

Two new genera of valvatiform stygobiont snails (Gastropoda: Hydrobiidae) from the Iberian Peninsula

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Two new genera and two new species of stygobiont gastropods from the Iberian Peninsula are described, including the first endemic genus from Aragón, and another one from Catalonia. Molecular analyses confirm them as being well separated from other previously known genera with similar shell morphology that have also been genetically analysed. These findings enlarge the list of stygobiont snails recently described from the Iberian Peninsula, pointing to an extreme richness of this type of malacofauna in its groundwater.

Keywords: groundwater, stygobiont, Aragón, Catalonia, endemism.

Dos nous gèneres de caragols estigobis valvatiformes (Gastropoda: Hydrobiidae) de la península Ibèrica

Es descriuen dos nous gèneres i dues noves espècies de gasteròpodes estigobis de la península Ibèrica, incloent-hi el primer gènere endèmic per a l'Aragó, i un de nou per a Catalunya. Les anàlisis moleculars confirmen la seva singularitat i permeten la descripció de nous gèneres ben separats d'altres prèviament descrits amb morfologia de la closca semblant i analitzats genèticament en aquest treball. Aquestes troballes augmenten la llista de caragols estigobis descrits recentment a la península Ibèrica i revelen una riquesa extraordinària d'aquest tipus de malacofauna en les seves aigües subterrànies.

Paraules clau: aigües subterrànies, estigobiont, Aragó, Catalunya, endemisme.

Various genera of valvatiform stygobiont Hydrobiidae are present in the Iberian Peninsula. Most of these have only recently been described, such as *Corbellaria* Callot-Girardi & Boeters, 2012 from Castilla y León, *Navalis* Quiñonero-Salgado & Rolán, 2017 from the Valencian Autonomous Community, *Salaeniella* Boeters, Quiñonero-Salgado & Ruiz, 2019 from Cantabria, *Onubiella* Martín-Álvarez, Quiñonero-Salgado, López-Soriano, Raven & Glöer, 2024 from Andalusia, *Robustiella* Quiñonero-Salgado, López-Soriano & García-Meseguer, 2025 from Murcia, and *Vilertia*

López-Soriano, Quiñonero-Salgado, Alonso, Rolán & Glöer, 2022 and *Alfahariella* Quiñonero-Salgado, López-Soriano, Raven & Glöer, 2024 from Catalonia (Quiñonero-Salgado et al., 2024). Recently, the first Iberian species of the genus *Hadziella* Kuščer, 1932 has been described from Aragón (Quiñonero-Salgado et al., 2023), which was also the first valvatiform stygobiont snail ever described from that autonomous community, and a second species of this genus has been described this year (Quiñonero-Salgado et al., 2025).

In the present article, two new genera and two new

species of stygobiont snails are described from Aragón and Catalonia, based on molecular, morphological and anatomical comparisons with related genera.

Material and methods

Specimen collection and morphological analysis

The type localities were visited between March and September 2024. To obtain the material, stones were lifted manually and sediment was collected from each spring and later washed with the use of sieves of different mesh (2.0, 1.0 and 0.25 mm). Shells were separated with the help of a brush, and cleaned with tap water.

As material for comparison, specimens of *Alfahariella panxampla* Quiñonero-Salgado, López-Soriano, Raven, Glöer & Prieto, 2024 from its type locality (Alfara de Carles, el Baix Ebre, Tarragona province) and *Onubiella suberensis* Martín-Álvarez, Quiñonero-Salgado, López-Soriano, Raven & Glöer, 2024 from Manantial de la Huerta (Zufre, Huelva province) were used.

Animals were dissected after immersion in 80% ethanol. The shell was carefully broken with the help of a microscope slide. To expose the penis, subsequently, with the help of two entomology pins, the mantle was withdrawn. Anatomical parts and anatomised specimen pictures were obtained with a Leica DMC5400 camera attached to a Leica M205C microscope.

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 electronic microscopy (SEM) to reveal their microsculpture. SEM images were obtained without coating in a JEOL -IT510 LV using low vacuum (30 Pa pressure) and 10 KV voltage.

Abbreviations: Naturalis: Naturalis Biodiversity Center (Leiden); SEM: Scanning Electron Microscopy; H=height; W=width; a.s.l.: above sea level; s: shell.

DNA extraction, PCR amplification and sequencing

The DNA was extracted from the foot tissue of two individuals of *A. panxampla*, *O. suberensis* and the new springsnails species preserved in ethanol, 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. (2024a). The PCR product was checked by 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 the new sequences of *A. panxampla*, *O. suberensis*, *Alagoniella alaunensis* sp. nov., *Siuraniella montsantensis* sp. nov., as well as other 83 available sequences from GenBank of Iberian valvati-form springsnails species plus one sequence of *Mercuria balearica* (Paladilhe, 1869) used as outgroup. Sequences were deposited in GenBank with the accession numbers shown in Table 3.

The test software IQ-TREE v2.3.1. (Minh et al., 2020) was used to predict the nucleotide substitution model showing the best BIC scores deploying ModelFinder options (Kalyaanamoorthy et al., 2017). A Maximum Likelihood tree was performed in IQ-TREE v2.0 using Ultrafast Bootstrap options (1,000 bootstrap replicates) (Minh et al., 2013) and a search was conducted for the best scoring tree using the HKY+F+I+G4 model.

Results

Systematics

Genus *Alagoniella* gen. nov.

Quiñonero-Salgado, López-Soriano, Raven & Sánchez

Type species: *Alagoniella alaunensis* sp. nov.

