

# *Bythinella gloeri* n. sp. – A New Cave Inhabiting Species from Bulgaria (Gastropoda: Risooidea: Hydrobiidae)

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**Abstract:** The paper represents a description of a new species of *Bythinella* (Gastropoda: Risooidea: Hydrobiidae) named *Bythinella gloeri* n. sp. The species was collected from Lepenitsa cave in Western Rhodopes, Bulgaria and is the second troglobite representative of this genus known so far from the country and the Balkan Peninsula.

**Key words:** Gastropoda, *Bythinella gloeri* n. sp., hypogean habitat, Balkans

## Introduction

Freshwater spring-snails *Bythinella* MOQUIN-TANTON, 1856 (Gastropoda: Risooidea: Hydrobiidae) consists of around 80 valid taxa known from Europe (BICHAIN *et al.* 2007). Members of this genus are minute (2-4 mm in shell length) and live mainly in small springs and rarely in running waters of hypogean habitats (BOETERS 1979). These gastropods are often characterized by small geographical ranges and are endemics (BENKE *et al.* 2009).

The papers of GLÖER, PEŠIĆ (2006) and GLÖER, GEORGIEV (2009) demonstrated that the species diversity of the genus *Bythinella* in Bulgaria is higher than currently known, and further detailed investigation is required. The following species are known to occur in the country till now: *Bythinella hansboetersi* GLÖER ET PEŠIĆ 2006, *Bythinella markovi* GLÖER ET GEORGIEV 2009, *Bythinella ravnogorica* GLÖER ET GEORGIEV 2009, *Bythinella walkeri* GLÖER ET GEORGIEV 2009, *Bythinella srednogorica* GLÖER ET GEORGIEV 2009. According GLÖER, GEORGIEV (2009) previously reported species as *Bythinella austriaca* (FRAUENFELD 1857) and *Bythinella opaca* (GALLENSTEIN 1848) by ANGELOV (2000) and GEORGIEV, STOYCHEVA (2008) does not occur in Bulgaria.

As one of the results of our current investigations of Bulgarian Hydrobiidae, in this paper we describe a new species from the genus named *Bythinella gloeri* n. sp.

## Material and Methods

The snails were collected and preserved in 75% ethanol. The dissections and measurements of the shell were carried out by means of CETI stereo microscope and an eye-piece micrometer; the photographs were made with camera system with a digital adapter. The type material is stored in the Museum für Tierkunde Dresden (= Zoological Museum of Dresden) with collection numbers from MTD Moll S1352 to MTD Moll S1355).

## Results

### *Bythinella gloeri* n. sp.

**Material examined:** 19 ex. from loc. typ. (15 shells measured, 4 males dissected).

**Holotype:** Shell height 2.64 mm, shell width 1.52 mm, Museum für Tierkunde Dresden, coll. No

MTD Moll S1352.

**Paratypes:** 3 ex. Museum für Tierkunde Dresden, coll. No MTD Moll S1353 /Paratype 1/, MTD Moll S1354 /Paratype 2/, MTD Moll S1355 /Paratype 3/, 5 ex. coll. Glöer, rest in coll. Georgiev (Plovdiv University).

**Locus typicus:** Lepenitsa Cave, south of Velingrad town (Batashki Ridge, the Rhodopes, Bulgaria), GPS coordinates: 41°57'14"N, 24°0.0'43.3"E, 950 m a.s.l.; 04.09.2009, D. Georgiev, S. Stoycheva leg.

**Habitat:** Under stones of an underground river in Lepenitsa karstic cave with water temperature 8.4 °C. The water of this river are completely caught when emerging above ground for drinking needs of the nearby Velingrad town. According to PETROV, STOEV (2007), the total cave length is 1525 m with a displacement of +10 m. It has three floors and a stream flows along the lowest one for 273 m. *B. gloeeri* population actually exists only in cave conditions and it is not clear if before the human influence on the habitat it was inhabiting and the ex outer stream. However no any *Bythinella* specimens were found in a search of streams closely situated to locus typicus.

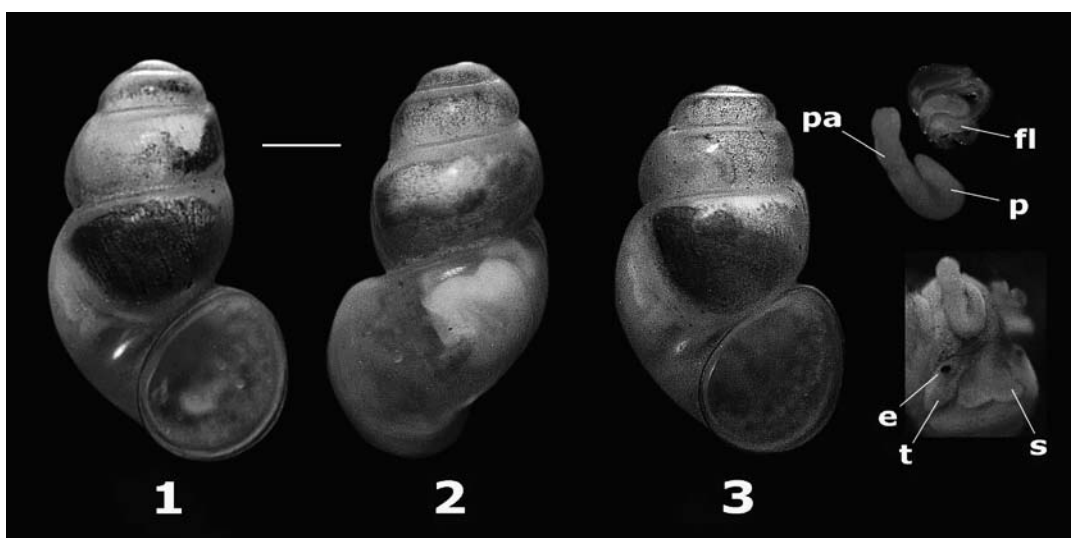
**Etymology:** The species is named after the outstanding expert on freshwater molluscs Peter Glöer

