

Research article

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Mahrazia benlelihi gen. et sp. nov., a new subterranean snail (Gastropoda: Hydrobiidae) from Morocco

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Abstract. The species richness of the Hydrobiidae in Morocco is one of the highest in North Africa. *Mahrazia benlelihi* gen. et sp. nov. is a new stygobiont hydrobiid gastropod from the Saiss aquifer, north-central Morocco. It can be distinguished by the morphology of the shell and anatomical details.

Key words. Minute snails; Saiss aquifer; stygobiont snail; new genus; groundwater.

INTRODUCTION

Freshwater gastropods often dominate superficial aquatic ecosystems in both biomass and numbers, where they graze on periphytic or epiphytic algae and biofilms. They constitute an important dietary component for several predatory animals. Freshwater snails can also be found in water bodies fed by karstic aquifers; some species are adapted to live in caves and subterranean habitats (Kebapçı 2013; Glöer 2019); these are called stygobionts.

The aquatic gastropod family Hydrobiidae Stimpson, 1865 occurs mainly in the western Palaearctic and the Nearctic (Lydeard & Cummings 2019). The family *sensu lato* comprises more than 400 extant genera (Kabat & Hershler 1993), many of which are stygobionts.

In Morocco, only four stygobiont species of hydrobiids are known to have depigmented bodies and to lack eye spots, these are: *Atebbania bernasconi* Ghamizi, Bodon, Boulal & Giusti, 1999, *Heideella andreae* Backhyus & Boeters, 1974, *Heideella makhfamensis* Bodon, Ghamizi & Giusti, 1999 and *Rifia yacoubii* Ghamizi, 2020. In addition, there are two stygobiont species of Moitessieridae: *Iglica seyadi* Backhyus & Boeters, 1974 and *Iglica soussensis* Ghamizi & Boulal, 2017 (Ghamizi 2020).

New research conducted recently in north-central Morocco revealed a new stygobiont genus of the family Hydrobiidae.

MATERIAL AND METHODS

Field surveys were conducted since 2014 (still ongoing), in which several localities were prospected in the northern part of Morocco. Stygobiont molluscs were collected from wells by means of a phreatobiological net, through filtering subterranean water by passing it through a nylon net and sieving mud and sediment. The samples were fixed in 75% ethanol. The dissections and measurements of the genital organs and the shells were carried out using a stereo microscope (Leica M205C) with a digital camera (Leica DMC5400). The type material is stored partly in the Zoological Museum Hamburg (ZMH), partly in the collection of the first author.

RESULTS

Phylum Mollusca Cuvier, 1795
Class Gastropoda Cuvier, 1795
Superorder Caenogastropoda Cox, 1960
Superfamily Truncatelloidea Gray, 1840
Family Hydrobiidae Stimpson, 1865

Mahrazia gen. nov.

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Type species

Mahrazia benlelihi gen. et sp. nov.

Table 1. Shell measurements of *Mahrazia benlemlihi* gen. et sp. nov. (in mm; N=9; measurement accuracy: 0.05).

Shell measures	Min	Max	Mean	sd
Shell height	3.15	3.35	3.25	0.10
Aperture height	1.00	1.10	1.05	0.05
Spire height	2.10	2.30	2.20	0.10
Shell width	1.55	1.75	1.65	0.10
Aperture width	0.90	1.00	0.95	0.05

Type material

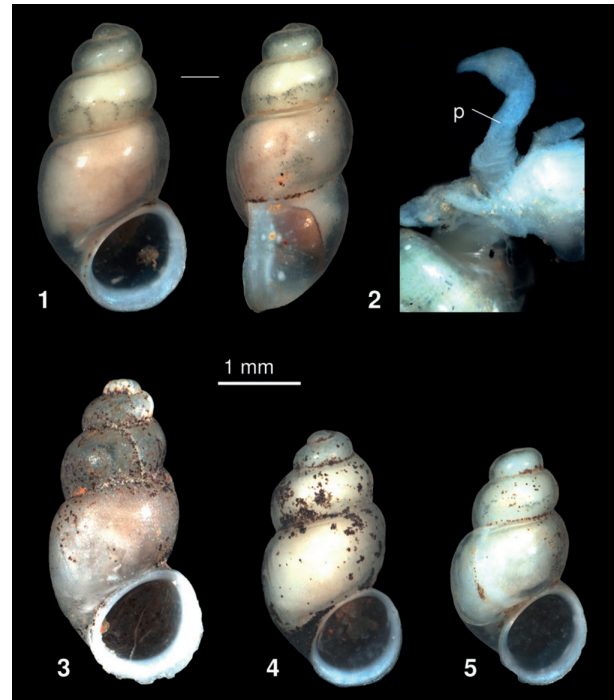
Holotype

ZMH 141428; from a well located at the Faculty of Sciences Dhar El Mahraz, University Sidi Mohamed Ben Abdellah, Fez-Meknes region; 34°01'59.16" N, 4°58'37.86" W; collected 9 Apr. 2022.

