NEMUS
REVISTA DE L'ATENEU DE NATURA

A new species of the genus *Islamia* Radoman, 1973 (Gastropoda: Hydrobiidae) from Spain

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Rebut el 04.03.2021. Acceptat el 15.04.2021.

A new species of the genus *Islamia* Radoman, 1973 is described for the Valencian Community in Spain. This is the first species of this genus discovered in this territory, and it can be distinguished from other known species by the morphology of the shell. The spring where it was found has another known endemic mollusc, thus being a place of high interest for the stygobiont malacofauna.

Key words: Gastropoda, Islamia, Hydrobiidae, new species, Spain

Nova espècie del gènere *Islamia* Radoman, 1973 per a Espanya

Es descriu una espècie nova del gènere *Islamia* Radoman, 1973 per a Espanya, concretament a la Comunitat Valenciana. Es tracta de la primera espècie del gènere coneguda al territori, la qual es pot diferenciar de les altres espècies conegudes per la morfologia de la conquilla. La font de la troballa presenta un altre mol·lusc endèmic conegut; es tracta per tant d'un espai de gran interès per la malacofauna estigobiont.

Paraules clau: Gastropoda, Islamia, Hydrobiidae, nova espècie, Espanya

The genus *Islamia* Radoman, 1973 includes small sized species that inhabit springs, rivers, lakes and groundwater systems. Its geographical distribution includes the Mediterranean basin, from the Iberian Peninsula to the Balkans, and is characterized by a high degree of endemicity (Bodon *et al.* 2001; Arconada & Ramos, 2006; Radea *et al.* 2017; Ruiz-Cobo *et al.* 2018).

The distribution of this genus in Spain includes both the Peninsula and Balearic Islands. *Islamia ayalga* Ruiz-Cobo *et al.* 2018 and *Islamia pistrini* Ruiz-Cobo *et al.* 2018 are present in the north of the Iberian Peninsula; *Islamia globulus* (Bofill, 1909), *Islamia lagari* (Altimira, 1960) and *Islamia ateni* (Boeters, 1969) are found in the northeast, although the last one may be extinct (Arconada & Ramos, 2006); *Islamia pallida* Arconada & Ramos, 2006 is located in the center; and finally, *Islamia henrici henrici* Arconada & Ramos, 2006 and *Islamia henrici giennensis* Arconada & Ramos, 2006 are distributed in the south. In the Balearic Islands, *Islamia archeducis* Boeters & Beckmann, 2007 is endemic to Mallorca (Bech, 1990; Boeters, 1988; Bertrand *et al.* 1999; Arconada & Ramos, 2006; Boeters & Beckmann, 2007; Callot-Girardi & Girardi, 2013).

In this article, a new species of the genus *Islamia* is described for the East of the Iberian Peninsula, being the first known species of the genus in the Valencian Community

Material and methods

The spring designated as the type locality of the new species was visited twice, in February 2014 and September 2020. To obtain the studied material, sediments from the spring were collected from the surface to 20-25 cm deep. After cleaning and drying out the sediment, it was sieved through 2.0, 1.5, and 1.0 mm meshes in order to sort all aquatic micromolluscs. The obtained specimens were later cleaned with water using a small brush and then examined and classified through the use of a stereomicroscope. Given their strictly stygiobiotic habitat, the collection of live specimens was very difficult and therefore only empty shells were included in the study. Specimens were photographed with a Nexius Zoom NZ1903-S trinocular stereomicroscope, with a Euromex CMEX-10PRO camera adaptor. For higher resolution imagery of

the microsculpture, some specimens were mounted on aluminum stubs and then photographed using a Quanta-200 electronic microscope.

