

A new genus and new species of valvatiform Hydrobiidae for the North-East Iberian Peninsula

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A new genus and a new species of valvatiform stygobiotic mollusc of the family Hydrobiidae are described for the Fluvià River basin, in Catalonia, based on morphologic traits of the shells and peculiarities of the male reproductive system.

Keywords: *freshwater, biodiversity, stygobitic, Gastropoda, Catalonia*

Un nou gènere i una nova espècie d'hidròbid valvatiform del NE de la península Ibèrica

Es descriuen un nou gènere i una nova espècie de mollusc valvatiforme estigobi de la família Hydrobiidae de la conca del riu Fluvià, a Catalunya, d'acord amb caràcters morfològics de la conquilla i peculiaritats de l'aparell reproductor masculí.

Paraules clau: *aigua dolça, biodiversitat, estigobiont, gastròpodes, Catalunya*

The family Hydrobiidae Stimpson, 1865 is one of the most widespread and richest in species of all the inhabitants of crenic and stygobiont systems. Among them, the valvatiform-shaped are a group of non-phylogenetically related species, characterized by shells with a very depressed spire, in opposition to the trochiform shells, which have a much more elevated spire (Quiñonero-Salgado & Rolán, 2017).

In the Iberian Peninsula, there are different genera of Hydrobiidae with valvatiform representatives, 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; *Iberohoratia* Arconada, Delicado & Ramos, 2007; *Corbellaria* Callot-Girardi & Boeters, 2012; *Navalis* Quiñonero-Salgado & Rolán, 2017; *Deganta* Arconada & Ramos, 2019; and *Salaeniella* Boeters et al., 2019. Most of them have a very restricted geographical distribution

range and a high level of endemism. They are present in many places in the Iberian Peninsula, but few of them inhabit the north-eastern part, north of the Ebro River (Ramos et al., 2000; Arconada & Ramos, 2001, 2002, 2006; Callot-Girardi & Girardi, 2013; Quiñonero-Salgado & Rolán, 2017; Delicado et al., 2019).

After different samplings in the Fluvià River basin (Catalonia, NE Iberian Peninsula), a new valvatiform species was found, which does not fit with any other genera described in the Iberian Peninsula. Genitalia analysis further confirms its differentiated status.

Material and Methods

Localities were visited between 2015 and 2018. Shells were separated from their substrates by sieving sediments from the springs through mesh diameters of 2.60 and 0.56 mm. Shells were later dried, and examined under a stereomicroscope. Animals were preserved in 75 % ethanol for dissection. The dissections of the genital organs and measurements of the shells were