Paratypes

3 spec.; ZMH 141429; same collection data as for holotype. – 6 spec.; Y. Mabrouki leg.; collected 10 Oct. 2022; same locality as for holotype.

Diagnosis. The new genus can be distinguished from the other Moroccan stygobiont hydrobiids by its elon-



Figs 1–5. *Mahrazia benlemlihi* gen. et sp. nov. 1. Holotype (ZMH 141428). 2. Holotype, penis. 3–5. Paratypes (3 dried).



Fig. 6. Habitus of live specimens of *Mahrazia benlemlihi* gen. et sp. nov.

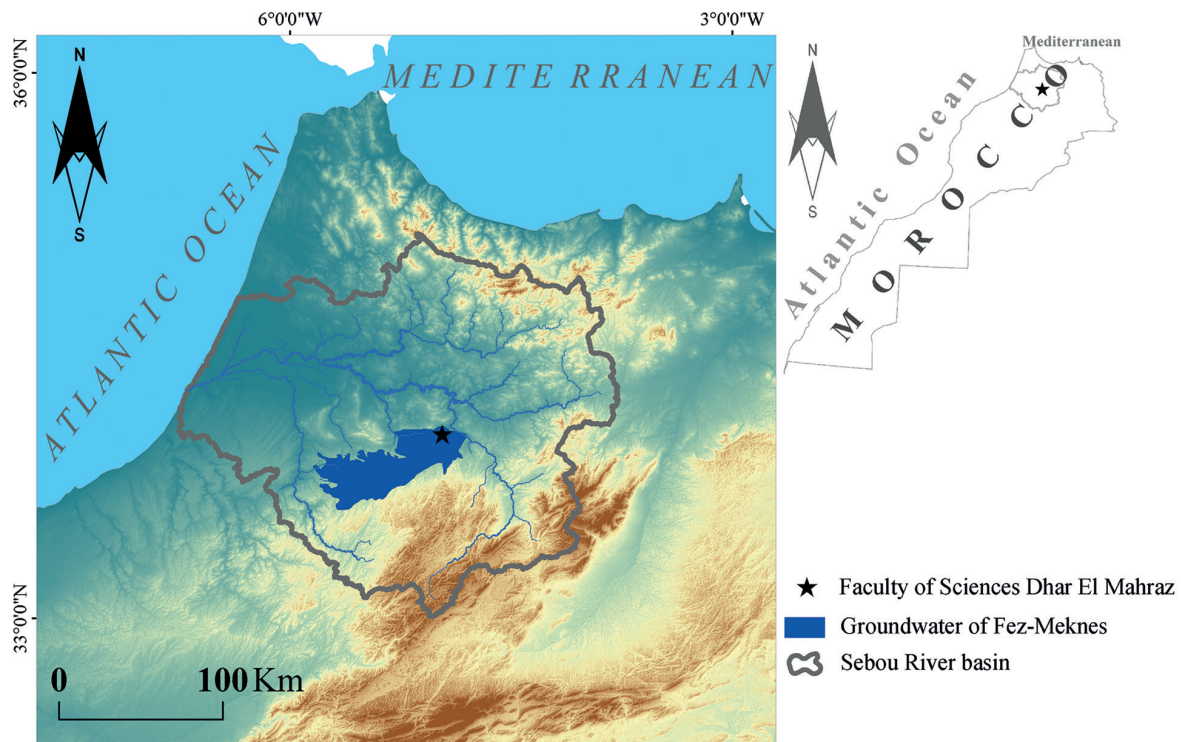


Fig. 7. Location of the type locality of *Mahrazia benlemlih* gen. et sp. nov.

gated ovate shell with less than 5 whorls, its long penis, thickened at the basis with a bulbous part near the pointed penis tip. *Heideella* Backhuys & Boeters, 1974 has a slim, elongated conical shell with more than 5 flat whorls, a conical penis that is more or less elongated, wrinkled near its base, with one lobe, more or less developed and bulging. *Atebbania* Ghamizi, Bodon, Boulal & Giusti 1999 has an elongated conical shell with more than 5 whorls, with the penultimate whorl slightly broader than the body whorl, a penis with an apical stylet, one lobe bent downwards on its left side, and the penial duct running near the right side. *Rifia* Ghamizi, 2020 has a valvatoid shell and a bifurcated penis. The other genera are surface water molluscs and have eyespots and pigmented bodies.

