

A new stygobiont species of the genus *Hadziella* Kuščer, 1932 (Gastropoda: Hydrobiidae) from Spain

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A new species of the genus *Hadziella* is described for Spain, which can be distinguished from other species in the genus by its particular morphology and a much smaller size.

This is the smallest freshwater gastropod known so far for the Iberian Peninsula.

Keywords: *Gastropoda*, *Hydrobiidae*, *new species*, *stygobiont*.

Una nova espècie estigòbia del gènere *Hadziella* Kuščer, 1932 (Gastropoda; Hydrobiidae) per a Espanya

Es descriu una espècie nova del gènere *Hadziella* per a Espanya, la qual es pot diferenciar de les altres espècies conegudes del gènere per la seva morfologia peculiar i la seva mida molt més petita.

Es tractaria de l'espècie de cargol d'aigua dolça més petit conegut per la península Ibèrica fins al moment.

Paraules clau: *Gastropoda*, *Hydrobiidae*, *nova espècie*, *estogobis*.

The family Hydrobiidae is one of the most extended and rich in species from all gastropods living in crenic and stygobitic aquatic systems. Among them, valvati-form species are a subgroup with no evident phylogenetic links, characterized by a depressed shell, in opposition to trochiform shells, much more elevated and slenderer (Quiñonero-Salgado & Rolán, 2017).

In the Iberian Peninsula, different genera of valvati-form Hydrobiidae are present, such as: *Islamia* Radoman, 1973; *Aretiana* Delicado & Ramos, 2021; *Tarraconia* Ramos & Arconada, 2000; *Boetersiella* Arconada & Ramos, 2001; *Chondrobasis* Arconada & Ramos, 2001; *Spathogyna* Arconada & Ramos, 2002; *Milesiana* Arconada & Ramos, 2006; *Josefus* Arconada & Ramos, 2006; *Iberhoratia* Arconada, Delicado & Ramos, 2007; *Corbellaria* Callot-Girardi & Boeters, 2012; *Navalis* Quiñonero-Salgado & Rolán, 2017; *Deganta* Arconada & Ramos, 2019; *Salaeniella* Boeters *et al.*, 2019; and *Vilertia* López-Soriano *et al.*, 2022. Knowledge of these species has increased rapidly over the last years, with the continuous description of new species (Quiñonero-Salgado & Rolán, 2017; López-Soriano *et al.*, 2022).

Most of the stygobiont Hydrobiidae have a very

narrow geographic range of distribution, and show a high degree of endemism. They are present along the Iberian geography, but with few representatives in its North East, above the Ebro River (Quiñonero-Salgado & Rolán, 2017; López-Soriano *et al.*, 2022).

The genus *Hadziella* Kuščer, 1932 includes stygobiont species with shells of small size and planospiral shape. Both upper and lower sides are flat, being the last one strongly umbilicated. Aperture is slightly oblique, rounded, and peristome is thickened. When fresh, shells are usually whitish and translucent to almost transparent (Kuščer, 1932; Schütt, 1960; Bole, 1961, 1992; Giusti & Pezzoli, 1980; Bodon *et al.*, 2001). First anatomic studies of the genus are from Bole (1961). The same author and others later confirmed its taxonomic validity (Bole, 1993; Bodon *et al.*, 2001).

There are at present seven known species of the genus, whose distribution area extends from Slovenia and Croatia to Italy (Kuščer, 1932; Schütt, 1960; Bole, 1961, 1967, 1992; Giusti, & Pezzoli, 1980; Bodon *et al.*, 2001), with a species of very dubious taxonomic assignment in Balearic Islands.

