

***Ainiella zahredini* gen. et sp.n. a new valvatoid snail (Gastropoda: Hydrobiidae) from Morocco**

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ABSTRACT. The species richness of the Hydrobiidae in Morocco is one of the most diverse in North Africa. *Ainiella zahredini* gen. et sp.n. is a new valvatoid hydrobiid gastropod from Morocco; it can be distinguished from other Moroccan hydrobiids by the morphology of the shell and anatomical criteria.

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KEY WORDS: Microsnails; Middle Atlas massif; crenobiotic; new spring snail; hotspot.

***Ainiella zahredini* gen. et sp.n., новый вид вальватидных моллюсков (Gastropoda: Hydrobiidae) из Марокко**

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РЕЗЮМЕ. Видовое богатство семейства Hydrobiidae в Марокко — наибольшее в Северной Африке. Дано описание нового вальватидного гидробиодного моллюска *Ainiella zahredini* gen. et sp.n. из Марокко; он отличается от других марокканских представителей этого семейства особенностями морфологии раковины и признаками анатомии.

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КЛЮЧЕВЫЕ СЛОВА: микромоллюски; массив Среднего Атласа; кренобиотик; новая родниковая улитка; горячая точка.

Introduction

Freshwater snails are among the most imperiled groups of organisms in the world; these molluscs have diversified into every conceivable natural aquatic habitats, where they are important dietary components and essential to the maintenance and balance of freshwater ecosystems. There are approximately 5000 species in the world, and about 10 000 species awaiting description (Darwall *et al.*, 2005; Mollusca-Base, 2022).

The Hydrobiidae is supposedly one of the largest gastropod family and it is one of the most diverse gastropod family among freshwater molluscs throughout the Mediterranean region (Glöer, 2019). The distribution of its members is limited by their stenotherm condition; most of them are obvious crenophilous, typically found in river sources and springs (Tachet *et al.*, 2010). The species richness of the Hydrobiidae in Morocco is one of the most diverse in North Africa. Very often, new species and even genera are described from this country (Gloer *et al.*, 2020a, b; Boulaassafeer *et al.*, 2021; Mabrouki *et al.*, 2020, 2021a, b, 2022; Taybi *et al.*, 2021; 2022), among which, those who have valvatoid shape.

The valvatoid hydrobiid is a group of minute gastropods with depressed trochiform shells. Most of these springsnails are narrow-range endemics and face a high risk of extinction, owing to their limited dispersal abilities and high degree of habitat specialization (Delicado *et al.*, 2019; Radea *et al.*, 2021). To date, the valvatoid Hydrobiidae are represented in Morocco by six genera, most of them are recently described, and these are *Fessia* Glöer, Mabrouki et Taybi, 2020; *Idresiella* Mabrouki, Glöer et Taybi, 2022; *Ifrania* Glöer, Mabrouki et Taybi, 2020; *Islamia* Radoman, 1973; *Pikasia* Taybi, Glöer et Mabrouki, 2021 and *Rifiya* Ghamizi, 2020. New research conducted recently in north-western Morocco revealed a new valvatoid genus. The aim of this paper is to describe a new springsnail genus and species.

Material and methods

Sampling. Field surveys were conducted from 2014 (still ongoing), in which several localities were prospected along the northern part of Morocco,

including the Atlas Mountains, Sebou and Moulaya River basins. Most of these sampling sites were visited several times. Our goal was to document maximum macroinvertebrate biodiversity in the different microhabitats, prospected at each sampling site. The samples of benthic fauna were collected by a kick net and clamps. The samples have been fixed in 75% ethanol.

The dissections and measurements of the genital organs and the shells were carried out using a stereomicroscope (Leica M205C) with a digital camera (Leica DMC5400). The type material is stored in the Zoological Museum of Hamburg (ZMH).

Results

Phylum Mollusca Cuvier, 1795

Class Gastropoda Cuvier, 1795

Superorder Caenogastropoda Cox, 1960

Superfamily Truncatelloidea Gray, 1840

Family Hydrobiidae Stimpson, 1865

Ainiella gen.n.

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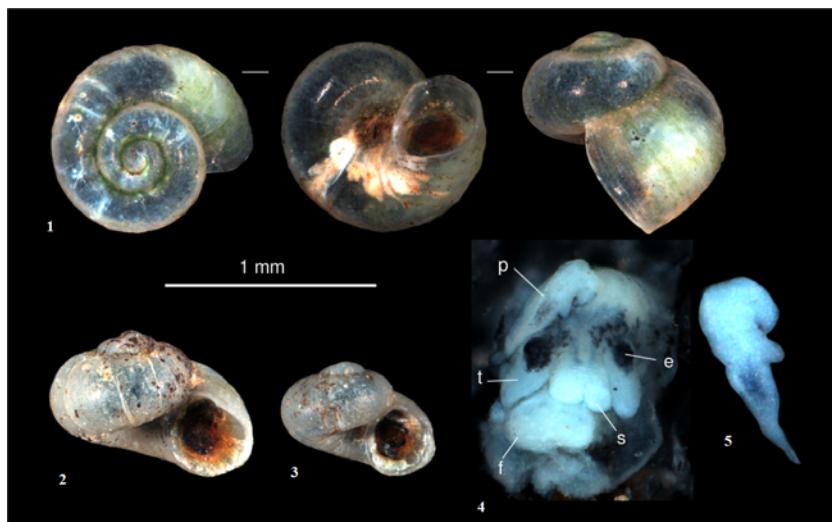
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Figs 1–5.