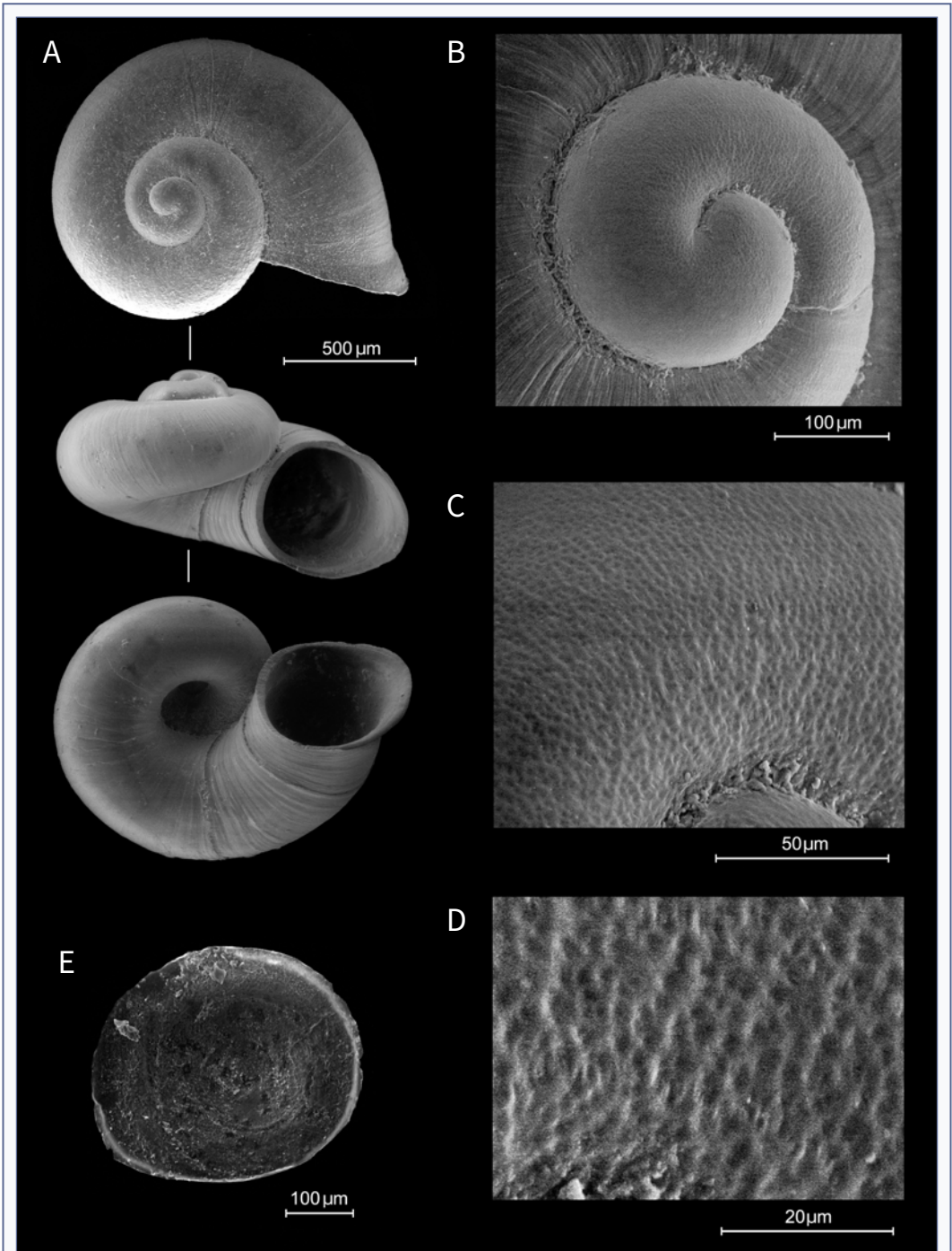


FIGURE 1. SEM pictures of *Vilertia galeata* gen. nov. sp. nov. **A:** Different views of the shell; **B:** Protoconch; **C-D:** Microsculpture of the protoconch; **E:** Operculum.

Fotografies SEM de *Vilertia galeata* gen. nov. sp. nov. **A:** diferents vistes de la closca; **B:** protoconquilla; **C-D:** microescultura de la protoconquilla; **E:** opercle.

carried out using a stereo microscope (Zeiss). Photographs were made with a digital camera system (Leica R8).

Abbreviations: MNHN = Muséum National d'Histoire Naturelle (Paris); p = penis; pl = penial lobe; w = wart; fp = faecal pellets; il = intestine loop; t = tentacle; fp = faeces pellets.

Systematics

Family HYDROBIIDAE Stimpson, 1865

Genus *Vilertia* gen. nov.

Type species: *Vilertia galeata* sp. nov.

Description: The most evident characteristic that differentiates this new species from other known valvatiform species on the Iberian Peninsula is the reflexed outer lip, a characteristic which let us introduce a new genus for this new species. The umbilicus is deep and wide.