In the present article, a new species of the genus

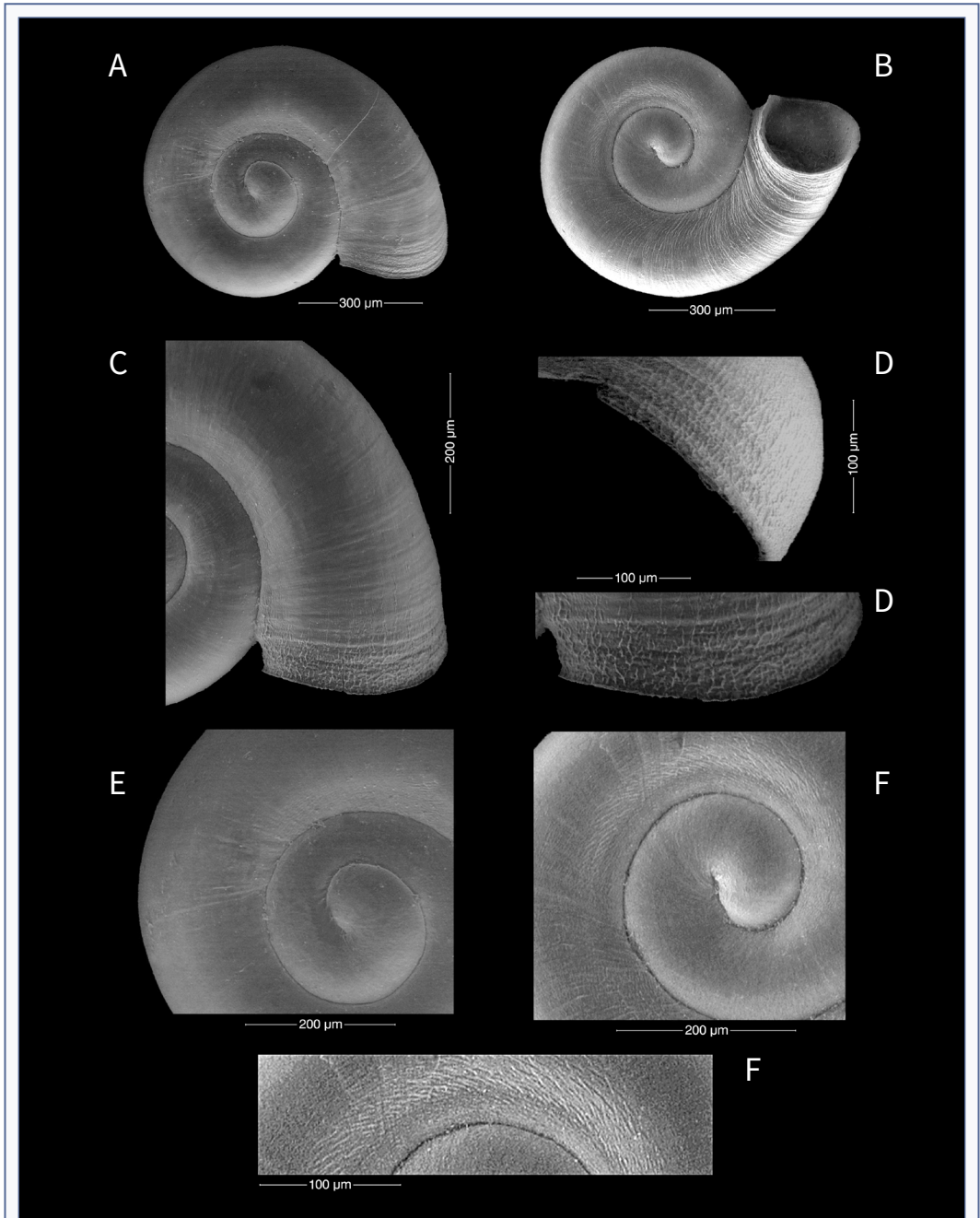


FIGURE 1. Scanning electron microscope picture of *Hadziella forneri* sp. n., showing details of protoconch and teleoconch. **A-B:** Paratype of *Hadziella forneri*. **C:** Detail of the last whorl. **D:** Detail of the rough microsculpture in the final part of the whorl. **E:** Protoconch. **F:** Detail of the umbilical area, showing the microsculpture towards the suture.

Fotografia per microscòpia electrònica de *Hadziella forneri* sp. n., mostrant detalls de la protoconquilla i teleoconquilla. **A-B:** Paratip de *Hadziella forneri*. **C:** Detall de l'última volta. **D:** Detall de la microescultura rugosa de la part final de la volta. **E:** Protoconquilla. **F:** Detall de la zona umbilical mostrant la microescultura junt a la sutura.