Type species: *Ainiella zahredini* sp.n. (see description below)

DESCRIPTION. The new genus is clearly distinguished by the following combination of characters: the tiny valvatoid translucent shell has only three whorls. The dark eyespots are very large at the base of the cylindrical tentacles; the new genus has probably the largest eyespots of all valvatoid snails. The triangular elongated penis is slim with a small outgrowth near the basis and very sharp penis tip, in the middle part there is a dark spot (Figs 4–5). Shell shape and penis morphology define the new genus.

DIFFERENTIAL DIAGNOSIS. The new genus can be distinguished from its Moroccan congeners by its tiny shell with 3 whorls, its elongated triangular penis with a small outgrowth and by its large dark eyespots. It can be confused with the recently described genus and species *Idresiella bourkaizensis* Mabrouki, Glöer et Taybi, 2022, but the latter has shells bearing more than 3 whorls, and the penis has a bulbous basis; the penis itself is flat and short, finally, there are small eyespots. While *Riftia yacobii* Ghamizi, 2020 has a bifurcated penis (subterranean). *Fessia aouintii* Glöer, Mabrouki et Taybi, 2020 (endemic to Aouinat El Hajjaj spring) has small and flat penis with a broad basis and tapered at the distal end. *Ifrania zerroukensis* Glöer, Mabrouki et Taybi, 2020 (endemic to Lake Zerrouka) has long and slender cylindric penis, widened at the basis and



Figs 1–5. *Ainiella zahredini* gen. et sp.n. 1 — holotype, 2–3 — paratypes, 4 — penis *in situ*, 5 — penis. Abbreviation. e — eye, f — foot, p — penis, s — snout, t — tentacle.

Рис. 1–5. *Ainiella zahredini* gen. et sp.n. 1 — голотип, 2–3 — паратипы, 4 — пенис *in situ*, 5 — пенис. Сокращения. е — глаз, f — нога, p — пенис, s — хобот, t — щупальце.

tapered at the distal end with a pointed penis tip. *Pikasia smenensis* Taybi, Glöer et Mabrouki, 2021 (endemic to Ain Chqef and Smen springs) is with a simple penis, broad and elongate flat with an acute penis tip, the distal part of the penis with an elongated triangular blackish spot. From the other *Islamia* species, the new genus can be distinguished by the penis which is bilobed in *Islamia*.

ETYMOLOGY. The genus name *Ainiella* refers to its type locality “Ain Sidi Bouali”. The word “Ain” in Arabic has a double meaning; it refers to the “eye” and “spring”. Since the new genus is characterized by its large eyespots and can only be found in springs, we thought appropriate to name the taxon as such.

Ainiella zahredini sp.n.

urn:lsid:zoobank.org:act:52D853CB-8B26-43ED-9276-D216EBFEF8AE

MATERIAL. **Holotype:** ZMH 141426, from Ain Sidi Bouali, Lakliaa, Fez-Meknes region ($33^{\circ} 46'24.3''N$ $4^{\circ}42'22.9''W$), collected on 9.04.2022. Shell measurements: 0.8 mm high, 1.0 mm broad. **Paratypes:** 30 specimens ZMH 141427, 30 specimens in coll Glöer, 20 specimens in coll Mabrouki, from Ain Sidi Bouali, Lakliaa, Fez-Meknes region ($33^{\circ}46'24.3''N$ $4^{\circ}42'22.9''W$), collected on 9.04.2022.

SHELL. The valvatoid shell is conical with a small spire and a prominent body whorl. The surface is smooth and glossy (Figs 1–3). The translucent

shell has 3 fast growing (regularly) whorls separate by a deep suture and a flat apex. The aperture is ovate with a sharp peristome. The umbilicus is wide. The outer lip is oblique from a lateral view and somewhat sinuated at the top. The shell is 0.5–0.8 mm high and 0.7–1.1 mm broad.

ANIMAL. The mantle is black with a white border. Tentacles long and cylindrical with a broad base. Eyespots are pigmented and very large at the base of tentacles (Fig. 4). The penis is elongated, slim with a small outgrowth near the basis, well-attached behind the head, in the middle part there is a dark spot (Fig. 5). The female sex tract is unknown.

OPERCULUM. The operculum is yellowish, transparent, and ovate with a rounded angle at the top. There is no peg.