Etymology: The name is a *derivatio nominis* referring to the village of Vilert, in the municipality of Esponellà (Pla de l'Estany, Girona province), where the first shells

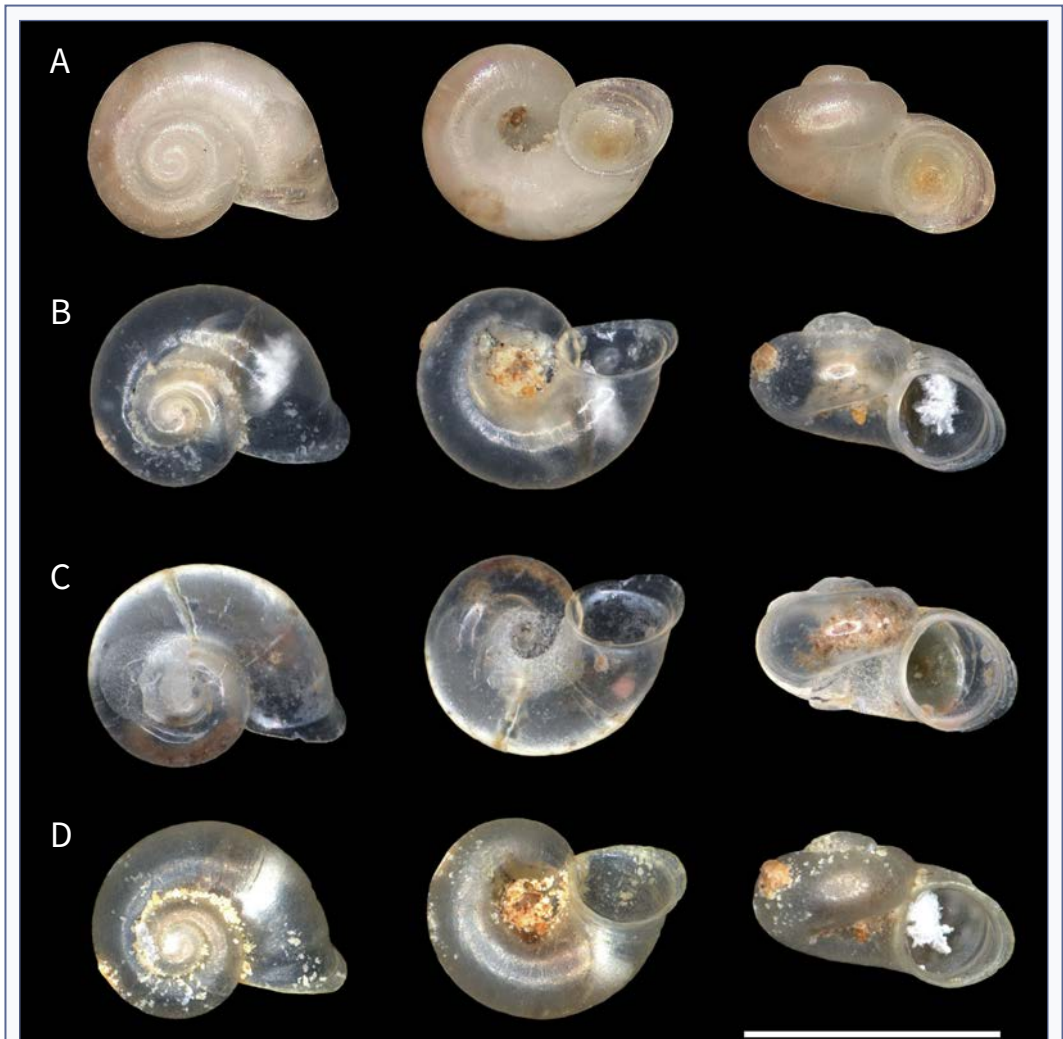


FIGURE 2. A: Holotype of *Vilertia galeata* gen. nov. sp. nov. **B-D:** Paratypes photographed under ethanol. Scale: 1 mm.

A: holotip de *Vilertia galeata* gen. nov. sp. nov. **B-D:** paratips fotografiats sota etanol. Escala: 1 mm.

were found. Gender of genus is feminine.

Remarks: Only known for the type species. See comparison with other genera and main characteristics thereafter.

***Vilertia galeata* sp. nov.**

Fig. 1-3

Type material: Holotype in MNHN Paris, #MNHN-IM-2000-38095. Paratypes: 2 shells in MNHN Paris, #MNHN-IM-2000-38096, 2 shells in PG coll., 10 shells in SQS coll.

