls can be seen and the apertures (and growth lines) are strongly prosocline. In all these genera the protoconch consists of polygonal microdepressions, but further study is needed to check whether these also have micropores. The shells of *Alzoniella* species from the NW of the Iberian Peninsula are much more elongated and slenderer, with less inflated whorls, shallower sutures and no umbilicus. This species is anatomically distinguished from its closest relative, *D. azarum* by the absence of a subterminal penial lobe, as well as in having a longer penis with a more acutely pointed distal end.

Genetic results. — Samples assigned to *Cachopiella alvaroi* spec. nov. based on morphology formed a well-supported group with a high bootstrap support (i.e., 100 %) located within a clade composed also by *D. azarum* (Fig. 13). The sequence divergence of COI for *Cachopiella alvaroi* spec. nov. and *D. azarum* was 8.81%.

Conservation status. — As with many other freshwater snails, its limited distribution area (thus far it is only known from a single population at the type locality) and the endangered habitats (overexploitation of springs, contamination of groundwater, presence of invasive species) suggest it should have some degree of protection. A long-term programme for assessing the status of its population(s) and a sensible management of the water in this area are highly desirable.

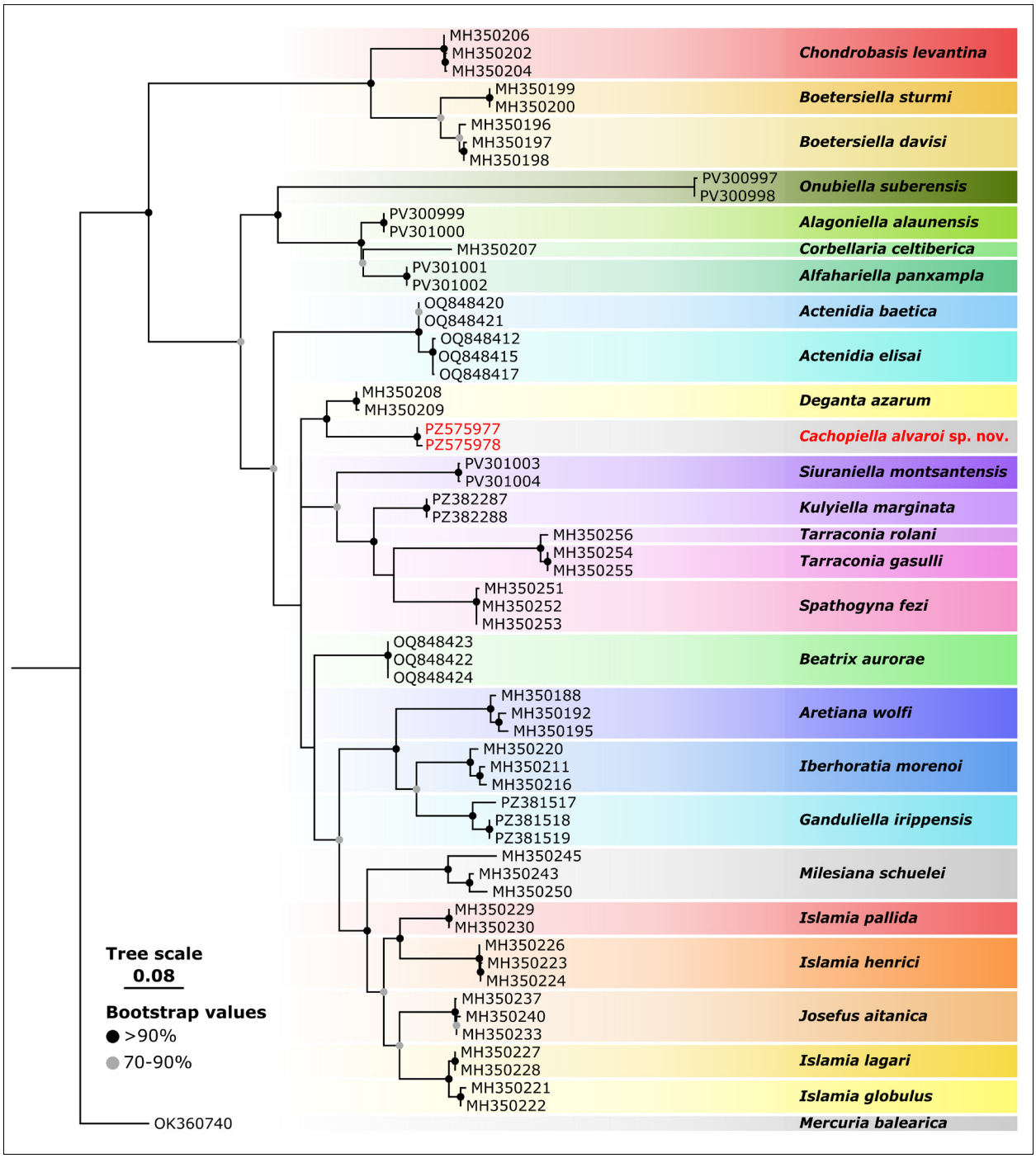


Fig. 13. Maximum likelihood phylogeny inferred using the COI dataset in IQ-TREE. Ultrafast bootstrap values are provided at relevant nodes. GenBank accessions numbers are listed adjacent to each scientific name. Each colour represents a different species. The new sequences are highlighted in red.

DISCUSSION

The Iberian Peninsula is very rich in Hydrobiidae springsnails representatives. The genus *Corrosella* Boeters 1970 has a hotspot in the south, with up to eighteen species known (Martín-Álvarez et al., 2025). *Alzoniella*, on the other hand, is highly represented in the north of the Iberian Peninsula, with at least fourteen Iberian species known, besides more than twenty species in continental Europe. Many other genera have been described, some of them inhabiting fontinal systems (see for example Martín-Álvarez et al., 2026), but others being strictly stygobiont, inhab-

iting only subterranean waters (López-Soriano & Quiñonero-Salgado, 2025).

In the NW of the Peninsula, in the region of Asturias and neighbouring Cantabria, two Hydrobiidae species are included at present in the genus *Islamia*, both stygobionts, although their generic assignation has been questioned (Boeters et al., 2019). Contrary to these two *Islamia* species, the newly described species, which has a relatively similar shell, inhabits superficial waters and has eyes. Another species formerly included in this genus, *D. azarum*, is also present in this territory. That species is fontinal and has a geographic range possibly extending into the neighbouring Cantabrian region, although those records have been challenged (Alonso Suárez et al., 2019). Thus, it seems important to have good ecological and genetic data for these organisms, to better understand their phylogenetic affinities.

Our results confirm the richness of the Iberian Peninsula in hydrobiid freshwater snails, and the need for exhaustive data to have a more reliable assignation at the generic level within this family. The newly described species has so far only been found at a single locality, which should be monitored and preserved.

ACKNOWLEDGEMENTS

The Consejería de Medio Rural y Cohesión Territorial of the Government of the Principality of Asturias is thanked for the collection permit which allowed us to collect living specimens. Every year Jairo Robla coordinates the request for these permits. Special thanks to Álvaro Alonso for endless hours of field trips in Asturias. Also, to Peter Glöer (deceased in 2024) who helped with the anatomical data. To Emilio Rolán (University of Vigo) who made SEM images. We thank TAXUS Medio Ambiente S.L. for sequencing funding of the specimens used in this study. This study was funded by the "MACROSEK" project (IDE/2024/000544), awarded by the Sekuens Agency (Asturias, Spain).

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