Abbreviations

MCNB: Museu de Ciències Naturals de Barcelona

MNHUS: Museo de Historia Natural de la Universidad de Santiago de Compostela

MNCN: Museo Nacional de Ciencias Naturales de Madrid

SEM: Scanning Electron Microscopy

CSQS: Collection of Sergio Quiñonero-Salgado

CAA: Collection of Álvaro Alonso

CJT: Collection of Julio Talaván

CRRJ: Collection Ruiz-Jarillo

s: Shell

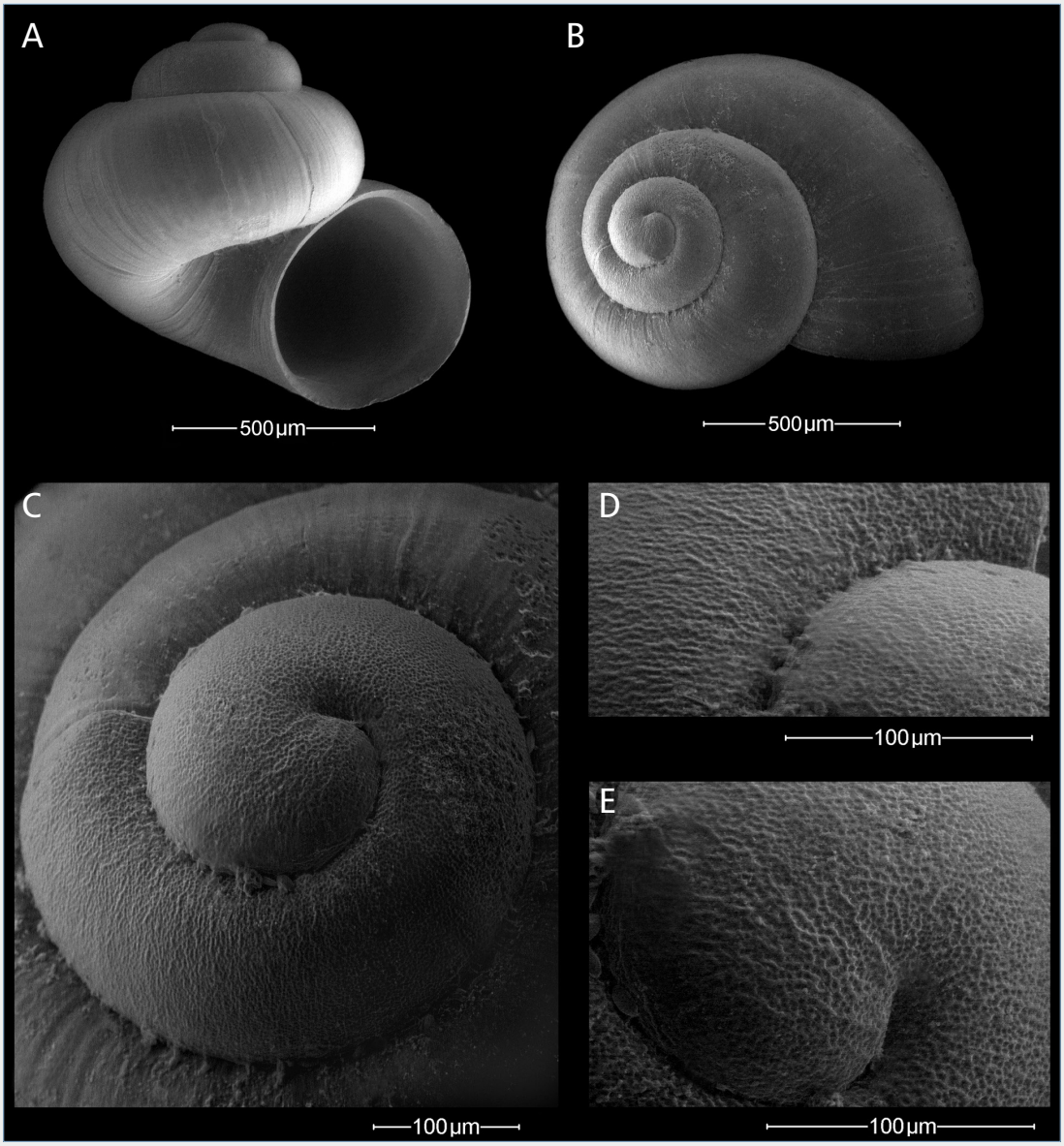

FIGURE 1. SEM photographs of *Islamia seniaensis* sp. n. from the type locality. **A-B**: Shell; **C-E**: detail of the protoconch and microsculpture.