Hadziella is described for Teruel province (E Iberian Peninsula), which shows a number of conchological characters that allow distinguishing it from other species in the genus.

Material and methods

The spring designed as type locality was visited in two occasions, both in October of 2021. For obtaining the studied material, sediments washed out of the spring were sorted *in situ* with sieves of 2.0, 1.0, and 0.5 mm of mesh size. Later on, sediment was dried and cleaned in the laboratory, and shells were separated with the help of a small brush and cleaned with tap water.

Only empty shells were studied. Specimens were photographed with a trinocular stereomicroscope Nexius Zoom NM1903-S, with a coupled Euromex CMEX-10PRO camera. Some shells were mounted in aluminium stubs for electron microscopy images, obtained with the Quanta-200 model, to reveal its microsculpture.

Abbreviations: MNHN: Muséum National d'Histoire Naturelle (París); ZUPV: Colección del Departamento de Zoología, Universidad del País Vasco, Bilbao; SEM: Scanning Electron Microscopy; s: Shell.

Results

Systematics

Family Hydrobiidae Stimpson, 1865

Genus *Hadziella* Kuščer, 1932

Type species: *Hadziella ephippiostoma* Kuščer, 1932

***Hadziella forneri* sp. n.**

Type material: (Figs. 1-2). Holotype in MNHN (MNHN-IM-2000-38778). Paratypes: 3 s in MNHN (MNHN-IM-2000-38779), 3 s in ZUPV-6840 5 s in SQS collection.

Type locality: Fuente de Morales, Calanda (Teruel province), Spain. [30TYL370357]. 381 m a.s.l.

This is a spring with abundant and permanent water flow, which rises in a small cavity and is channelized with a rubber pipe. It is hard to localize and to access, due to its abandoned state, and the amount of vegetation around. It is located in a slope close to the Guadalope River.

Etymology: The species is dedicated to Enric Forner

i Valls, paleontologist specialized in sea urchins, and Editor of *Nemus* journal.

Description: Shell flat, planorbiform, compressed on both sides, lenticular and fragile. Very small in size, ranging from 0.23 to 0.32 mm in height and 0.70 to 0.83 in diameter. About 2 ½ whorls, from which 1.2 correspond to the protoconch. Marked sutures. Shell has a smooth appearance, but at high magnifications a microsculpture is evident in the protoconch, formed by many faint growth lines, slightly marked towards its last whorl, forming a rough surface at the end. In the umbilical part of the shell, a microsculpture formed by oblique lines irregularly arranged in spiral direction (Fig. 1F) is observed along the suture. Aperture oval-circular in shape with inclined axis, about 0.25 mm in diameter, with a thin border; in its inner part, which is detached from the previous whorl, a prominent area shows up which ends in a beak shape.

Dimensions: See Table 1 and Fig. 3.

Habitat: Stygobitic. Shells were washed out from their habitat, likely after sudden rises of the subterranean water levels. Shells had a mainly fresh appearance, given its transparent color.

Distribution: Only known from the type locality.

Differential diagnosis: Shells of *Hadziella forneri* sp. n. can be distinguished from other species in the genus by these characters:

Hadziella anti Schütt, 1960: Shell larger with more whorls (about 3 ½). A depression is observed both in upper and lower sides in the central part, while in the apical area there is a slight concavity. Apertural border is slightly tilted towards the outer side.

Hadziella rudnicae Bole, 1992: Shell larger with more whorls, wider and more angled in the upper part, while slightly depressed in the lower part. It shows a slight concavity in the upper part.

Hadziella diminuta Bole, 1961: Shell larger with more whorls (about 3 ½ - 4). Central part of both sides immersed, slightly wider the lower side, underside nearly flat. Upper apertural border slightly prolonged. Apical area showing a slight concavity in the upper part.

Hadziella sketi Bole, 1961: Shell larger with more whorls. Slightly concave on both sides, and irregularly striated. Upper part of the peristome prolonged towards outside. Lower border of the shell angled. It shows a slight concavity in the upper part.

