

New species of the genus *Spiralix* Boeters, 1972 (Gastropoda: Moitessieriidae) from Spain

Sergio Quiñonero-Salgado^{1*}, Álvaro Alonso² & Emilio Rolán³

1. Associació Catalana de Malacologia, Museu Blau, plaça Leonardo da Vinci 4-5, 08019 Barcelona, Spain.

2. C/Infesto 7, 6º J, 33207 Gijón Asturias, Spain.

3. Museo de Historia Natural de la Universidad de Santiago, Campus Norte, Parque Vista Alegre, 15782.

Santiago de Compostela, Spain.

*Autor corresponsal: sergioqs85@hotmail.com

Rebut el 19.03.2021. Acceptat el 11.05.2021.

A new species of the genus *Spiralix* is described for the province of Castelló (Spain), which differs conchologically from other known species in this genus. This geographical area is a hotspot for this genus, given the high number of endemic taxa already described.

Key words: Gastropoda, Moitessieriidae, *Spiralix*, new species, Spain.

Nova espècie del gènere *Spiralix* (Gastropoda: Moitessieriidae) per a Espanya

Es descriu una espècie nova del gènere *Spiralix* per a la província de Castelló (Espanya), la qual es diferencia conquiliològicament de les altres espècies del gènere conegudes. Aquesta zona geogràfica és un punt calent de diversitat del gènere, donada l'elevada quantitat de tàxons endèmics descrits.

Mots clau: Gastropoda, Moitessieriidae, *Spiralix*, espècie nova, Espanya.

The family *Moitessieriidae* Bourguignat, 1863 includes small sized freshwater gastropods, mainly from stygobiotic habitats. In Spain, the genus *Spiralix* is represented by numerous species and subspecies.

In the northeast (Basque Country, Castilla and León, Cantabria and Asturias) seven species have been described, all currently included in the subgenus *Burgosia* Boeters, 2003 (Rolán & Ramos, 1995; Boeters, 2003; Rolán & Arconada, 2003; Quiñonero-Salgado et al., 2017, 2018). In the Levantine area of Spain, the genus is represented by various species, all included in the nominotypical subgenus: *Spiralix* (*S.*) *gloriae* (Rolán & Martínez-Ortí, 2003); *Spiralix* (*S.*) *valenciana valenciana* Boeters, 2003; *Spiralix* (*S.*) *valenciana castellonica* Boeters, 2003; *Spiralix* (*S.*) *pequenoensis* Boeters, 2003; *Spiralix* (*S.*) *calida* Corbella et al., 2014; *Spiralix* (*S.*) *tuba* Quiñonero-Salgado et al., 2019; *Spiralix* (*S.*) *gusii* Quiñonero-Salgado et al., 2020; and *Spiralix* (*S.*) *cubelli* Quiñonero-Salgado et al., 2020 (Boeters, 2003; Rolán & Martínez-Ortí, 2003; Corbella et al., 2014; Quiñonero-Salgado et al., 2019, 2020).

In the present work, one new species of the genus *Spiralix* is described for the east of Spain, which can be

differentiated from other species by a series of conchological characters.

Material and methods

The type locality was visited twice, in January 1915 and September 2020. The study material was collected manually and, after cleaning and drying, it was filtered through consecutive sieves of 2.0, 1.0 and 0.5 mm mesh, in order to sort the molluscs by size. The shells were cleaned with water with the help of a small brush and examined under a stereomicroscope for their identification. No live specimens were collected, so the study was carried out only with empty shells. Photographs of the specimens were done with a trinocular stereomicroscope Nexius Zoom NZ 1903-S coupled to a Euromex CMEX-10PRO camera. Afterwards, some shells were processed with aluminium stubs for electronic images with an electronic Quanta-200 microscope, in order to examine details of microsculpture.