(Figs. 1-2)

Description: Shell small, valvati-form, with deep sutures and a low spire. Protoconch with a microsculpture of numerous variously shaped angular shallow pits that fade and are replaced by spirally arranged

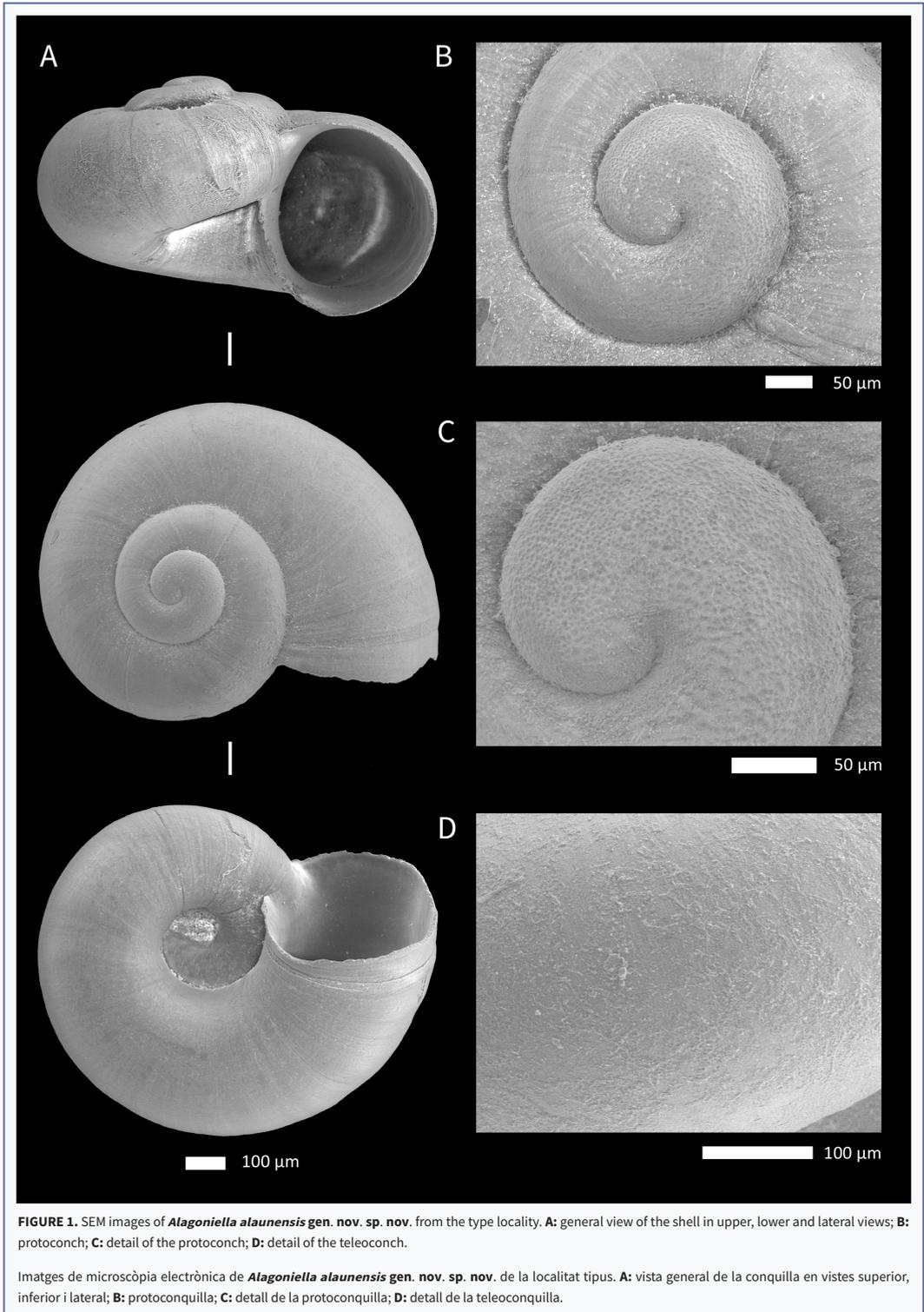


FIGURE 1. SEM images of *Alagoniella alaunensis* gen. nov. sp. nov. from the type locality. **A:** general view of the shell in upper, lower and lateral views; **B:** protoconch; **C:** detail of the protoconch; **D:** detail of the teleconch.

Imatges de microscòpia electrònica de *Alagoniella alaunensis* gen. nov. sp. nov. de la localitat tipus. **A:** vista general de la conquilla en vistes superior, inferior i lateral; **B:** protoconquilla; **C:** detall de la protoconquilla; **D:** detall de la teleconquilla.