Type locality: Deu d'en Roure (=Deu d'en Costei), Esponellà (Pla de l'Estany, Girona province) located in the Fluvià River basin (Fig. 4 & 5) Coordinates: 31TDG82054700. 115 m a.s.l.

Other localities: Font de Beu i Tapa, Vilert (Pla de

l'Estany, Girona province), also in the Fluvià River basin. 31TDG85341691. 90 m a.s.l.

Description: Small shell, with valvatiform shape, 0.51 - 0.74 mm in height and 0.96 - 1.13 mm diameter, with 3 whorls, deep sutures, and translucent coloration in freshly-collected specimens (Fig. 2, 3, 6). Protoconch microsculpture is formed by irregularly arranged microdepressions (Fig. 1C-D). Teleoconch showing growing lines. Deep and wide umbilicus, ovoid aperture, about 0.60 - 0.80 mm high and 0.51 - 0.66 mm wide, slightly oblique, and having a sharp peristome, slightly reflected towards the columella, and strongly towards the outer lip. Last whorl represents 90% of total height. Corneum operculum, with orange to yellow coloration, convex in the inner side (see Fig. 1E, 3D).

Animal: The animal is colorless, and the eyes are missing. The penis is broad and rounded at the tip with

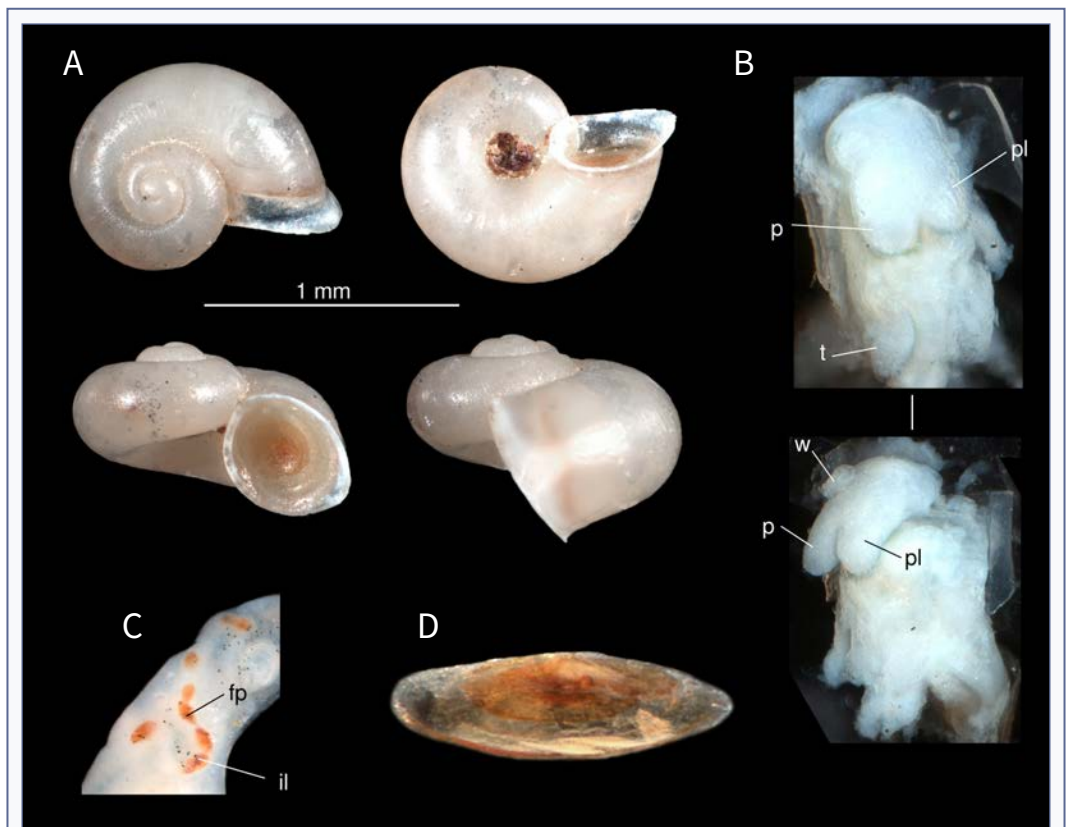


FIGURE 3. *Vilertia galeata* gen. nov. sp. nov. **A:** shell (paratype); **B:** male copulatory organ; **C:** intestinal loop; **D-E:** operculum (inner side). Scale: 1 mm