Microfotografies de *Islamia seniaensis* sp. n. de la localitat tipus. **A-B**: conquilla; **C-E**: detall de la microescultura de la protoconquilla.

Results

Systematics

Family HYDROBIIDAE Stimpson, 1865
Genus *Islamia* Radoman, 1973
Type species: *Islamia valvataeformis* (Möllendorff, 1873: 59) = *Horatia servaini* Bourguignat, 1887 (by original designation)

***Islamia seniaensis* sp. n.**
(Fig. 1-3)

Type material: Holotype (Fig.1) in MCNB, MZB 2021-0464, paratypes: 10 s in MCNB, MZB 2021-0465, 3 s MNCN 15.05/200131, 5 s MNHUS 100756, 10 s CAA, 20 s CJT, 10 s CRRJ, 20 s CSQS

Type locality: Font dels Rossegadors, la Pobla de Benifassà, Castelló province, Valencian Community, Spain (31TBF667059, 450 m). This fountain is located near the Sènia river (Fig. 5-6).

Etymology: Its name is derived from the Sénia river basin, where the type locality is located.

Description: Small sized shell, trochiform in shape, of 0.94-1.34 mm height, and 1.09-1.48 mm diameter. It is formed by 3-3.5 spiral whorls, the last one representing about 1/3 of total length. Translucid to whitish coloration. The protoconch shows a microsculpture with irregularly arranged microperforations. The teleoconch has a smooth surface, with isolated growth lines, more abundant towards the end of the shell. Deep umbilicus. Last whorl usually adhered to the aperture, although sometimes slightly detached. Ovoidal aperture, of 0.59-0-78 mm height, and 0.44-0.68 mm diameter. Thin peristome, showing no thickening nor protuberances.

***Dimensions*:** see table 1 and Fig. 4

Habitat: Stygobiotic. Despite the large number of fresh shells collected, not a single live specimen was found. Shells were likely dragged to the outer spring after sudden increases in the subterranean flow.

Distribution: Only known from the type locality (Fig. 5, 6).

***Remarks*:** *Islamia seniaensis* sp.n. can easily be distinguished conchologically from the genera *Tarraconia*, *Chondrobasis, Spathogyna*, *Josefus* and *Navalis,* the other only Hydrobiidae genera with valvatiform shape recorded in the vicinities of the type locality of the new species.

Tarraconia Ramos, Arconada & Moreno, in Ramos

FIGURE 2. Holotype of *Islamia seniaensis* sp. n. Scale 1 mm.

Holotip de *Islamia seniaensis* sp. n. Escala 1 mm.

et al., 2000. includes only two species, *Tarraconia gasulli* (Boeters, 1981) and *Tarraconia rolani* Ramos, Arconada & Moreno, 2000. Species in this genus have shells more trochiform in shape, with the spiral whorls less convex and rounded, and have more quadrangular and angled silhouette. In addition, sutures are less marked, and the peristome is much more thickened, especially on the external side, this being diagnostic (Ramos *et al.* 2000).

Chondrobasis Arconada & Ramos, 2001 includes a single species, *Chondrobasis levantina* Arconada & Ramos, 2001, which is clearly distinguishable from *Islamia seniaensis* sp. n. for having a much bigger shell, globulous in shape, and less trochiform, with an elevated spire, and whorls more developed. The aperture is also proportionally bigger, and has a notorious thickening of the peristome, particularly in the columellar side. Umbilicus is also smaller, barely forming a small cleft, partially covered with the edge of the peristome.