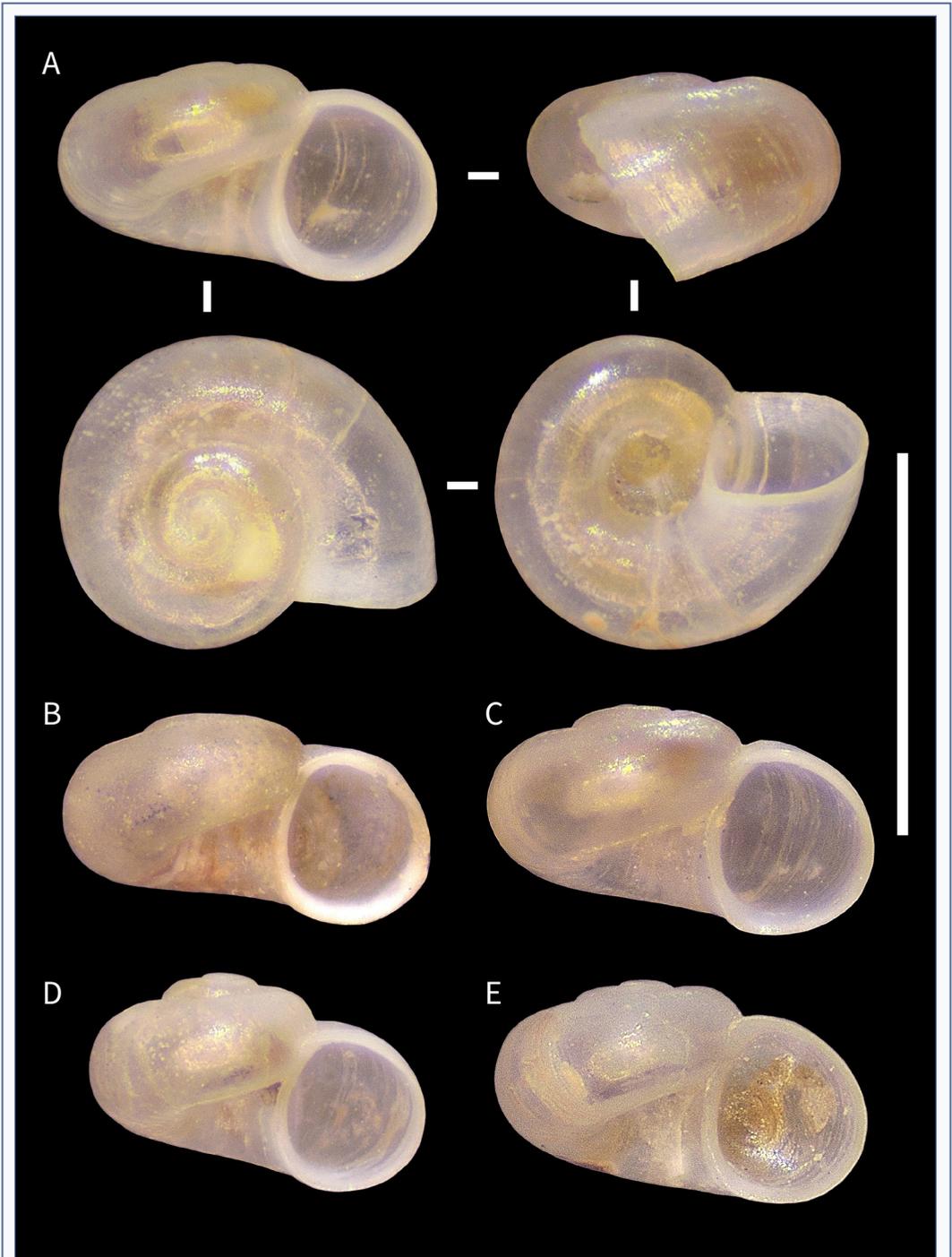


FIGURE 2. Type specimens of *Alagoniella alaunensis* gen. nov. sp. nov. from the type locality. **A:** different views of the holotype; **B-E:** four different paratypes. Scale: 1 mm.

Col·lecció tipus de *Alagoniella alaunensis* gen. nov. sp. nov. de la localitat tipus. **A:** diferents vistes de l'holotip. **B-E:** quatre paratips diferents. Escala: 1 mm

irregular cuneiform marks on the final part of the whorl. Teleoconch with clearly prosocline growth lines and a microsculpture of minute pits. Umbilicus wide and deep. Aperture rounded, at about 30° from vertical, edge not reflected.

Etymology: Named after the municipality of Alagón (Zaragoza province, Aragón), type locality.

Remarks: See description of the new species. DNA analysis proves that it appears in the same cluster as *Alfahariella*, *Corbellaria* and *Onubiella*, being more related with the first one. Based on molecular data only, at this point the new species could be grouped within the genus *Corbellaria* (with the type species). The different morphological and particularly anatomical traits justify placement in a new genus. Further research may deliver additional species belonging to this cluster. Their sequences may better resolve the molecular tree, and improve the threshold for separating the genera.

The shell of *Alagoniella* gen. nov. has higher whorls than shells of similar genera. In ventral view near

the aperture, the final whorl overlaps the penultimate whorl (as in *Alfahariella* and *Vilertia*) whereas in *Corbellaria* and *Onubiella* it does not. *Alfahariella* has a different microsculpture of the protoconch whereas the aperture is slightly laterally inclined and is at a

		1	2	3	4
1	<i>Alfahariella panxampla</i>	-	0	0	0
2	<i>Corbellaria celtiberica</i>	9.88	-	0	0
3	<i>Onubiella suberensis</i>	17.17	17.78	-	0
4	<i>Alagoniella alaunensis</i> sp.nov.	5.78	8.81	17.48	-

		1	2	3	4
1	<i>Spathogyna fezi</i>	-	0	0	0
2	<i>Tarraconia gasulli</i>	12.87	-	0	0
3	<i>Tarraconia rolani</i>	12.87	1.82	-	0
4	<i>Siuraniella montsantensis</i> sp.nov.	14.24	16.72	17.33	-

TABLE 2. Genetic divergence matrix for the species examined, based on the COI gene sequence.

Matriu de divergències genètiques de les espècies examinades, basat en seqüències del gen COI.

		SH	SW	PH	PW
<i>Alagoniella alaunensis</i> sp. nov. Fuente de las Mujeres, Alagón (Zaragoza province) (n=30)	HOLOTYPE	0.60	1.04	0.48	0.47
	min	0.54	0.91	0.41	0.39
	max	0.83	1.22	0.56	0.53
	mean	0.69	1.07	0.49	0.46
	st.dev.	0.078	0.081	0.042	0.035
<i>Siuraniella montsantensis</i> sp. nov. Font del Racó de la Pastera, Ulldemolins (Tarragona province) (n=31)	HOLOTYPE	0.59	1.04	0.46	0.45
	min	0.50	0.95	0.42	0.41
	max	0.77	1.31	0.59	0.57
	mean	0.60	1.12	0.48	0.46
	st.dev.	0.059	0.091	0.035	0.036

TABLE 1. Measurements (mm) of *Alagoniella alaunensis* gen. nov. sp. nov. and *Siuraniella montsantensis* gen. nov. sp. nov. from their type localities. **SH:** shell height; **SW:** shell diameter; **PH:** aperture height; **PW:** aperture width.

Mesures (mm) de la conquilla d'*Alagoniella alaunensis* gen. nov. sp. nov. i *Siuraniella montsantensis* gen. nov. sp. nov. de les seves localitats tipus. **SH:** alçada de la conquilla; **SW:** amplada de la conquilla; **PH:** alçada de l'obertura; **PW:** amplada de l'obertura.

Species	Locality	GenBank accession numbers
<i>Onubiella suberensis</i>	Manantial de la Huerta, Zufre, Huelva, Spain	PV300997-PV300998
<i>Alfahariella panxampla</i>	Font Vella, Alfera de Carles, Tarragona, Spain (type locality)	PV301001-PV301002
<i>Alagoniella alaunensis</i> sp. nov.	Fuente de las Mujeres, Alagón, Zaragoza, Spain (type locality)	PV300999-PV301000
<i>Siuraniella montsantensis</i> sp. nov.	Font del Racó de la Pastera 1, Ulldemolins, Tarragona, Spain (type locality)	PV301003-PV301004

TABLE 3. Locality name and GenBank accession numbers for the Iberian valvatiform species sequenced in this study.

Taula III. Nom de les localitats i números d'accés GenBank per a les espècies de valvatiforms seqüenciades en aquest estudi.