Abbreviations:

MCNB: Museu de Ciències Naturals de Barcelona

SEM: Scanning Electron Microscopy

CQS: Collection Quiñonero-Salgado

s: Shell

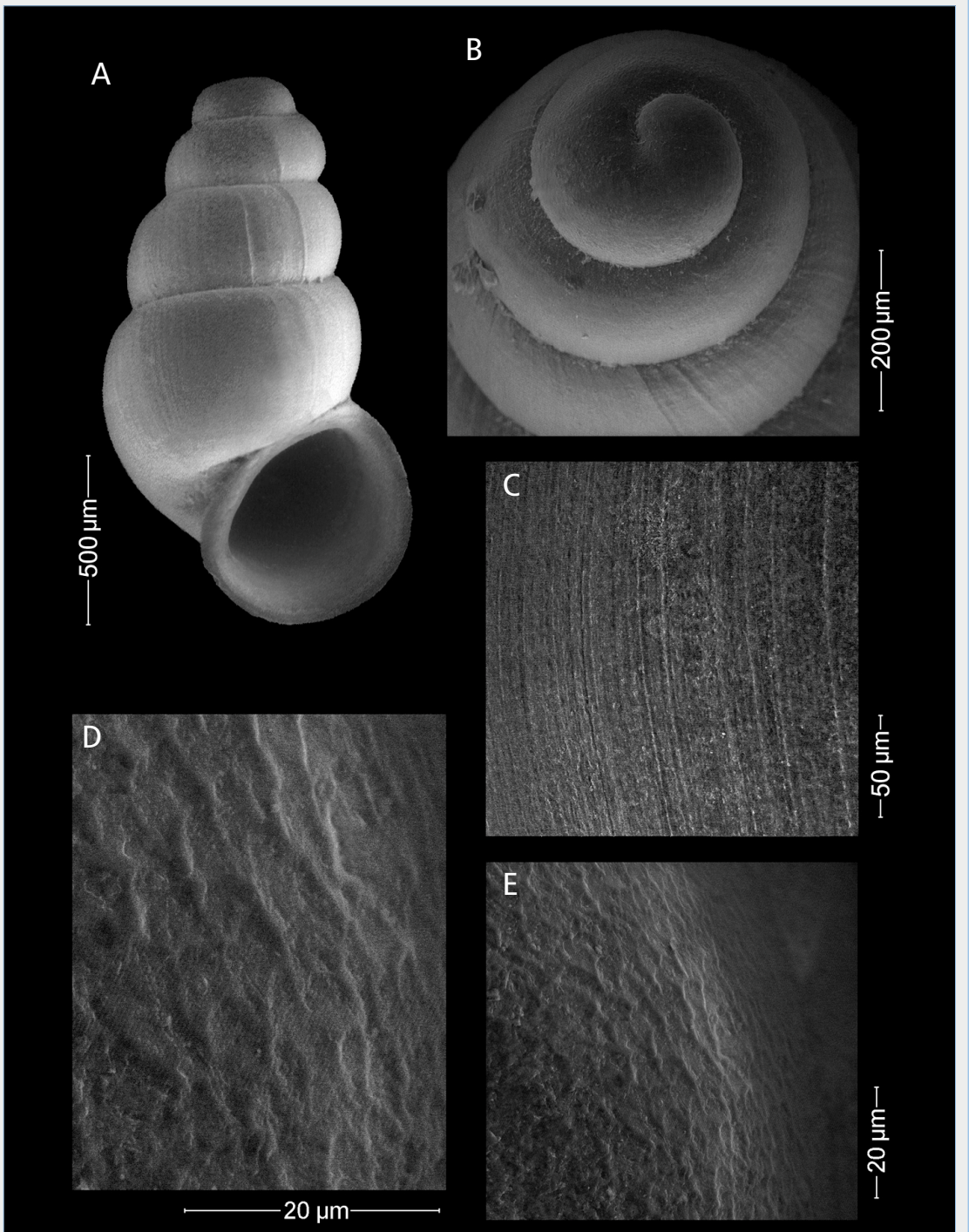


FIGURA 1. S.E.M photos of *Spiralix heisenbergi* sp. n. from the type locality. **A:** apertural view; **B:** protoconch; **C:** detail of the teleoconch microsculpture; **D-E:** detail of the protoconch microsculpture.

S.E.M fotos d'*Spiralix heisenbergi* sp. n. de la localitat tipus. **A:** vista apertural; **B:** protoconquilla; **C:** detall de la microescultura de la teleoconquilla; **D-E:** detall de la microescultura de la protoconquilla.