Hadziella thermalis Bole, 1992: Shell larger with more whorls. Upper part slightly concave and regularly striated. Upper part of the peristome slightly elongated towards outside. In the apical area a slight concavity is present in the upper part.

Hadziella krkae Bole, 1992: Shell larger with more whorls, slightly depressed on both sides. In the apical area a slight concavity is present in the upper part.

Hadziella ephippiostoma Kuščer, 1932: Shell larger with more whorls (3-3 ½), slightly convex apical area.

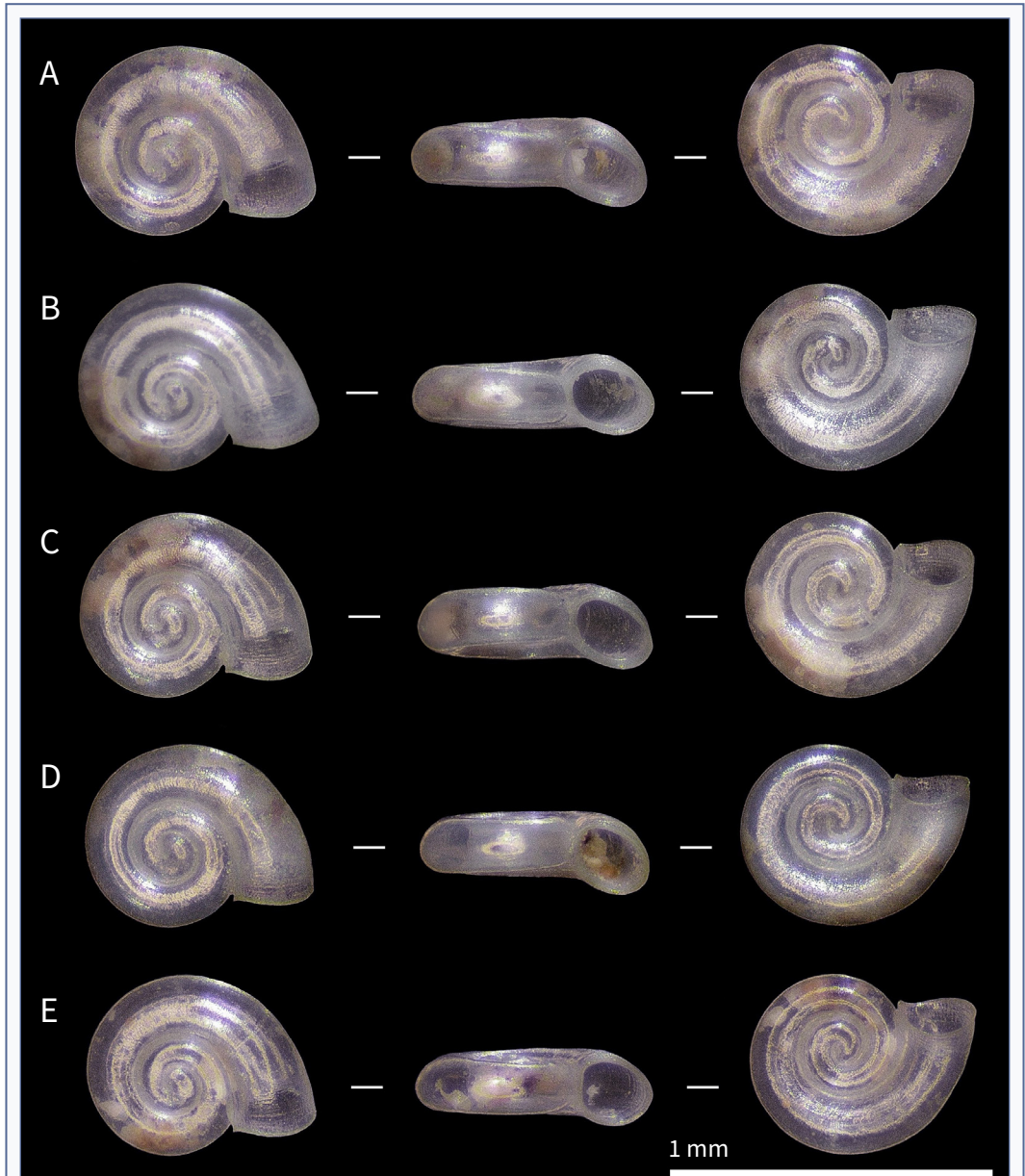


FIGURE 2. Type material of *Hadziella forneri* sp. n. **A:** Holotype; **B-D:** Four representative paratypes.