Spathogyna Arconada & Ramos, 2002 has a single known species, *Spathogyna fezi* (Altimira, 1960). Shell is smaller, more depressed, with a less elevated spire and less prominent apex. Spiral whorls are flatter, and aperture less rounded, and wider in the lower margin. Umbilicus is wider, and reveals a big portion of the spiral curling through it. It is only known in the

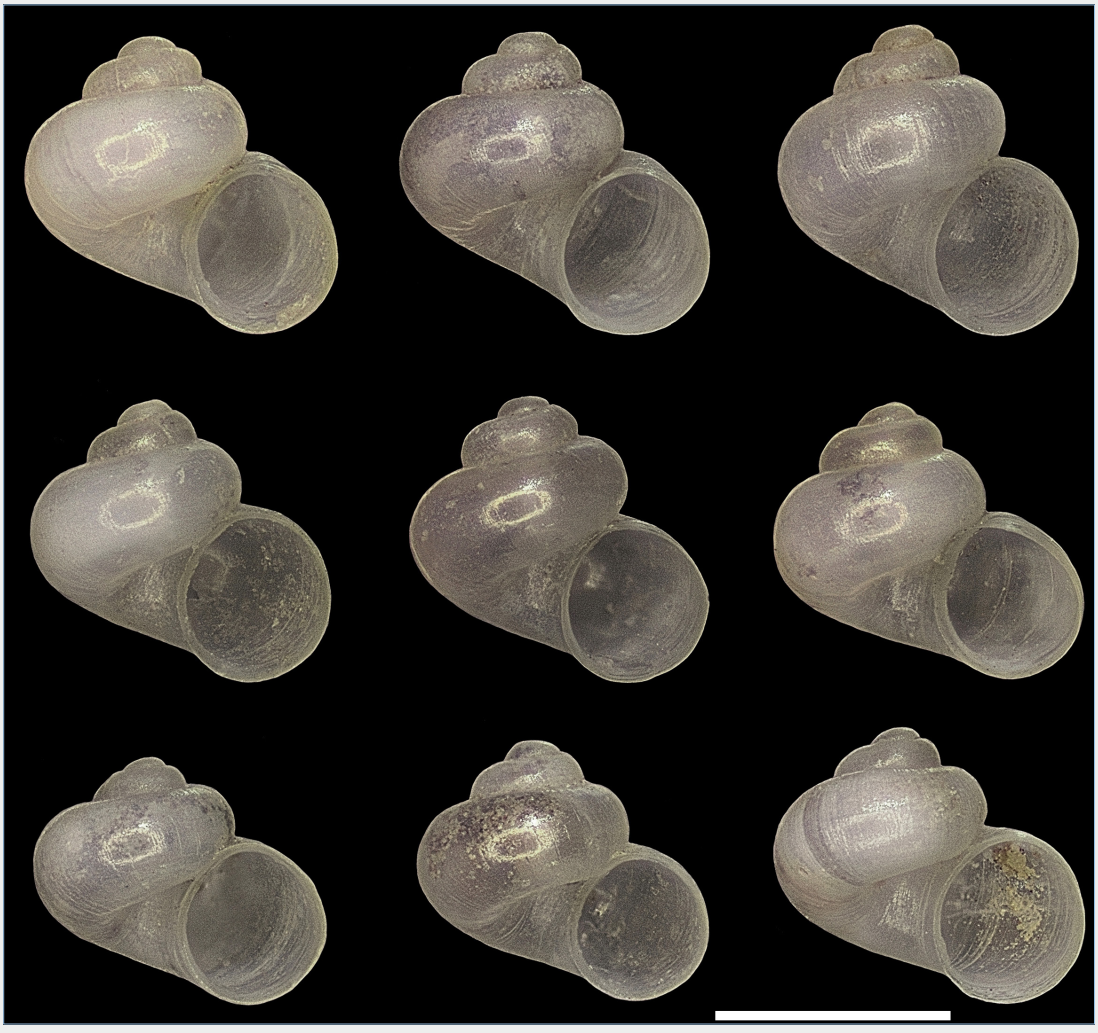

FIGURE 3. Variability in specimens of *Islamia seniaensis* sp. n. Scale 1 mm.

Variabilitat d'exemplars de *Islamia seniaensis* sp. n. Escala 1 mm.

provinces of Cuenca and Castelló.