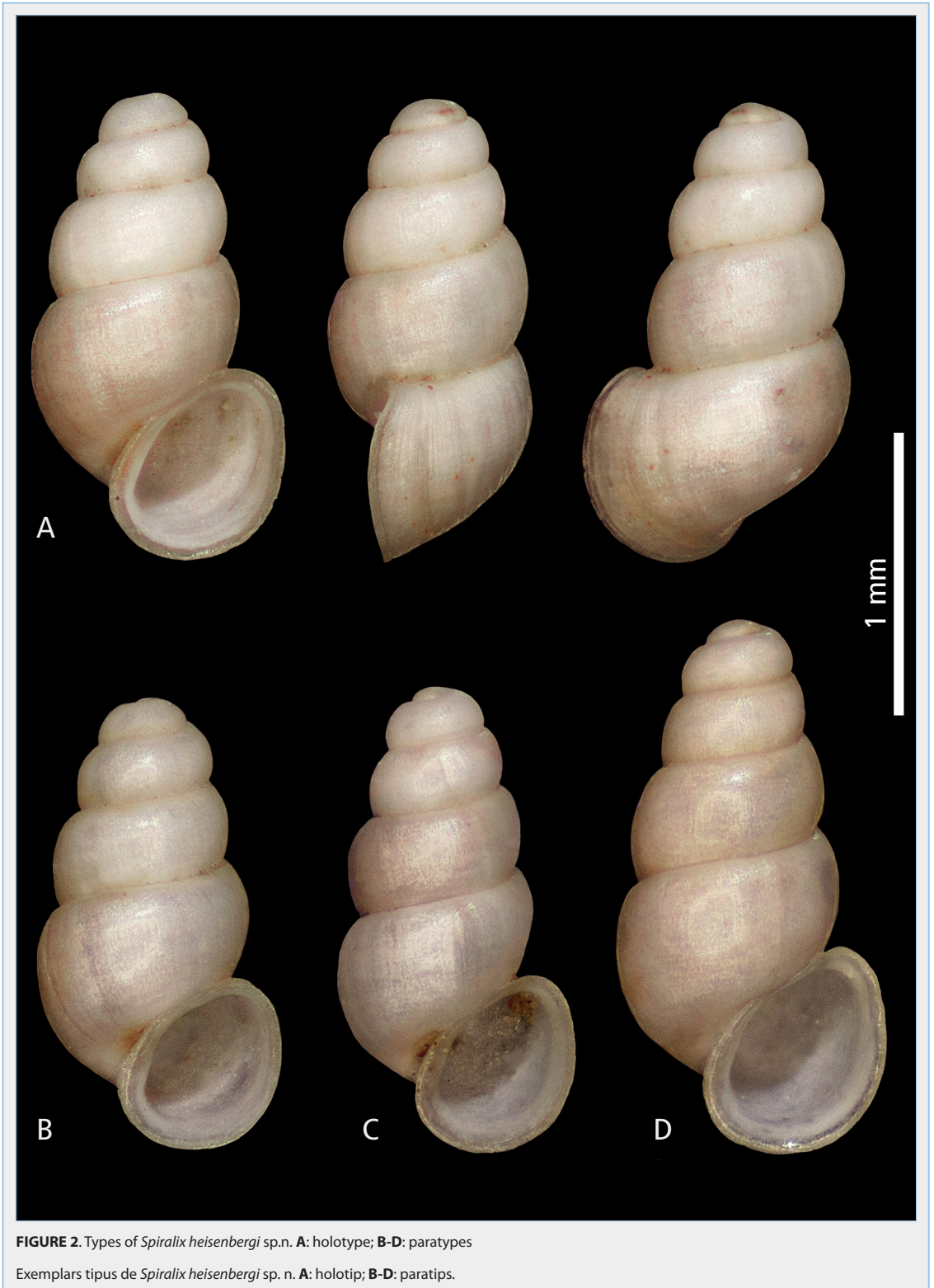


FIGURE 2. Types of *Spiralix heisenbergi* sp.n. **A:** holotype; **B-D:** paratypes

Exemplars tipus de *Spiralix heisenbergi* sp. n. **A:** holotip; **B-D:** paratips.

Results

Family: Moitessieriidae Bourguignat, 1863

Genus *Spiralix* Boeters, 1972

Subgenus *Spiralix* Boeters, 1972

Type species: *Spiralix* (*S.*) *rayi* (Locard, 1883) by original designation

Spiralix (*S.*) *heisenbergi* sp. n.

(Fig. 1-2)

Type material: (Fig. 2A) Holotype in MCNB MZB 2021-0469. Paratypes: 2 s in MCNB MZB 2021-0470, 10 s in CQS.