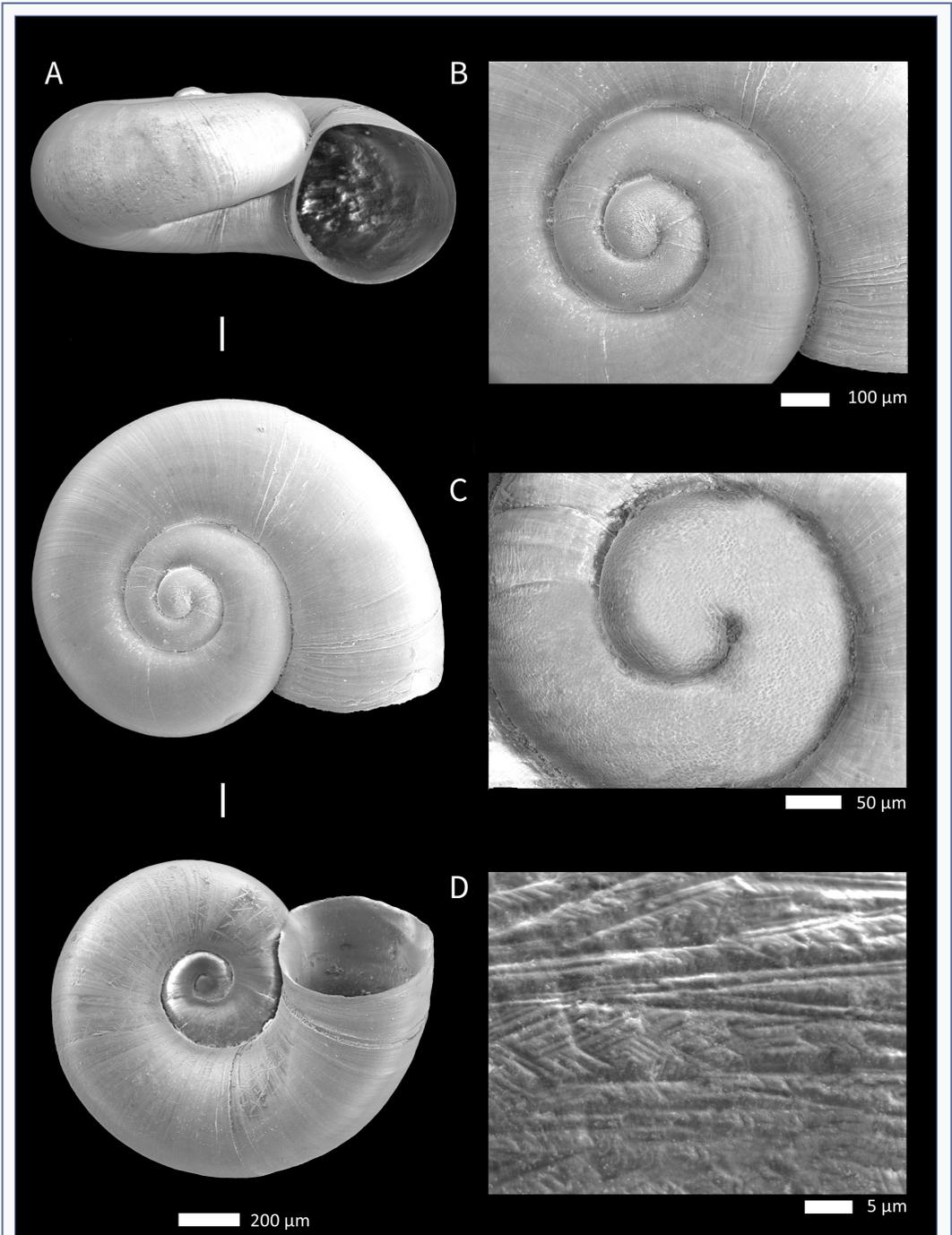


FIGURE 3. SEM images of *Siuraniella montsantensis* gen. nov. sp. nov. from the type locality. **A:** general view of the shell in upper, lower and lateral views; **B:** central part in upper view; **C:** protoconch; **D:** detail of the teleoconch.

Imatges de microscòpia electrònica de *Siuraniella montsantensis* gen. nov. sp. nov. de la localitat tipus. **A:** vista general de la conquilla en vistes superior, inferior i lateral; **B:** part central en vista superior; **C:** protoconquilla; **D:** detall de la teleoconquilla.