Vilertia galeata gen. nov. sp. nov. **A:** conquilla (paratip); **B:** òrgan copulador del mascle; **C:** gir intestinal; **D-E:** opercle (costat intern). Escala: 1mm

a penial lobe of the same length (Fig. 3B). Intestine with one loop (Fig. 3C). Female sex tract with spherical bursa, receptaculum could not be found.

Etymology: The specific name refers to the helmet-shape of the shell, resembling the M15 Adrian French model of World War I.

Dimensions: The holotype is 1.05 mm in diameter and 0.68 mm in height. Paratypes range from 0.96 - 1.27 mm in diameter and 0.51 - 0.74 mm in height (see Table I).

Habitat: Stygobiotic, all the shells were collected

from sediments at the opening of the springs.

Distribution: Only known from two different springs, very close to each other, in the margins of the Fluvià River.

Differentiating characters: *Vilertia* gen. nov. differs from all valvatooid genera by the reflexed peristome. It differs from *Rifia* Ghamizi 2020 by the missing outgrowth at the operculum; from *Fissuria* Boeters, 1991, by the penis, which is papillose but without a penial lobe. In addition, *Fissuria* has two intestinal loops, while *Vilertia* gen. nov. has only one.

| | | SH | SW | BWH | PH | PW |
|--|----------|------|------|------|------|------|
| Deu d'en Roure (n=24) Type locality | HOLOTYPE | 0.68 | 1.05 | 0.61 | 0.46 | 0.48 |
| | min | 0.51 | 0.96 | 0.48 | 0.41 | 0.43 |
| | max | 0.74 | 1.27 | 0.67 | 0.54 | 0.55 |
| | mean | 0.64 | 1.12 | 0.56 | 0.47 | 0.50 |
| | st.dev. | 0.05 | 0.08 | 0.05 | 0.04 | 0.03 |
| Font de Beu i Tapa (n=3) | min | 0.63 | 1.17 | 0.56 | 0.52 | 0.54 |
| | max | 0.72 | 1.33 | 0.66 | 0.63 | 0.60 |
| | mean | 0.67 | 1.25 | 0.61 | 0.57 | 0.57 |
| | st.dev. | 0.05 | 0.08 | 0.05 | 0.06 | 0.03 |

TABLE 1. Shell measurement of the studied specimens, separated by the two populations. SH: shell height; SW: shell width; BWH: body whorl height; PH: aperture height; PW: aperture width.

Mesures dels espècimens estudiats, separats per les dues poblacions. SH: alçada de la conquilla; SW: amplada de la conquilla; BWH: alçada de la darrera volta; PH: alçada de l'obertura; PW: amplada de l'obertura.



FIGURE 4. Map of Spain showing the localities where *Vilertia galeata* gen. nov. sp. nov. were found. **A:** Deu d'en Roure; **B:** Font de Beu i Tapa.

Mapa d'Espanya mostrant les localitats on es va trobar *Vilertia galeata* gen. nov. sp. nov. **A:** deu d'en Roure; **B:** font de Beu i Tapa.

Discussion: Valvatoid species are common in the western Mediterranean area, particularly in East Iberian Peninsula. Taking into consideration all the species in the coastal arch comprising southern France, Eastern Iberian Peninsula and down to north Morocco, the number of genera with valvatiform species increases to 13, 10 of which are monotypic. By

restricting it to the Iberian Peninsula, these numbers are 10 and 7 respectively, more than all of the West Palaearctic. In addition, among them, only *Islamia* has more than two known species, thus showing the high degree of diversification within this group. The huge morphological differences among all these genera, along with the anatomical characters and the relative



FIGURE 5. *Vilertia galeata* gen. nov. sp. nov. habitat. **A-B:** Deu d'en Roure; **C:** Font de Beu i Tapa. **D-E:** live specimens.