Type locality: Fuente de los Ignacios, Argelita, Castelló province, Valencian Community, Spain. (30TYK26433866). 320m.

Etymology: The name is derived from the character Walter White, known as “Heisenberg”, in the TV series Breaking Bad.

Description: Shell non pigmented, bright, translucent in fresh specimens. Conical in shape, and showing regular growth. Average height of 1.68 mm (range 1.44-1.92 mm), and average diameter of 0.92 mm (range 0.79-1.10 mm). Average height/diameter of

1.83, giving the shell a robust appearance (Figs 1A, 2A-D). Between 4 – 4 ½ convex whorls, leaving a deep suture in between. Last whorl represents, on average, 63% of total shell height, and is relatively ascendant in the final stretch (Fig 2A), forming a narrow umbilicus, as a fine slit partially covered by the columellar reflection, not allowing to see the internal spire curling (Figs. 1A, 2A-D). Ovoid aperture, with average height of 0.67 mm (range 0.59-0.80 mm), and width of 0.58 mm (0.51-0.66 mm). Continuum peristome, adhered to the last whorl in a stretch of variable length, reflected in its whole extension, but more noticeable at basal and columellar level. External lip projecting only slightly out of the shell profile, forming a quite pronounced sinule in the area of parietal insertion (Fig. 2A). Teleoconch has a rather little marked superficial sculpture, with growth lines little prominent, regularly and densely arranged (Fig. 1C). Protoconch has a microsculpture formed by irregularly ovoid depressions, separated by narrow and undulated ridges (Fig. 1D-E).

Dimensions: See Table 1, Fig. 3

Habitat: Stygobiotic.

Distribution: Only known from the type locality (Fig. 4).

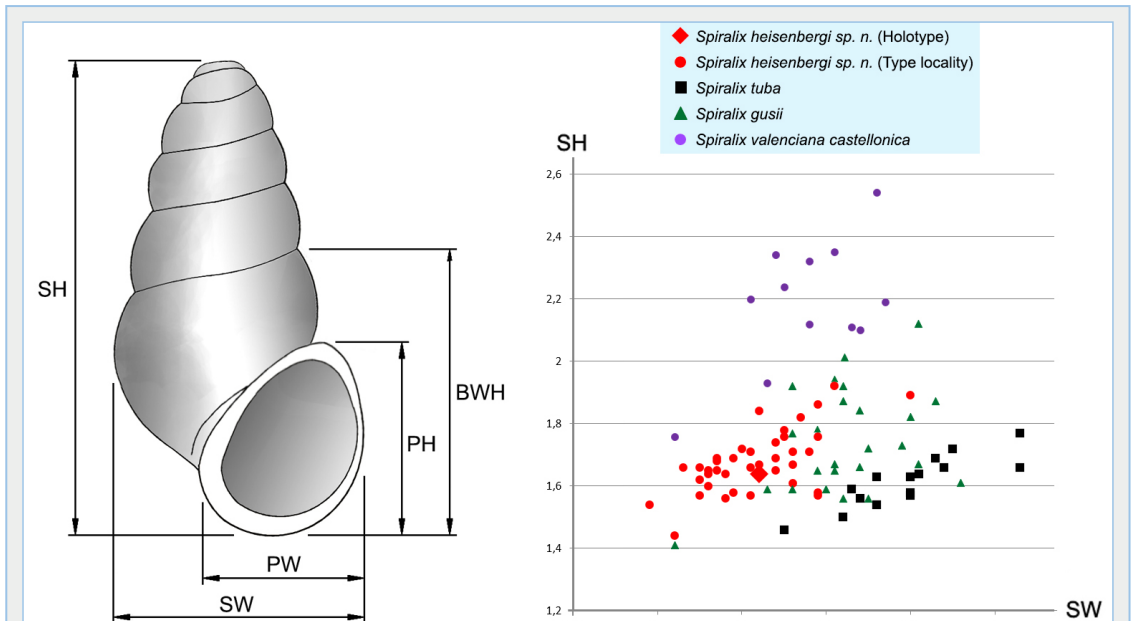


FIGURA 3. Shell measurements of *Spiralix heisenbergi* sp. n. compared to *S. valenciana castellanica*, *S. tuba*, and *S. gusii*. SH: shell height. SW: shell diameter. BWH: last whorl height. PH: aperture height. PW: aperture width.