Josefus Arconada & Ramos, 2006 is also known from a single species, *Josefus aitanica* Arconada & Ramos, 2006. Shell is smaller, less elevated in the spire, and with less pronounced apex. In addition, spiral whorls are less convex and bulky, and sutures less marked, overall making it less globous and more depressed. Peristome is thickened, and the aperture is wider in the lower part, and narrower and angled in the upper part, being thus less rounded than in *Islamia seniaensis* sp.n. The distribution of the only known species, *Josefus aitanica* encompasses the provinces of Valencia and Alicante (Arconada & Ramos, 2006).

Navalis Quiñonero-Salgado & Rolán, 2017, is also known from a single species, *Navalis perforatus* Quiñonero-Salgado & Rolán, 2017, which is smaller in size, more depressed in shape, less elevated spire, less prominent apex, spiral whorls less convex, and a marked angulation surrounding the umbilicus in the lower part of the shells, making it unmistakable between all the Iberian valvatiform species. It is only known from two localities in the area of Segorbe, Castelló province (Quiñonero-Salgado & Rolán, 2017).

Among the Iberian species of the genus *Islamia*, where the new species has been tentatively placed according to its conchological main traits, *Islamia globulus* (Bofill, 1909), *Islamia ateni* (Boeters, 1969) and *Islamia lagari* (Altimira, 1960) have marked differences regarding *Islamia seniaensis* sp.n. All the three species have bigger shells, more elevated spires, and are more globous in shape, having in consequence an ovoidal profile, and not trochiform. Aperture is also more ovate, slightly more angled, and narrower in the upper part but wider in the lower part. Umbilicus is much smaller and narrower, with a cleft shape. Their geographical distribution is also different: *Islamia globulus* is present in the Aragon and Catalan Pyrenees and pre-Pyrenees systems; *Islamia ateni* was only

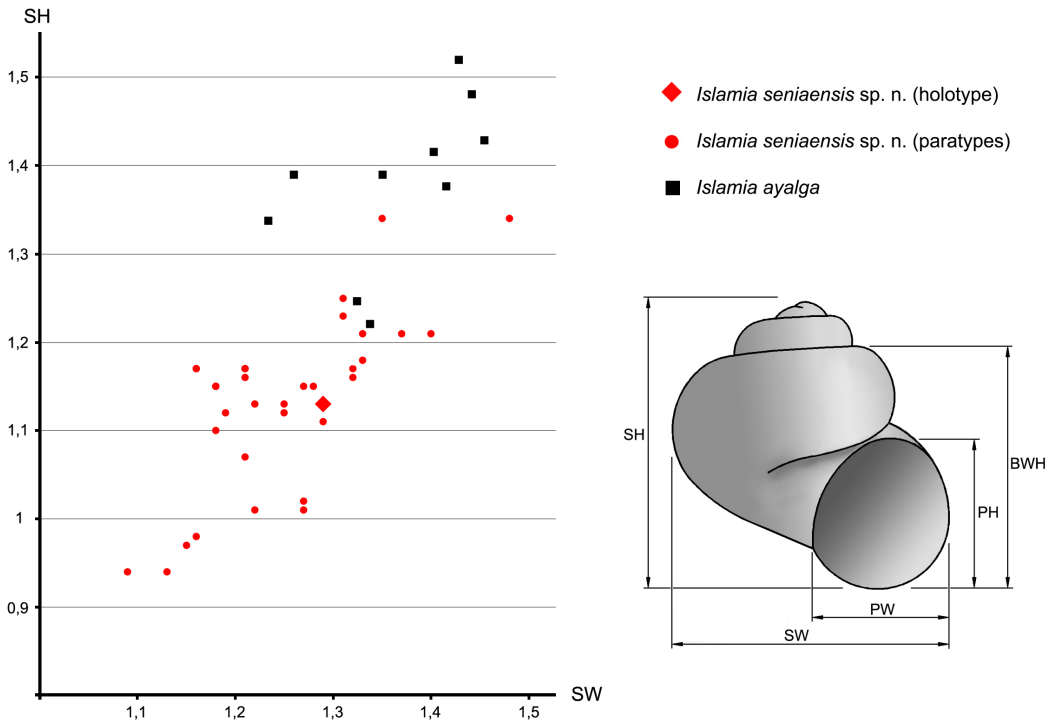

FIGURE 4. Shell measurements of *Islamia seniaensis* sp. n. and *Islamia ayalga* SH: shell height. SW: shell diameter. BWL: last whorl height. PH: aperture height. PW: aperture width.