Material tipus de *Hadziella forneri* sp. n. **A:** Holotip; **B-D:** Quatre paratips representatius.

Discussion

With the description of *Hadziella forneri* sp. n. the number of known species in the genus is raised to eight. However, a species was described for Balearic Islands, *Hadziella leonorae* Rolán & Pardo, 2011, but the same authors assumed its generic assignation as tentative (Rolán & Pardo, 2011). However, other authors consider that this species belongs to genus *Islamia* Radoman, 1973 (Bodon & Cianfanelli, 2012). Indeed, its habitat was not proved to be stygobitic, and the appearance of the shell, showing a protruded spire, suggests it does not belong to *Hadziella*.

Hadziella forneri sp. n. is characterized by a much smaller size compared to all other members of the genus, a smaller whorl number, and some other differential traits, particularly its apical part remains leveled without any depression. All other species also have some degree of concavity in the upper part, except in *H. ephippiostoma* where is slightly convex.

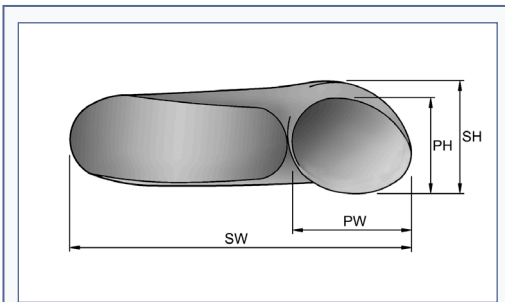


FIGURE 3. Measurements obtained in the shells. **SW:** shell diameter; **SH:** shell height; **PW:** aperture width; **PH:** aperture height.

Mesures obtingudes amb les conquilles. **SW:** diàmetre de la conquilla; **SH:** alçada de la conquilla; **PW:** amplada de l'obertura; **PH:** alçada de l'obertura.

<i>Hadziella forneri</i> sp. n. (n=34)	SH	SW	PH	PW
HOLOTYPE	0.26	0.75	0.23	0.26
min	0.23	0.70	0.20	0.24
max	0.32	0.83	0.26	0.28
mean	0.267	0.766	0.229	0.255
st.dev.	0.020	0.026	0.015	0.012

TABLE 1. Measurements (mm) of *Hadziella forneri* sp. n. shells. **SH:** shell height; **SW:** shell diameter; **PH:** aperture height; **PW:** aperture width.

Mesures (mm) de la conquilla de *Hadziella forneri* sp. n. **SH:** alçada de la conquilla; **SW:** amplada de la conquilla; **PH:** alçada de l'obertura; **PW:** amplada de l'obertura.

Despite not having anatomical data yet, morphological characters allow to include it confidently in the genus, particularly because of the flat, planospiral, very small shell, concave on both sides, showing a large umbilicus and a thickened peristome.

It is by far the westernmost species of the genus, largely widening its geographical range. Some other springs were sampled in the course of the present study in the vicinities of type locality, all with negative results. Giving its apparent very narrow range, the fragility of its habitat, and the ever-increasing hazards for aquatic subterranean snails, the species seems highly vulnerable to catastrophic local events, so a protection of both the species and its habitat is highly recommended.

This finding adds an additional new genus to the list of stygobiont fauna present in the Iberian Levantine area (considering the area at north of Valencian Community, south-east of Aragón, and Catalonia), which seems particularly rich in subterranean malacofauna. In addition, this new species is likely the smallest species of all known freshwater gastropods in the Iberian Peninsula.



FIGURE 4. Fuente de Morales, Calanda (Teruel province), sampling locality of *Hadziella forneri* sp. n.

Font de Morales, Calanda (Terol), localitat dels mostres de *Hadziella forneri* sp. n.

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