Description. See description of single known species below.

Etymology. The genus name ‘*Mahrazia*’ refers to its type locality: the Faculty of Sciences Dhar El Mahraz FSDM, located on the university campus Dhar El Mahraz and covering an area of 6 ha. It mainly serves the region of Fez-Boulemane located in the northern center of Morocco.

Mahrazia benlemlih gen. et sp. nov.

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Figs 1–6

Etymology. The species was named after Professor Mohammed Benlemlih (the Dean of the Faculty of Sciences, Dhar El Mahraz), in recognition of his encouragement and support for our research work and for his help in finding the new species.

Description

Shell. Minute, thin-walled, elongated ovate, glossy and transparent when fresh, spire of 4.5 whorls growing regularly, and separated by a deep suture. Shell surface smooth, with growth lines that are hardly visible. Apex broad and flat. Aperture ovate with a sharp peristome. Umbilicus closed. Outer lip slightly sinuated in lateral view. The shell measurements (N=9) are presented in Table 1. Since the number of individuals studied is quite small, these morphometric characteristics need to be completed by further catches of the new subterranean snail.

Operculum. The corneous operculum is smooth and thin, and brown in colour.

Soft parts morphology and anatomy. Body translucent when alive, white when preserved, pigment-less; tentacles very long and thin, without eyes. Penis long, thickened at basis with a bulbous part near pointed penis tip, four times longer than wide with folds at the basis.

Distribution. This new genus and species is known only from the type locality, which is a well located in the Faculty of Sciences Dhar El Mahraz (Fig. 7). It belongs

to the Saiss aquifer system, one of the main aquifer systems of Morocco, limited to the North by the Pre-Rif, to the East by the valley of the Oued Sebou, to the West by the tributaries of the Oued Beht and to the South by the Middle Atlas. It is formed by the deep Lias aquifer and the Quaternary groundwater. The water level is on average at a depth of 50 m below the ground level.

DISCUSSION

The Moroccan freshwater ecosystem is among the most diverse within the northern African region, where a diversified molluscan fauna appears to live in the aquifers, in the karstic underground (Van Damme et al. 2010). In addition to the historical records, many new species and genera have been recently discovered in this country (Glöer et al. 2020a, 2020b; Boulaassafeer et al. 2021; Mabrouki et al. 2020, 2021a, 2021b, 2022a, 2022b; Taybi et al. 2021; 2022a, 2022b, 2022c). While there has been a significant advancement of knowledge on the surface water malacofauna of Morocco, gaps remain and knowledge on the occurrence of freshwater species from several aquifers is still poor, with some entirely 'blank areas'.

Five species of stygobiont Hydrobiidae *sensu stricto* are currently recognized, including *Mahrazia benlemlihi* gen. et sp. nov. For the moment, the new genus and species is only known from the Sais aquifer. The stygobiont valvatooid *Rifia yacoubii* is widespread in the phreatic waters in the southern border of the Rif region, in the upstream of the Moulouya, Sebou and Loukkos basins. *Atebbania bernasconii* is restricted to the subterranean waters of the Tiznit plain (southern Morocco). *Heideella andreae* is distributed in southern-central Morocco and the Marrakech vicinity, and *H. makhfamanensis* is endemic to the hyporheic waters of Oued Makhfame in the centre of the Haouz plain, in central Morocco (Ghamizi 2020; Glöer 2022).

Pollution, habitat loss, and an ever-drier climate seem to be the main factors responsible for the decline of freshwater molluscs in North Africa (Taybi et al. 2017). Numerous freshwater wells are presently at risk of salinization (Van Damme et al. 2010; Khalloufi et al. 2017), threatening the stygobiont fauna which they shelter, including molluscs. Further intensified studies and collecting expeditions, and description of new taxa are an urgent need.

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