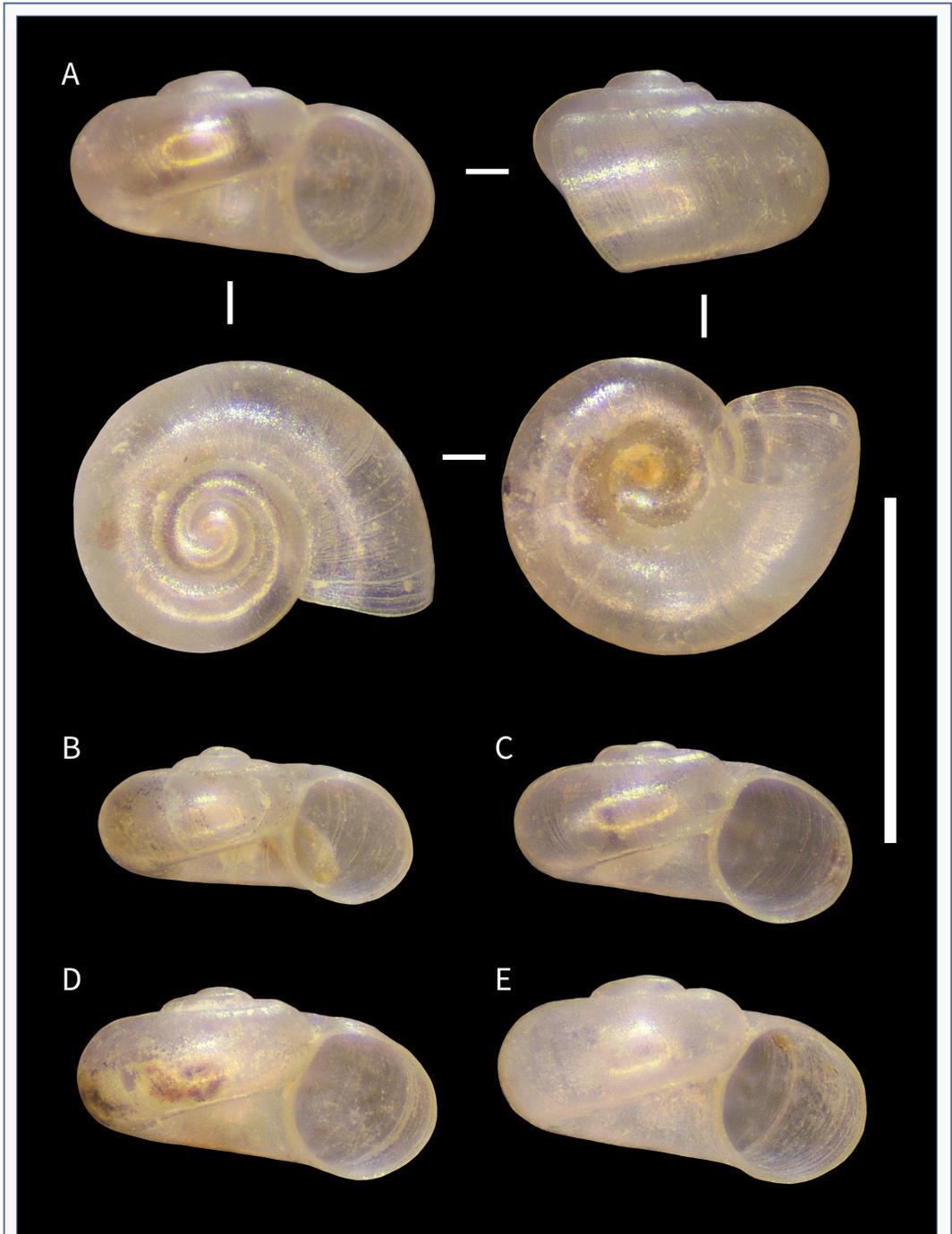


FIGURE 4. Type specimens of *Siuraniella montsantensis* gen. nov. sp. nov. from the type locality. **A:** different views of the holotype; **B-E:** four different paratypes. Scale: 1 mm.

Col·lecció tipus de *Siuraniella montsantensis* gen. nov. sp. nov. de la localitat tipus. **A:** diferents vistes de l'holotip; **B-E:** quatre paratips diferents. Escala: 1 mm

15° angle from vertical. *Vilertia galeata* has a very different shape, with a higher spire, a more oval aperture in outline and a reflected edge.

***Alagoniella alaunensis* sp. nov.**

Quiñonero-Salgado, López-Soriano, Raven & Sánchez
(Figs. 1-2)

Material: Holotype Naturalis, MOL. 350867, Paratypes: 5 s. Naturalis, RMNH. MOL. 350868. Other material examined: 25 s. in SQS collection.

Type locality: Fuente de las Mujeres (Alagón, Zaragoza province, Spain). [30TXM54782633]. 222 m a.s.l. (Fig. 5A).

Etymology: *Derivatio nominis* of Alaun, also known as Alavona or Allavona, Iberian city, the easternmost of all

Vasconian cities in Iberian times, where various series of coins with Iberian alphabet were minted. This was likely the origin of the present town of Alagón, the type locality for this species.

Description: Shell small, translucent, fragile, valviform, with deep sutures and low spire. Protoconch with about 1.7 convex whorls with a microsculpture formed by numerous variously shaped angular shallow pits that become larger, shallower, curved and elongated until they fade and are replaced by spirally arranged irregular cuneiform marks on the final 0.4 whorl. Teleoconch of 1.4 convex whorls with upper third attached to lower half of previous whorl, with very limited overlap. Very fine clearly prosocline growth lines, a few coarser ones representing growth stops. Microsculpture of minute pits. Umbilicus wide and deep. Aperture rounded, at about 30° from vertical, edge not reflected.

Anatomy: Animal entirely white, without pigmentation. Male genitalia consisting of a single penis (without any appendages), thick over its entire length and with a blunt apex (Fig. 7B).

Dimensions: Shell height of 0.54-0.83 mm, and diameter of 0.91-1.22 mm. The aperture/last whorl has dimensions of 0.41-0.56 mm high and 0.39-0.53 mm wide. See Table 1 and Fig. 6.

Habitat: Stygobiotic.

Distribution: Only known from the type locality.

Differentiating characters: The shell is compared with that of genera within the same clade:

Alfahariella panxampla has a similar outline, but is flatter with lower whorls, its protoconch has very low oval bumps arranged in a curved radial pattern, the teleoconch has cuneiform marks, whereas the aperture is slightly laterally inclined and is at a 15° angle from vertical.

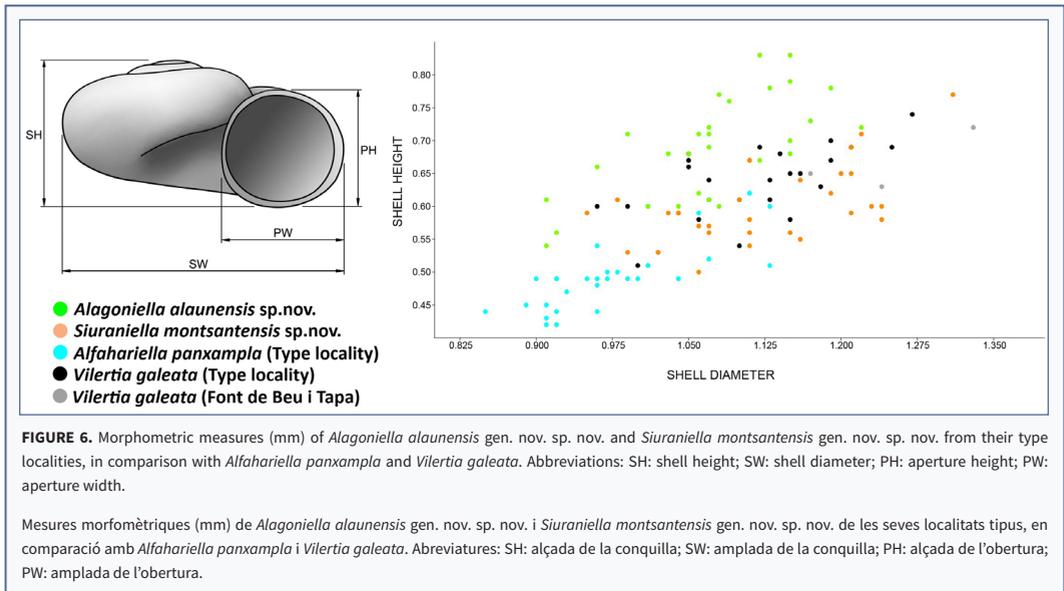
Corbellaria celtiberica varies in shape but generally is much flatter with lower whorls and as result a smaller aperture. The shells are most easily differentiated in ventral view as the umbilicus is very wide and near the aperture the ultimate whorl is clearly attached to the penultimate one without any overlap.