Hàbitat de *Vilertia galeata* gen. nov. sp. nov. **A-B:** deu d'en Roure; **C:** font de Beu i Tapa. **D-E:** exemplars vius.

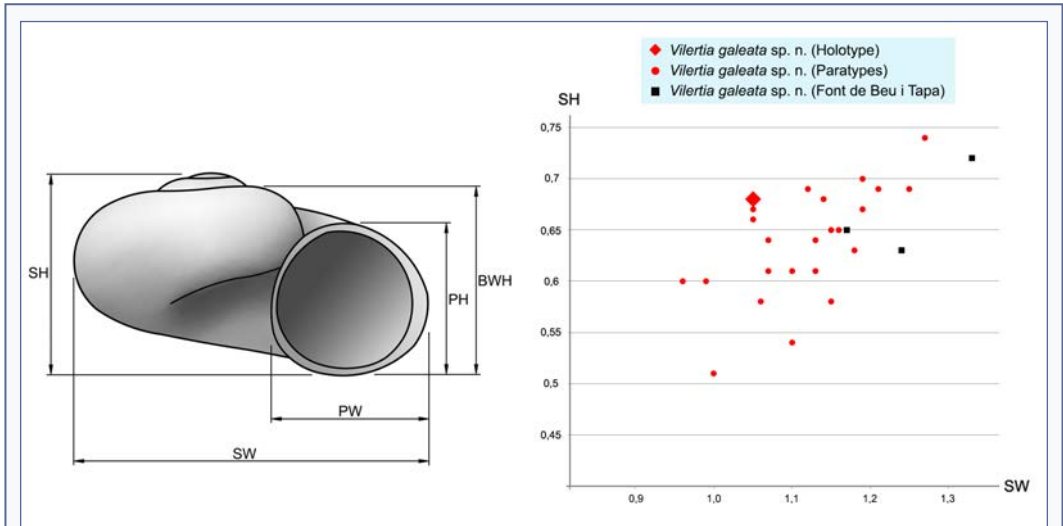


FIGURE 6. *Vilertia galeata* gen. nov. sp. nov. shell profile (left) and measurements from the different specimens studied (right).

Aspecte de la conquilla de *Vilertia galeata* gen. nov. sp. nov. (esquerra) i mesures dels exemplars estudiats (dreta).

isolation of the new population, permits the suggestion of a new genus until molecular data can either confirm or contradict this hypothesis. However, among the valvatiforms, only *Tarraconia* is represented in Catalonia (NE Iberian Peninsula), although it is found south of the Ebro River, and distant from the hydrographic basin of the newly described genus, which seems quite isolated from the other areas with presence of valvatiforms. In this sense, the Ebro River seems to have worked as an important biogeographical barrier for Hydrobiidae valvatiforms, as it can be observed with another stygobiotic genus, *Moitessieria* Bourguignat, 1863, whose taxa are well represented northwards of this river, but barely southwards (Glöer, 2022).

Regarding the genital anatomy, it is worth mentioning that only *Islamia* has a relatively similar, bilobulated penis, thus confirming the need for the assignation of the new species to a new genus. The only genera with a flat shell and a bilobed penis are *Rifia* from Morocco, and *Fissuria*, which occurs in south of France, Italy and Greece. Whether the new species could actually be included in any of these genera should be resolved by molecular affinities as and when data becomes available.

Habitat status and conservation: While the new species is present in the Fluvià River basin, which has a rather good ecological status, it is worth mentioning

that any damage to underground waters (overexploitation for different human or agricultural uses, contamination by farms, etc.) could pose an important risk for these populations. A permanent survey of the populations and the quality of the habitats is highly desirable. A search for new populations of the species will be advisable too, in order to guarantee enough well-preserved habitats where the species could be present.

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