ETYMOLOGY. The species was named after Prof. Zahr Eddine Taybi (University Mohamed Premier of Oujda), in recognition for his encouragement and support for our research work and for his help during the sampling campaigns.

HABITAT. The new genus and species was found in springs located at a place named Sidi Bouali in the Middle Atlas, southeastern Fez. The locality belongs to Sebou River basin. The whole place is located in a rural environment, known by multiple rheocrenous natural springs (at least three permanent). The bottom substrate of the spring is made up of blocks, stones, pebbles and sand (Fig. 6).

Ainiella zahredini gen. et sp.n. was found with different invertebrate aquatic species including oth-

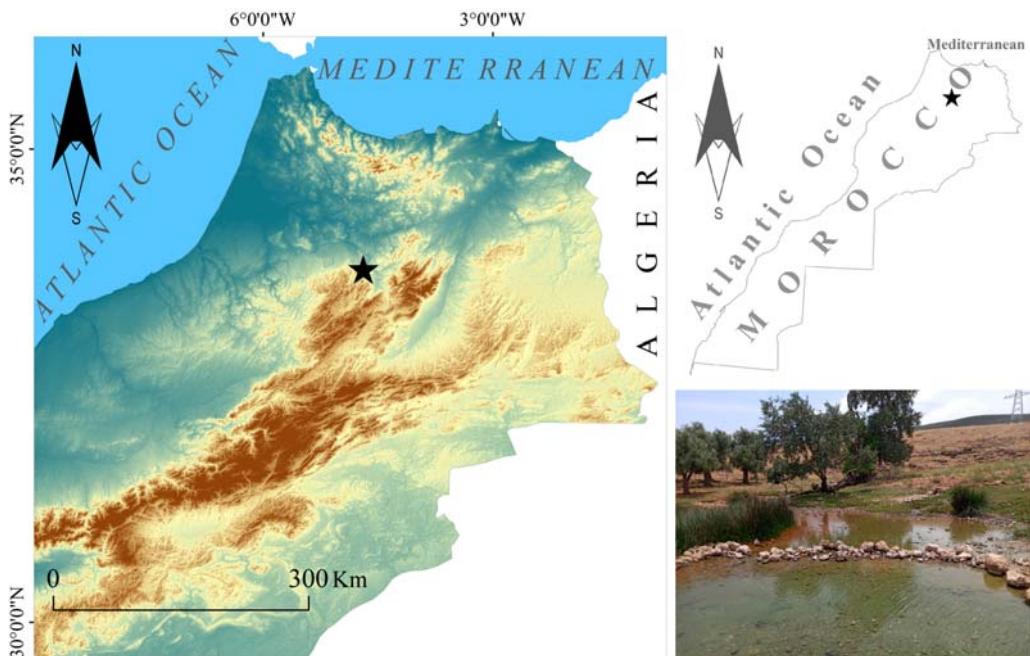


Fig. 6. The sampling site and habitat of *Ainiella zahredini* gen. et sp.n.

Рис. 6. Местонахождение и биотоп *Ainiella zahredini* gen. et sp.n.

er molluscs: *Theodoxus* spp., *Melanopsis praemorsa* (Linnaeus, 1758) s.l. (Gastropoda); *Limnatis nilotica* (Savigny, 1822) (Hirudinea); *Potamon algeriense* (Herbst, 1785) s.l. (Decapoda); *Baetis* sp., *Labiobetis* sp., *Ecdyonurus rothschildi* Navás, 1929 and *Rhithrogena* sp. (Ephemeroptera, larvae); *Anax imperator* Leach, 1815 and *Onychogomphus forcipatus* (Linnaeus, 1758) (Odonata, larvae and imagos); *Hydropsyche* spp. (Trichoptera, larvae). The aquatic vertebrates are presented by fish species e.g. *Carasobarbus* sp and other Cyprinid members, and aquatic reptiles *Natrix maura* (Linnaeus, 1758) and *Maurmys leprosa leprosa* (Schweigger, 1812).

Two invasive species have been spotted; these are *Phryscella acuta* (Draparnaud, 1805) and *Gambusia holbrooki* Girard, 1859.

REMARKS. Springs in Morocco are subjected to huge anthropogenic impacts, summed up in the excessive pumping water for domestic use, irrigation and cattle breeding, in addition to solid and liquid pollution. With the continuous deterioration in water quality of the freshwater ecosystems, many species will probably have disappeared before being recorded or even described. Moreover, the great pressure on natural ecosystems, especially aquatic ones in Morocco, act synergically with the effects of global warming and can potentially favour the expansion of invasive species in North Africa in general, which can bring huge irreversible impacts on

the native biodiversity. Therefore, we suggest the inclusion of *Ainiella zahredini* gen. et sp.n. and all the crenobiotic valvatoid species of Morocco in the IUCN Red-List.

Compliance with ethical standards

CONFLICTS OF INTEREST: The authors declare that they have no conflicts of interest.

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