Onubiella suberensis also has a much flatter shell with very wide umbilicus and near the aperture also in this species the ultimate whorl is clearly attached to the penultimate one without any overlap. The protoconch is also pitted, but the pits continue over the



FIGURE 5. A: spring Fuente de las Mujeres at Alagón (Zaragoza), type locality of *Alagoniella alaunensis* gen. nov. sp. nov. **B:** upper spring at Font del Racó de la Pastera at Ulldemolins (Tarragona), type locality of *Siuraniella montsantensis* gen. nov. sp. nov.

A: Fuente de las Mujeres a Alagón (Saragossa), localitat tipus d'*Alagoniella alaunensis* gen. nov. sp. nov. **B:** Font del Racó de la Pastera a Ulldemolins (Tarragona), localitat tipus de *Siuraniella montsantensis* gen. nov. sp. nov.



entire protoconch. In apical view the aperture has an S-shaped outline.

Vilertia galeata has a very different shape, with a higher spire, much more rapidly widening whorls that hardly touch preceding whorls whereas the aperture is more oval in outline, as the edge is reflected, widest in the outermost part of the whorl. As in *Onubiella*, the pits continue over the entire protoconch.

Anatomically, *Alagoniella alaunensis* sp. nov. has a simple penis without any outgrowth, while in *C. celtiberica* and *A. panxampla* the penis has a simple penial appendix (Callot-Girardi & Boeters, 2012, fig. 10D; Quiñonero-Salgado et al., 2024, fig. 3B). Meanwhile, *Onubiella suberensis* Martín-Álvarez, Quiñonero-Salgado, López-Soriano, Raven & Glöer, 2024, has a simple penis, but it becomes progressively sharper in its extension, and is much thinner than in *Alagoniella alaunensis* sp. nov. (Martín-Álvarez et al., 2024b, fig. 5C).

Genetic results: The phylogenetic analysis revealed a similar topology and clades previously reported by Delicado et al. (2024). Samples assigned to *Alagoniella alaunensis* sp. nov. based on morphology formed a well-supported group with a high bootstrap support (i.e., 93%) located within a clade composed of *O. suberensis*, *A. panxampla* and *C. celtiberica*, all of them stygobionts. The sequence divergence of COI for *Alagoniella alaunensis* sp. nov. and the other congeners

of its clade ranged between 8.81% with *C. celtiberica* and 5.78% with *A. panxampla*, being this last one the genetically closest species to *Alagoniella alaunensis* sp. nov. (Table 2).

Remarks: This is the third known valvatiform stygobiont present in Aragón, after *Hadziella forneri* Quiñonero-Salgado, López-Soriano & Rolán, 2023 and *Hadziella kanoi* Quiñonero-Salgado, López-Soriano & Raven, 2025, and the first endemic genus. Future research may uncover additional taxa from this region, as its karst topography is very suitable for stygobiont snails.

Genus *Siuraniella* gen. nov.

Quiñonero-Salgado, López-Soriano, Raven, Pascual, García, Solé & Sánchez

Type species: *Siuraniella montsantensis* sp. nov.

(Figs. 3-4)

Description: Shell small, valvatiform, with deep sutures and low spire. Protoconch with a microsculpture formed by numerous variously shaped pits with 3-6 grooves inside forming small star-like structures, on the final part of the protoconch the grooves become longer in the direction of the aperture and eventually fade into spirally arranged irregular cuneiform marks on the final part of the whorl. Teleoconch with marked, clearly prosocline growth lines and a microsculpture of spirally

arranged irregular cuneiform marks that fade away from the protoconch. Umbilicus wide and deep. Aperture rounded, at $\sim 25\text{-}30^\circ$ from vertical, edge not reflected.

Etymology: Named after Siurana, name of the river that outlines the southern edge of Montsant massif (Tarragona province, Catalonia), in whose basin the new genus was found.

Remarks: See description of new species. DNA analysis proves that this genus is far from all other known genera of stygobiont valvatiform up to now sequenced. It has homology with two crenobiont genera present in the eastern area of the Peninsula, *Tarraconia* M. A. Ramos & Arconada, 2000 and *Spathogyna* Arconada & M. A. Ramos, 2002.

The shell of *Siuraniella* has higher whorls than shells of similar genera. In ventral view near the aperture the final whorl overlaps the penultimate whorl (as in *Alfahariella* and *Vilertia*) whereas in *Corbellaria* and *Onubiella* it does not. *Alfahariella* has a different microsculpture of the protoconch whereas the aperture is slightly laterally inclined and is at a 15° angle from vertical. *Vilertia galeata* has a very different shape, with a higher spire, the aperture is more oval in outline and the edge is reflected.

Siuraniella montsantensis sp. nov.

Quiñonero-Salgado, López-Soriano, Raven, Pascual, García, Solé & Sánchez
(Figs. 3-4)

Material: Holotype: Naturalis, RMNH. MOL. 350869, Paratypes: 3 s. in RMNH. MOL. 350870. Other material examined: 22 s. in SQS collection.

Type locality: upper spring at Font del Racó de la Pastera (Ulldemolins, Priorat, Tarragona province, Spain). [31TCF19007653]. 524 m a.s.l. (Fig. 5B). Note that this is not the spring where three new stygobiont species were described in 2009, but it is located in the same ravine, about 280 m upstream. We refer to the spring visited by Alba et al. (2009) and Corbella et al. (2009) as lower spring at Font del Racó de la Pastera (see Pascual et al., 2024 for more details on the localities).

Etymology: *Derivatio nominis* of Montsant, the mountain system and Natural Park where the new species was found.

Description: Shell small (H 0.5-0.77 mm, W 0.95-1.31 mm), translucent, fragile, valvatiform, with deep sutures and low spire. Protoconch about 1.6 convex whorls with some wrinkles on the inner part of the nucleus, otherwise microsculpture formed by numerous variously shaped pits with 3-6 grooves inside forming little star-like structures, on the final part of the protoconch the grooves becoming longer in the direction of the aperture and eventually fade into spirally arranged irregular cuneiform marks on the final part of the whorl. Teleoconch of 1.5 convex whorls with upper third attached to lower half of previous whorl, covered with microsculpture of spirally arranged irregular cuneiform marks, which gradually fade away from the protoconch. Marked, regular prosocline growth lines, and some coarser ones representing growth stops. Umbilicus wide and deep. Aperture rounded, very slightly higher than wide (H 0.42-0.59 mm, W 0.41-0.57 mm), at about $25\text{-}30^\circ$ from vertical, edge not reflected.