Dimensions de la conquilla de *Spiralix heisenbergi* sp. n. comparat amb *S. valenciana castellanica*, *S. tuba* i *S. gusii*. SH: alçada. SW: diàmetre. BWH: altura de l'última volta PH: alçada de l'obertura. PW: amplada de l'obertura.

Remarks: The new species is compared with the other three that could be prone to some confusion, given their similar geographical distribution and shell morphology.

Spiralix valenciana castellanica Boeters, 2003 is widely distributed in Castelló province. It has, compared to the new species, a less conical shell, larger (average height 2.20 vs. 1.68 mm; diameter 0.95 vs. 0.92 mm), more slender (height/diameter average ratio 2.32 vs. 1.83), and larger whorl number ($4\frac{1}{4}$ - $5\frac{1}{4}$, vs. 4 - $4\frac{1}{2}$). Whorls have a less convex profile, and the last whorl is proportionally shorter (average ratio of last whorl height/total shell height of 56 vs 63%) (Boeters, 2003; Quiñonero-Salgado *et al.*, 2019).

Spiralix gusii Quiñonero-Salgado *et al.*, 2020 is restricted to a single known population, in Segorbe (Castelló province), and has, compared to the new species, a more superficial suture, less reflected peristome, less pronounced sinule, and less apparent ornamentation

<i>Spiralix heisenbergi</i> sp. n.		SH	SW	BWH	PH	PW
(n=39)	HOLOTYPE	1.64	0.92	1.07	0.68	0.60
	min	1.44	0.79	0.99	0.59	0.51
	max	1.92	1.10	1.19	0.80	0.66
	mean	1.68	0.92	1.06	0.67	0.58
	st.dev.	0.100	0.062	0.050	0.046	0.040

TABLE 1. Measurements of *Spiralix heisenbergi* sp. n. shells. SH: shell height. SW: shell diameter. BWH: last whorl height. PH: aperture height. PW: aperture width. See also Fig. 3.

Mesures de la conquilla de *Spiralix heisenbergi* 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. 3.



FIGURE 4. Fuente de los Ignacios, type locality of *Spiralix heisenbergi* sp. n.

Fuente de los Ignacios, localitat tipus d'*Spiralix heisenbergi* sp. n.

in the protoconch (Quiñonero-Salgado *et al.*, 2020).

Finally, *Spiralix tuba* Quiñonero-Salgado *et al.*, 2019, also known by a single population at La Pobla de Benifassà (Castelló province), clearly differs from the new species by having a much more reflected peristome, and a more prominent external lip in frontal view of the shell profile. In addition, *S. tuba* is more robust (average height/diameter ratio of 1.48 vs. 1.83), and has a last whorl height proportionally larger to the total shell height (75 vs 63% Quiñonero-Salgado *et al.*, 2019).

Discussion

The newly described species has evident similarities with all the other species of the genus *Spiralix*, characterized by conico-cylindrical to subcylindrical shells. Overall, the subgenus *Spiralix* has scarce ornamentation in the teleoconch, slightly more marked in the teleoconch, but still much more reduced than in the subgenus *Burgosia*, with cuneiform-shaped marks in the teleoconch, and a geographical range very distant

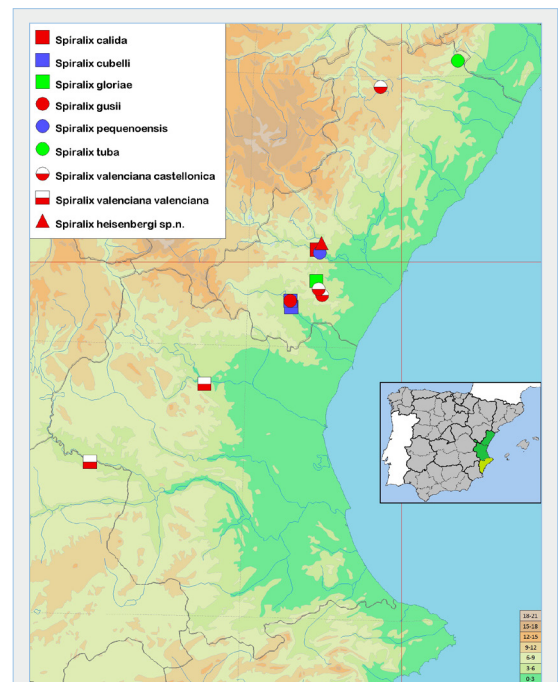


FIGURA 5. Map of Castelló and València provinces showing the known distribution range of some species of the genus *Spiralix* in the Valencian Community.