(Hetlingen, Germany) who is contributing so much in the studies of Bulgarian Hydrobiidae.

**Description:** The penis has a penial appendix and a flagellum, a distinctive feature of the genus *Bythinella* from the rest of the Bulgarian minute Hydrobiidae.

The horn-colored translucent shell is cylindrical and consists of 4 convex whorls with clear suture. The shell height is 1.85-2.64 mm, and shell width 1.09-1.52 mm (15 specimens measured). The mantle is black with grey-white edge. The sole and snout are white. The eyes are visibly well developed. The penis is regularly broad with rounded apex. The ratio of penis length to this one of the penial appendix is about 1:2. The flagellum is regularly broad, at the proximal part thickened (Fig. 1).

**Differential diagnosis:** The specific mantle pigmentation (black with grey-white edge) discerns *B. gloeeri* from the rest of the known Bulgarian species from this genus having white (*B. markovi*, *B. ravnogorica*), uniformly black (*B. hansboetersi*, *B. walkeri*) or grey pigmentation (*B. srednogorica*). The only Bulgarian *Bythinella* species known so far to live in caves is *B. markovi*. While *B. markovi* has a short and small shell, the shell of *B. gloeeri* is longer and larger (Fig. 2). Shell proportions of the first species (width to height) are about 0.47-0.50 and in



**Fig. 1.** *Bythinella gloeeri* n. sp. (photographed in ethanol) – 1, 2: Shell of the holotype, front and back view respectively (mantle and sole pigmentations are visible); 3: Shell of a paratype, front view (coll. Museum für Tierkunde Dresden); Anatomical features of dissected specimens: p = Penis, pa = Penial Appendix, fl = Flagellum; Morphology of the head: e = Eye, t = Tentacle, s = Snout.

the second they are 0.53–0.69. The eyes of *B. gloeeri* are well developed in contrast with *B. markovi*. The penis/penial appendix length ratio is about 1:2 in the first species while in second it is 1:1.

## Discussion

Till now very few *Bythinella* species are known to live in caves having small ranges, mainly in Western Europe. For example *Bythinella padiraci* LOCARD, 1903 is regarded as a restricted endemic of the Padirac karstic network in France (BICHAIN *et al.* 2007). The only *Bythinella* from Bulgaria and Balkan Peninsula known to live in caves is *Bythinella markovi* from Gargina Dupka cave, an area at about 80 km straight line to the east from locus typicus of *B. gloeeri*. Also these two caves are situated in different river catchments and ridges of the Rhodope Mountains. The two cave inhabiting species differ both by morphology and anatomy (see differential diagnosis).

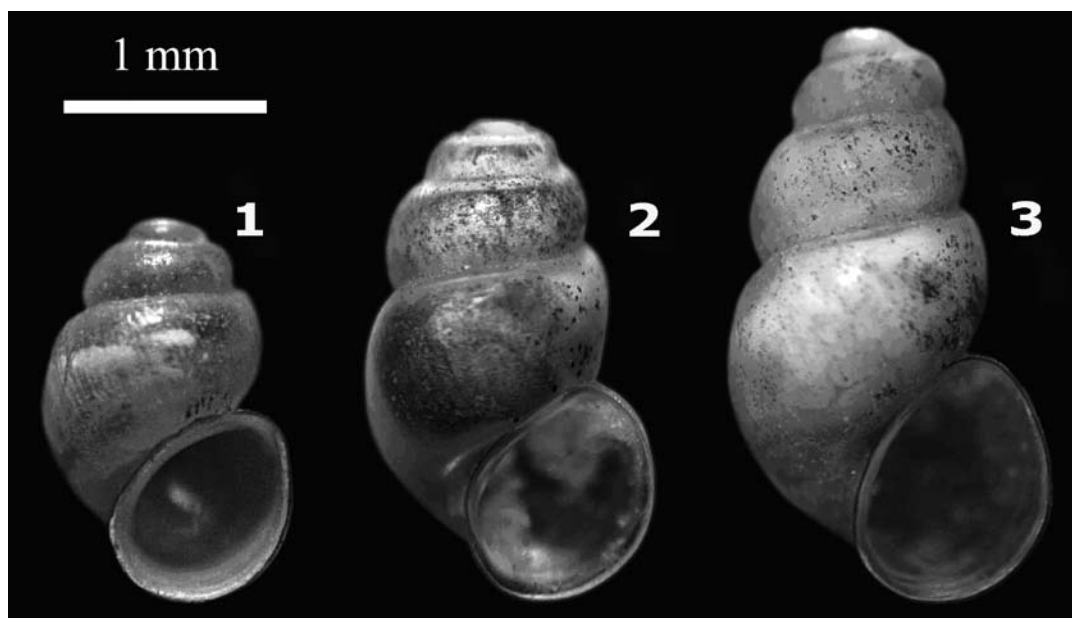
No any *Bythinella* species were ever recorded from the Greek part of the Rhodopes (BANK 2006) and the rest of *Bythinella* species described from Bulgaria are not known to live in caves. Except its habitat, the newly described species discerns from them and by its morphological and anatomical fea-