Anatomy: Animal entirely white, without pigmentation. Male genitalia consisting of a simple penis, without appendages and pointed apex, slender throughout its entire length except in the region near the apex where there is a clear thickening (Fig. 7).

Dimensions: See Table 1 and Fig. 4.

Habitat: Stygobiotic.

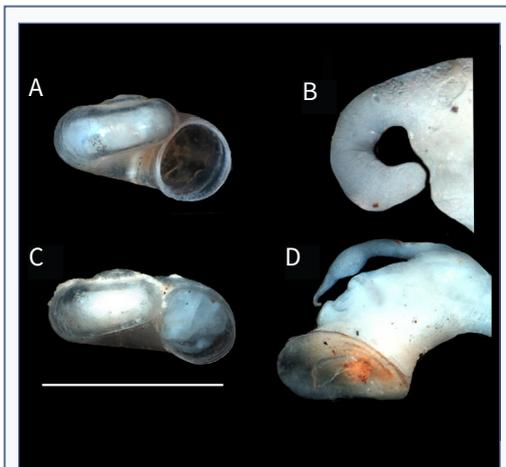


FIGURE 7. A: aspect of the penis of *Alagoniella alaunensis* gen. nov. sp. nov. and B: *Siuraniella montsantensis* gen. nov. sp. nov. Images courtesy of Peter Glöer.

A: aspecto del penis de *Alagoniella alaunensis* gen. nov. sp. nov. i B: de *Siuraniella montsantensis* gen. nov. sp. nov. Imatges cortesia de Peter Glöer.

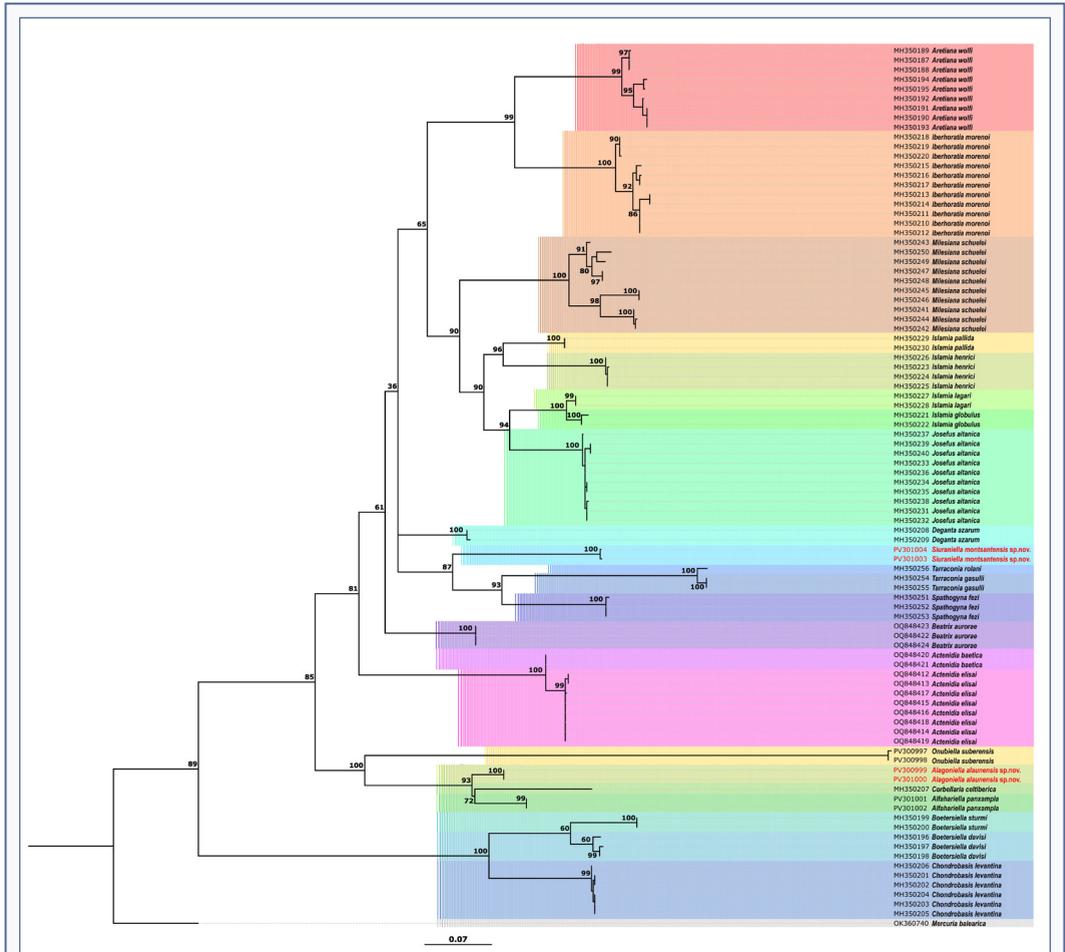


FIGURE 8. Maximum likelihood phylogenetic tree inferred using the COI dataset in IQ-TREE. The new species are highlighted in red.
 Arbre filogenètic de màxima versemblança inferit utilitzant les seqüències de COI en IQ-TREE. Les noves espècies estan marcades en vermell.

Distribution: Known from the type locality and a few different spots associated to springs, all in the Montsant massif: lower spring at Font del Racó de la Pastera, Font de la Gleva, la Fontalba, Font de Baix, Font del Barranc, Font de les Planes, Font de Ca l’Antonet, la Fonteta, Font del Mas de Sant Blai. It has also been identified in a sample from hyporheic zone of Montsant River between Mas del Soleràs and l’Aiguabarreig (detailed coordinates available at Pascual et al., 2024).

Differentiating characters: The shell is more flattened than that of *V. galeata*, but less than in *A. panxampla* or *C. celtiberica*. From all the four species here compared, this is the only one having an aperture that is (slightly) higher than wider.

Anatomically, *Siuraniella montsantensis* sp. nov. has a simple penis without any outgrowth, while in *Tarraconia rolani* Ramos, Arconada & Moreno, 2000, *Tarraconia gasulli* (Boeters, 1981) and *Spathogyna fezi* (Altimira, 1960) the penis has a simple penial lobe (Ramos et al., 2000, fig. 8c and 13C; Arconada & Ramos, 2002, fig. 7). *Onubiella suberensis* and *Alagoniella alauensis* sp. nov. have a simple penis without outgrowths, but without a characteristic thickening in the region near the apex and the apex is not pointed (Martín-Álvarez et al., 2024b, fig. 5C) (Fig. 7).