Dimensions de la conquilla de *Islamia seniaensis* sp. n. i *Islamia ayalga* SH: alçada. SW: diàmetre. BWL: alçada de l'última volta PH: alçada de l'obertura. PW: amplada de l'obertura.

known from a single locality in Lleida province; and *Islamia lagari* is known from north of Tarragona province and south of Barcelona province (Arconada & Ramos, 2006).

Two subspecies of *Islamia henrici* Arconada & Ramos, 2006 are known: *Islamia henrici henrici* in the province of Córdoba, and *Islamia henrici giennensis*, in the eatsern part of Jaén province. This species, and also *Islamia pallida* (Arconada & Ramos, 2006), endemic of the northern part of the province of Madrid, have smaller shells, more depressed in shape, less trochiform, less convex whorls, and less marked sutures. Their distribution range is far enough from the newly described species. Finally, *Islamia ayalga*, species endemic to eastern Asturias, is likely the closest species to the newly described one, but also has a very distant distribution range, and shows a bigger shell and less rounded aperture (Ruiz-Cobo *et al.* 2018).

FIGURE 5. Font dels Rossegadors, type locality of *Islamia seniaensis* sp. n.

Font dels Rossegadors, localitat tipus de *Islamia seniaensis* sp. n.

FIGURE 6. Map of Castelló province showing the known distribution range of *Islamia seniaensis* sp. n.

Mapa de la província de Castelló que mostra el rang de distribució de *Islamia seniaensis* sp. n.

Conclusions

A new species of the genus *Islamia* is described for the Iberian Peninsula, raising to 10 the number of known species in Spain, and being the first one for the Valencian Community. The conchologically closest species to *Islamia seniaensis* sp. n. seems to be the Asturian *Islamia ayalga*. However, there are enough biogeographical and conchological differences to justify them belonging to a different species. The adscription of the valvatiform-like species of the family Hydrobiidae can be very difficult in the absence of anatomical studies, given that their conchological characters by themselves do not allow for a correct assignation to any given genus. Since no live specimens were collected, given its strict stygobiotic habitat, assignation to the genus *Islamia* has been tentatively made based on the morphological characters of the shell, while waiting for anatomical studies which should clarify its real status.

Given its very limited geographical distribution, for the moment restricted to the type locality only, and the fragility of these ecosystems which are highly vulnerable to various actions, strict protection for the site is highly recommended. Indeed, water capture and canalization of the spring itself together with disturbance to its surroundings have already compromised the site.

Islamia seniaensis sp.n.		SH	SW	BWH	PH	PW
(n=33)	HOLOTYPE	1.13	1.29	0.96	0.69	0.59
	min	0.94	1.09	0.82	0.59	0.44
	max	1.34	1.48	1.14	0.78	0.68
	mean	1.10	1.26	0.97	0.67	0.57
	st.dev.	0.100	0.084	0.074	0.042	0.055

TABLE 1. Measurements of *Islamia seniaensis* sp. n. shells. SH: shell height. SW: shell diameter. BWH: last whorl height. PH: aperture height. PW: aperture width. See also Fig. 4.

Mesures de la conquilla de *Islamia seniaensis* sp. n. SH: alçada. SW: diàmetre. BWH: alçada de l'última volta. PH: alçada de l'obertura. PW: amplada de l'obertura. Cal veure també la Fig. 4.

Restoration of natural conditions is also advisable even before any intervention, in order to make compatible both protection of the species and water uses, assuring a minimum water flow. Its inclusion in the Atlas and Red List of endangered invertebrates in Spain seems also justified. *Islamia seniaensis* sp. n, was found along another stygobiont mollusk species of the family Moitessieriidae Bourguignat, 1863; *Spiralix tuba* Quiñonero-Salgado et. al. 2019, also endemic from Font dels Rossegadors (Quiñonero-Salgado et. al. 2019).

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