Mapa de les províncies de Castelló i València que mostra el rang de distribució de les espècies del gènere *Spiralix* a la Comunitat Valenciana.

from the former, since *Burgosia* is distributed only by the northeast of Spain (Boeters, 2003; Quiñonero-Salgado et al 2017, 2018). Given the conchological traits and geographical distribution, we include the new species in the subgenus *Spiralix*.

It can be differentiated from other genera such as *Palaospeum* Boeters, 1999 by having a less conical shape, and a narrower aperture; from *Moitessieria* Bourguignat, 1863, by lacking the well-defined spiral ornamentation present in all the species of the genus; from *Sardopaladilhia* Manganelli, Bodon, Cianfanelli, Talenti & Giusti, 1998, because this last genus has a continuous and everted peristome, and microsculpture formed by spirally-arranged dots or lines.

Conclusions

A new species of *Spiralix* (*Spiralix*) is described for the province of Castelló, in the Valencian Community, raising to 16 the known taxa in the Iberian Peninsula. It must be noticed the richness of the Levantine area of the Iberian Peninsula, making Castelló and Valencia provinces, with up to 9 taxa, a hotspot of diversity for the genus *Spiralix*, as already reported by Corbella et al. (2014). In contrast, not a single species is known for the province of Alacant.

Due to the reduced geographic distribution range, restricted to the type locality, and the fragility of this ecosystem, the newly described species seems to be highly vulnerable, so we would advocate for some protection status for both the species and its habitat.

References

- Boeters, H. D. 2003.** Supplementary notes on Moitessieriidae and Hydrobiidae from the Iberian Peninsula (Gastropoda, Caenogastropoda). *Basteria*, 67: 1-41.
- Corbella, J., Guillén, G., Prats, L., Tarruella, A. & Alba, D. 2014.** *Spiralix calida* sp. nov. (Gastropoda: Moitessieriidae), una nova espècie de gastròpode estigobi de Toga (l'Alt Millars, País Valencià, Espanya). *Spira*, 5: 111-120.
- Quiñonero-Salgado, S., Ruiz Cobo, J. & Rolán, E. 2017.** Three new species of *Spiralix* (*Burgosia*) (Gastropoda, Moitessieriidae). *Iberus*, 35(1): 59-70.
- Quiñonero-Salgado, S., Alonso, Á. & Rolán, E. 2018.** *Spiralix* (*Burgosia*) *vetusta* (Gastropoda: Moitessieriidae) a new species from Asturias (North of Spain). *Nemus*, 8: 95-100.
- Quiñonero-Salgado, S., Alonso, Á. & Rolán, E. 2019.** *Spiralix tuba* (Gastropoda: Moitessieriidae) a new species from Spain. *Nemus*, 9: 112-117.
- Quiñonero-Salgado, S., López-Soriano, J., Alonso, A. & Rolán, E. 2020.** Two new species of the genus *Spiralix* Boeters, 1972 (Gastropoda: Moitessieriidae) from Spain. *Nemus*, 10: 21-29.
- Rolán, E. & Ramos, M. A. 1995.** Una nueva especie de Hydrobiidae (Mollusca, Prosobranchia) del norte de la Península Ibérica. *Iberus*, 13 (2): 119-127.
- Rolán, E. & Arconada, B. 2003.** Nueva información sobre *Paladilhioipsis septentrionalis* (Mollusca, Prosobranchia). *Iberus*, 21 (2): 141-143.
- Rolán, E. & Martínez-Ortí, A. 2003.** Nuevas especies de la familia Hydrobiidae (Mollusca: Orthogastropoda) de la Comunidad Valenciana (España). *Iberus*, 21 (1): 191-206.
- Acknowledgements:** Our thanks to Inés Pazos from the Centro de Apoyo Científico y Tecnológico a la Investigación (CACTI) at Universidad de Vigo for the SEM pictures. Also to Carlos E. Prieto for elaborating the figure 5, to Joaquín López-Soriano for language revision, and to Albert Orozco for a critical revision of the manuscript.