Genetic results: Samples assigned to *Siuraniella montsantensis* sp. nov. based on morphology formed a well-supported group with a high bootstrap support

(i.e., 87%) located within a clade composed of *T. rolani*, *T. gasulli* and *S. fezi*. The sequence divergence of COI for *Siuraniella montsantensis* sp. nov. and the congeners of its clade ranged between 17.33% with *T. rolani* and 14.24% with *S. fezi* (Table 2).

Remarks: This is the third known valvatiform stygobiont endemic from Catalonia, after *Vilertia* and *Alfahariella*.

Discussion

This paper provides the first genetic data for multiple Iberian stygobiont snail species. Of the species discussed in this paper, a sequence was available only for a single species, *C. celtiberica* (Delicado et al., 2019). The phylogenetic tree obtained with the new data validates some previously described genera such as *Onubiella* and *Alfahariella*, and coupled with the anatomical results gives support to the two new genera here described. The large genetic distance between *O. suberensis* and the other Iberian valvatiforms (from 22% to 17.3%) is remarkable. This has led us to think that perhaps this species does not belong to any of the subfamilies included within the informal term

“valvatiform”. However, the tests carried out have always given the same result, fitting the species within the “*Corbellaria*” clade. Further sequences of these and other species will be required to better clarify the positioning of each of these taxa, particularly in the “*Corbellaria*” clade, presently composed of different monotypic genera, whose assignment could still change when more sequences are introduced in the analysis.

It is surprising that one of the newly described stygobiont genera (*Alagoniella* gen. nov.) clusters with some other stygobionts, which is not the case for *Siuraniella* gen. nov. These results provide evidence for one cluster having multiple stygobiont species distributed all along the Iberian Peninsula (from Catalonia, Aragón and Castilla y León in the north, down to western Andalucía), while the other is formed by both crenobiont and stygobiont species from a well-defined area, i.e., the north-east. No hypotheses have yet been proposed on the development of stygobiont adaptations in snails. While for example all Moitessieriidae are stygobiont and may derive from a stygobiont ancestor, the situation within Hydrobiidae is very complex, with both crenobiont and stygobiont representatives mixed

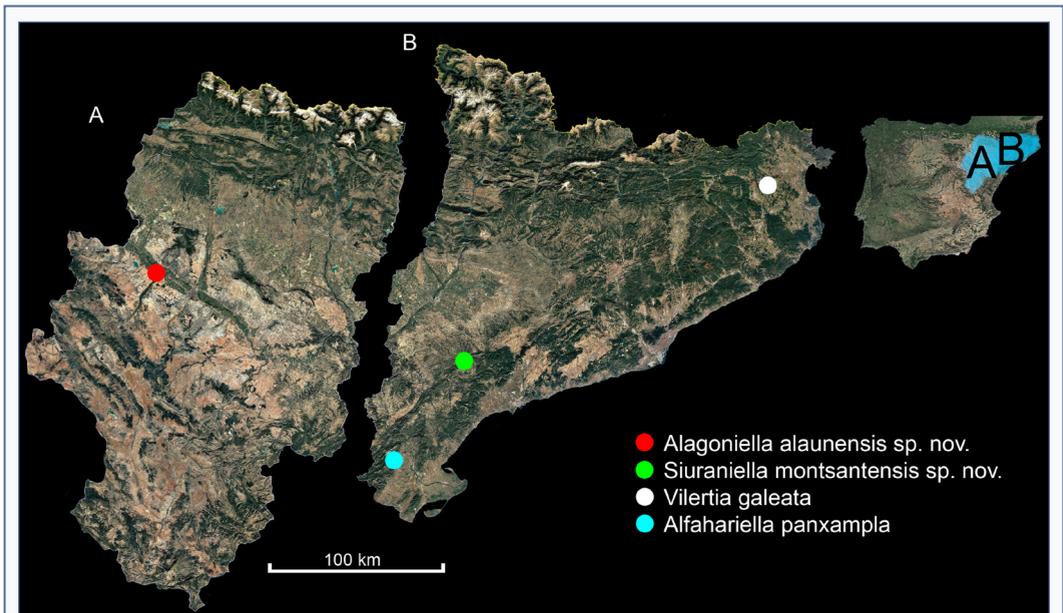


FIGURE 9. Map of the Iberian Peninsula showing the localities of the newly described taxa, and all the other valvatiform species included in the genetic analysis. **A:** Aragón; **B:** Catalonia.

Mapa de la península Ibèrica mostrant les localitats dels nous tàxons descrits i dels altres valvatiformes inclosos en l'anàlisi genètica. **A:** Arag3n; **B:** Catalunya.

within the tree. Our results indicate that adaptation to stygobiont life could have appeared multiple times during evolution in this family, since there is no direct relationship between all stygobiont genera, and at least one (*Siuraniella* gen. nov.) is closely related with some crenobiont species from nearby localities which have clear morphological affinities. However, many more genetic results are needed to support this hypothesis.

It is quite surprising that most of the stygobiont valvatiform taxa have only very recently been discovered, despite being present in most of the Iberian Peninsula. Additionally, *Siuraniella* gen. nov. appears to be a taxon known from multiple localities in an area (Montsant massif) previously examined resulting in the discovery of three other stygobiont endemic species (Alba et al., 2009; Corbella et al., 2009; Pascual et al., 2024). This points to a lack of exhaustive sampling in the hyporheic habitats, where valvatiform snails seem to be rather common, and could be explained by the fact that most of this research has been executed by citizen scientists with very limited resources, while receiving little attention and support from academic institutions in Spain. An important exception to this may be seen in the work by Notenboom & Meijers (1985) who collected numerous stygobiont molluscs whilst sampling for amphipods, a work that was fundamental for the latter descriptions by Boeters (2003).

While still quite incomplete, our molecular data are more informative about the phylogenetic placement of these valvatiform species than those of Delicado et al. (2019), at least concerning Iberian species. *Corbellaria celtiberica*, the only Iberian stygobiont included in that work, appeared in a cluster along with two Balkan species, while our study groups it with three newly described Iberian species, all stygobionts, which makes more sense. Obviously, more complete sampling and inclusion of additional taxa will deliver more approximate and realistic molecular results. Further sampling by the authors is already planned, in order to come to a more complete overview of this taxonomic puzzle.

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