tures (Table 1). From *B. hansboetersi* and *B. ravnogorica* the new species differs by the ratio of the penis according the length of the penial appendix. The two species mentioned have penis much shorter than the half of the penial appendix.

The penis in *B. gloeeri* is regularly broad while in *B. srednogorica* (and *B. hansboetersi*) it has a broad base and thin apical part. Also penial appendix is slimmer in *B. gloeeri*. The two species under discussion differ also by shell size (first species is quite larger).

The ratio of the same male genital structures is similar in *B. walkeri* and *B. gloeeri* but in the first species the penis has a relatively broader base and tapered apex. The two species also differ by size (first species is larger), shell pigmentation (whitish to yellowish in first and horn colored in second) and shape (*B. gloeeri* has more cylindrical shell). Also the penis and snout of *B. walkeri* is pigmented in black while in *B. gloeeri* it is white. Both species occupy different mountains and habitats as *B. walkeri* was described from Rila Mts from a spring on volcanic rocks, while *B. gloeeri* inhabits a river in a karstic cave in the Rhodope Mts.

In his review paper ANGELOV (2000) listed a total of 16 minor Hydrobiid snail species in Bulgaria,



**Fig. 2.** Shells of *Bythinella* species known so far from the Rhodope Mountain (coll. D. Georgiev, from the type localities): 1: *B. markovi* (Gargina Dupka cave), 2: *B. gloeeri* (Lepenitsa cave), 3: *B. ravnogorica* (karstic spring in Ravnogor village).

**Table 1.** Characteristic features of the known Bulgarian species of genus *Bythinella* MOQUIN-TANDON, 1856. Legend: H – Shell height, W – Shell width, W/H – Shell width /Shell height ratio, MP – Mantle pigmentation, P/PA – Penis/ Penial appendix ratio.

<i>Bythinella</i> species	H	W	W/H	MP	P/PA
<i>B. hansboetersi</i>	2.6-2.9	1.6-1.7	0.59-0.62	black	1:4
<i>B. markovi</i>	2.0-2.2	1.2-1.3	0.47-0.50	white	1:1
<i>B. ravnogorica</i>	2.9-3.1	1.6-1.9	0.38-0.42	white	1:4
<i>B. walkeri</i>	3.0-3.2	1.9-2.0	0.43-0.44	black	1:2
<i>B. srednogorica</i>	2.9-3.1	1.6-1.7	0.42-0.44	grey	1:1
<i>B. gloeeri</i>	1.9-2.6	1.1-1.5	0.53-0.59	black with grey-white edge	1:2

11 of them endemics for only few hypogean habitats. The author stated that this group is not well studied in the country and needs more precise investigations. He supposed that such work will reveal a lot of new species and possibly will characterize Bulgaria as a center of species origin of some genera. The intensive explorations of GLÖER, PEŠIĆ (2006), GLÖER, GEORGIEV (2009), and the present paper (also a lot of unpublished materials collected) confirmed these suppositions when contributed to the knowledge of these interesting, and hard to find minor gastropods with 13 species. This is about same number of all described taxa from the beginning of the studies focused on Hydrobiidae by WAGNER (1927) and the review of ANGELOV (2000).

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## Conclusion

Lepenitsa cave is a ‘natural landmark’. Despite its protected status, it is highly disturbed and polluted due to unregulated visits of various people. Also, a construction project for tourist visits within the cave is ongoing. The disturbance of the habitat by chemical agents, walking in the stream and constant strong lightening must be avoided which is essential for the survival of the population of *B. gloeeri*. As the new species is possibly endemic with very restricted range we recommend its full protection by law.

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## ***Bythinella gloeeri* n. sp. – нов вид, описан от пещера в България (Gastropoda: Risooidea: Hydrobiidae)**

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### **(Резюме)**

Описан е нов вид сладководен гастропод от род *Bythinella* (Gastropoda: Risooidea: Hydrobiidae) с име *Bythinella gloeeri* n. sp. Видът е установен в пещерата Лепеница (Западни Родопи, България) и е втори троглобионт от този род, познат в страната и на Балканския полуостров.

